DEPARTMENT OF PUBLIC WORKS

DIVISION OF CIVIL ENGINEERING

INVITATION TO BID

FIRE STATION 15 AND FIRE STATION 16 RENOVATIONS
(25% MBE PARTICIPATION GOAL)

Electronic bids will be received by the Director, Department of Public Works, City of Dayton, Ohio until 12:00 o'clock NOON, Dayton time, **OCTOBER 16, 2025** for the following improvement in accord with the bidding documents available for download at www.questcdn.com using the QuestCDN eBidDoc Number for this project **9860039**. Bids will **ONLY** be received and accepted via the online electronic bid service through www.QuestCDN.com. Bid results will be published and can be viewed on the QuestCDN project page using the project number listed above, shortly after the bids are received. Bid results will also be available on the City of Dayton website at www.daytonohio.gov/bids.aspx.

There will be a voluntary site visit will be held on Wednesday October 1, 2025, at 10:00am located at Fire Station 15 located at 2801 Wayne Ave, Dayton, Ohio 45420 and proceeding to Fire Station 16 located at 4111 Kings Highway, Dayton, Ohio 45406.

Minority Business Enterprise (MBE) subcontract bidders on this project must be certified with the City of Dayton Human Relations Council as such.

The City of Dayton encourages all bidders to review the list of certified companies in our Procurement Enhancement Program at http://daytonhrc.org/business-technical-assistance/certification/ (click the "Certification List" link under Procurement Enhancement Program). This Project is being bid with a **25% MBE participation** goal. A company must be certified as **MBE for the MBE goal** at the time of the bid opening and must be pre-qualified to perform the proposed subcontracted work. You are advised to obtain a copy of the company's certification letter and to review the Certification List. The participation must be submitted with your bid on the **"PEP-Certified MBE Participation Form (for the MBE goal)"** provided by the City of Dayton Human Relations Council (HRC). Participation Forms must be completely filled out in accordance with the instructions listed on the forms. Any total or partial request for waiver of the **MBE** goal must be submitted on the enclosed **"PEP Participation Commitment and/or Waiver Request Form."**

CHANGES TO THE BID EVALUATION PROCESS

Each Bidder must submit an executed "PEP Participation Commitment and/or Waiver Request Form" to summarize the Bidder's overall PEP participation plan and/or to request a full or partial waiver of a PEP participation goal. For each PEP firm whose participation is being counted toward a goal, a Bidder must also submit one (1) executed "PEP-Certified SBE/MBE/WBE/DLSB Participation Form" describing the PEP firm's participation on the Base Bid and on Alternates. Participation will be evaluated based on the Base Bid plus Alternates as selected by the awarding department.

If unable to meet the project's PEP participation goal(s), a Bidder must submit a waiver request with its Bid. A Bidder must maintain supporting documentation of its Good Faith Efforts to meet the participation goal(s). If requesting a waiver, documentation of Good Faith Efforts must be submitted to the HRC within two (2) business days of the Bid Opening date. Bidders will receive no further reminders about this deadline.

A waiver will be granted based on a Bidder's Good Faith Efforts, and only when the HRC determines that a Bidder has completed all of the following activities:

1. **Solicited the interest of all PEP-Certified Firms having the capability to perform the work of the contract. The Bidder must solicit this interest at least ten (10) business days before the Bid Opening Date in order to allow the PEP-Certified Firm sufficient time to respond to the solicitation. Electronic communication will not be deemed as sufficient Good Faith Efforts, if it is the sole method of communication used.**
2. **Divided contract work items into economically feasible units to facilitate PEP participation, even when the Bidder/Proposer might otherwise prefer to perform these work items with its own forces.**
3. **Negotiated in good faith with PEP-Certified Firms and considered the firms' prices and capabilities as well as the contract goals. Rejected PEP-Certified Firms as being unqualified only for reasons based on a diligent investigation of their capabilities. The Bidder's standing within its industry; membership in specific groups, organizations, or associations; and political or social affiliations (for example, union vs. non-union employee status) are not legitimate causes to reject or not solicit bids from particular PEP-Certified Firms.**
4. **Provided interested PEP-Certified Firms with plans and specifications at no cost, or directed them to the Greater Dayton Minority Business Assistance Center (Dayton MBAC) for information about the project's plans, specifications, and requirements at least ten (10) business days prior to the Bid Opening Date in order to assist them in responding to a solicitation.**
5. **Sought the Dayton MBAC's assistance or used the services of community organizations; contractors' groups; local, state or federal business assistance offices; or similar organizations to find PEP-Certified Firms. Contacting the HRC for a list of certified companies will not be deemed as sufficient Good Faith Efforts.**

NOTE: In determining whether a Bidder has made Good Faith Efforts, the HRC may take into account the performance of other Bidders in meeting the goal(s). For example, when the apparent low bidder fails to meet a participation goal but others meet it, the HRC may reasonably raise the question of whether, with additional reasonable efforts, the apparent low bidder could have met the goal.

If you have questions regarding PEP participation or the waiver request process, please contact the Human Relations Council at (937) 333-1430.

Description of Improvement

This project consists of renovations to Fire Station 15 located at 2801 Wayne Avenue, Dayton, OH 45420 and Fire Station 16 located at 4111 Kings Highway, Dayton Ohio 45406. Work includes comprehensive renovations of living spaces including but not limited to, bunkrooms, bathrooms, and kitchen. Scope of work will also include limited upgrades to building systems including but not limited to plumbing, HVAC and electric.

Location

FIRE STATION 15 AND FIRE STATION 16 RENOVATIONS
(25% MBE PARTICIPATION GOAL)

Completion Date

August 31, 2026

CHARGE FOR PLANS & SPECIFICATIONS: $70.00
(NON-REFUNDABLE)

LEGAL NOTICE NO. 40

Electronic bids will be received by the Director of Public Works of the City of Dayton, State of Ohio, until 12:00 Noon, **OCTOBER 16, 2025** for the following improvement:

FIRE STATION 15 AND FIRE STATION 16 RENOVATIONS
(25% MBE PARTICIPATION GOAL)

Information and instructions to bidders may be obtained at the City Engineer's Office Prospective bidders must be on the plan holders list through QuestCDN for bids to be accepted. Bidding documents for this project may be examined online or downloaded at: www.questcdn.com. The QuestCDN eBidDoc Number for this project is **9860039.** There is a non-refundable fee of $70 for each set of bidding documents.

There will be a voluntary site visit will be held on Wednesday October 1, 2025, at 10:00am located at Fire Station 15 located at 2801 Wayne Ave, Dayton, Ohio 45420 and proceeding to Fire Station 16 located at 4111 Kings Highway, Dayton, Ohio 45406.

Minority Business Enterprise (MBE) and Small Business Enterprise (SBE) subcontract bidders on this project must be certified with the City of Dayton Human Relations Council as such.

The City of Dayton encourages all bidders to review the list of certified companies in our Procurement Enhancement Program at http://daytonhrc.org/business-technical-assistance/certification/ (click the "Certification List" link under Procurement Enhancement Program). This Project is being bid with a **25% MBE participation** goal. A company must be certified as **MBE for the MBE goal** at the time of the bid opening and must be pre-qualified to perform the proposed subcontracted work. You are advised to obtain a copy of the company's certification letter and to review the Certification List. The participation must be submitted with your bid on the **"PEP-Certified MBE Participation Form (for the MBE goal)"** provided by the City of Dayton Human Relations Council (HRC). Participation Forms must be completely filled out in accordance with the instructions listed on the forms. Any total or partial request for waiver of the **MBE** goal must be submitted on the **enclosed "PEP Participation Commitment and/or Waiver Request Form."**

Thomas Ritchie, Jr., Director
Department of Public Works

Published in the Dayton Daily News on September 22, 2025, and September 29, 2025.

INSTRUCTIONS

Instructions for submitting a Bid are contained in the Invitation to Bid; the City of Dayton Construction and Material Specifications dated October 1, 2008, sections 103.01-103.43 and related modifications; the Amendments to the City of Dayton General Provisions; and any Addendum.

Electronic bids for the **FIRE STATION 15 AND FIRE STATION 16 RENOVATIONS (25% MBE PARTICIPATION GOAL) project** will be received by the Director, Department of Public Works, until 12:00 o'clock NOON, Dayton time, on **OCTOBER 16, 2025**. Each bid shall be submitted using the QuestCDN vBid portal. Bidders must download the project bid document file from QuestCDN, which will add Bidders to the plan holders list and give Bidders access to vBid Online Bidding. No paper bids will be accepted for this project. There is a non-refundable fee of $70 to download the bid package and submit an electronic bid. Minority Business Enterprise (MBE) subcontract bidders on this project must be certified with the City of Dayton Human Relations Council as such.

There will be a voluntary site visit will be held on Wednesday October 1, 2025, at 10:00am located at Fire Station 15 located at 2801 Wayne Ave, Dayton, Ohio 45420 and proceeding to Fire Station 16 located at 4111 Kings Highway, Dayton, Ohio 45406.

The City of Dayton encourages all bidders to review the list of certified companies in our Procurement Enhancement Program at http://daytonhrc.org/business-technical-assistance/certification/ (click the "Certification List" link under Procurement Enhancement Program). This Project is being bid with a **25% MBE participation** goal. A company must be certified as **MBE for the MBE goal** at the time of the bid opening and must be pre-qualified to perform the proposed subcontracted work. You are advised to obtain a copy of the company's certification letter and to review the Certification List. The participation must be submitted with your bid on the **"PEP-Certified MBE Participation Form (for the MBE goal"** provided by the City of Dayton Human Relations Council (HRC). Participation Forms must be completely filled out in accordance with the instructions listed on the forms. Any total or partial request for waiver of the **MBE or SBE** goal must be submitted on the enclosed **"PEP Participation Commitment and/or Waiver Request Form."**

CHANGES TO THE BID EVALUATION PROCESS

Each Bidder must submit an executed "PEP Participation Commitment and/or Waiver Request Form" to summarize the Bidder's overall PEP participation plan and/or to request a full or partial waiver of a PEP participation goal. For each PEP firm whose participation is being counted toward a goal, a Bidder must also submit one (1) executed "PEP-Certified SBE/MBE/WBE/DLSB Participation Form" describing the PEP firm's participation on the Base Bid and on Alternates. Participation will be evaluated based on the Base Bid plus Alternates as selected by the awarding department.

If unable to meet the project's PEP participation goal(s), a Bidder must submit a waiver request with its Bid. A Bidder must maintain supporting documentation of its Good Faith Efforts to meet the participation goal(s). If requesting a waiver, documentation of Good Faith Efforts must be submitted to the HRC within two (2) business days of the Bid Opening date. Bidders will receive no further reminders about this deadline.

The time of completion is August 31, 2026.

Please direct all technical questions to:

Brad French
Dayton Fire Department
Phone 937-333-4503
E-mail **brad.french@daytonohio.gov**

Each Bid shall be accompanied by a bond executed by a surety company authorized to do business in the State of Ohio for an amount of **at least ten percent (10%) of the amount of the bid submitted, including Alternates**, as a guarantee that if the bid is accepted, a Contract will be entered into and its performance properly secured.

NOTE: THIS PROJECT IS STATE OF OHIO SALES TAX EXEMPT
THIS PROJECT IS STATE PREVAILING WAGE

CITY OF DAYTON CMS MODIFICATIONS FOR ONLINE BIDDING

The City of Dayton Construction and Material Specifications are hereby modified by this Contract as follows:

100 GENERAL PROVISIONS

ITEM 101 ABBREVIATIONS

101 Abbreviations. The following abbreviations, when used in the Contract Documents, shall have the respective meaning shown below:

ANLA	American Nursery and Landscape Association
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ANSI	American National Standards Institute
APWA	American Public Works Association
AREA	American Railway Engineering Association
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing and Materials
AWG	American Wire Gauge
AWP	American Wood Preservers' Association
AWS	American Welding Society
AWWA	American Water Works Association
CMS	Construction and Material Specifications of the Ohio Department of Transportation
DCE	District Construction Engineer
DDD	District Deputy Director
DET	District Engineer of Tests
DMA	Declaration Regarding Material Assistance/Non-Assistance to a Terrorist Organization
DNR	Department of Natural Resources
EEI	Edison Electric Institute
EPA	Environmental Protection Agency
FHWA	Federal Highway Administration, Department of Transportation
FSS	Federal Specifications and Standards, General Services Administration
HRC	The Human Relations Council of the City of Dayton
IEEE	Institute of Electrical and Electronic Engineers
IES	Illuminating Engineering Society
IMSA	International Municipal Signal Association
IPCEA	Insulated Power Cable Engineers Association
ISSA	International Slurry Seal Association
ITE	Institute of Transportation Engineers
JMF	Job Mix Formula
MSDS	Material Safety Data Sheet(s)

NCHRP	National Cooperative Highway Research Program
NEMA	National Electrical Manufacturers Association
NISTN	National Institute of Standards and Technology
NPDES	National Pollutant Discharge Elimination System
OAC	Ohio Administrative Code
ODOT	Ohio Department of Transportation
OMUTCD	Ohio Manual of Uniform Traffic Control Devices
ORC	Ohio Revised Code
ORDC	Ohio Rail Development Commission
OSHA	Occupational Safety and Health Administration
PCC	Portland Cement Concrete
RCGO	City of Dayton Revised Code of General Ordinances
REA	Rural Electrification Administration
SSP	Steel Structures Painting Council
STAR	State Treasurer's Asset Reserve
UL	Underwriters’ Laboratories, Inc.

ITEM 102 DEFINITIONS

102 Definitions. The following words or terms, when used in the Contract Documents, are defined to mean as follows:

Addendum or Addenda A written or graphic instruction issued prior to the Bid Deadline which clarifies, amends or interprets the Contract Documents.

Alternate A proposed change in the work described in the Contract Documents providing the City with an option to select between alternative materials, products or systems, or to add or delete portions of the Work.

Alternative Dispute Resolution A method of resolving disputes other than arbitration or litigation.

Approved Equal Article, device, material, Equipment, form of construction or other item proposed by the Bidder and approved by the Engineer for incorporation or use in the Work as being equivalent to essential attributes of a standard specified in the Contract Documents.

As-built Drawings Drawings or computer files revised and submitted by the Contractor to show changes made during the construction process.

Authorized Representative Unless otherwise specified in the Contract Documents, the City Manager of the City or any of the City Manager's duly authorized assistants or designees.

Base Bid The amount of money stated in a Bid as the sum for which the Bidder offers to perform the Work described in the Contract Documents, exclusive of adjustments for Alternates.

Bid The offer of a Bidder to perform the Work for the amount or amounts quoted, as applicable.

Bidder A Person who submits a Bid for a Contract with the City.

Bid Deadline The date and time established as the deadline for submission of Bids, either through the Electronic Bidding Service or as otherwise provided by the City, subject to modification by Addendum.

Bid Guaranty Bid Bond or other instrument of security furnished by the Bidder to provide assurance that the Bidder will execute the Contract Form.

Board of Review Committee consisting of the City Manager, City Attorney and Director of the Department of Public Works or any of their respective authorized assistants or designees.

Borrow Area A location from which natural materials are to be removed for use in the Work.

Bridge A Structure, including supports, erected over a depression or an obstruction, as water, highway, or railway, and having a track or passageway for carrying traffic or other moving loads and having a length measured along the center of the roadway of more than 10 feet between undercopings of abutments or extreme limits of openings for multiple boxes.

Length. The length of a Bridge Structure is the over all length measured along the center line of Roadway of the surface of the Roadway.

Roadway width. The clear width measured at right angles to the longitudinal centerline of the Bridge between the bottom of curbs or guard timbers or, in the case of multiple heights of curbs, between the bottoms of the lower risers. For curb widths of 1 foot or less, the Roadway width shall be measured between the parapets or railings.

Building Department The City's Department of Building Services.

Bulletin A document issued by the Engineer after the execution of the Contract Form requesting a Proposal from the Contractor which, if approved as provided in the Contract Documents, will cause the execution of a Change Order to modify, amend or alter the Contract Documents. The Bulletin becomes a part of the Contract Documents when a Change Order related to the Bulletin is executed by all applicable Persons.

Certificate of Contract Completion A document signed by the Contractor and the Engineer certifying that Contract Completion has occurred.

Certificate of Partial Occupancy or Use A document signed by the Contractor and the Engineer certifying that City has chosen to occupy or utilize the Project or a designated portion thereof in accordance with 105.03.

Certified Test Data A test report from a manufacturer's Laboratory or an independent Laboratory approved by the City listing actual test results of samples tested for compliance with specified City requirements. The City will accept Certified Test Data from a manufacturer's Laboratory if its products have been used satisfactorily on prior City Contracts and its test data has been confirmed. The Contractor shall include a statement that the test data furnished is representative of the material furnished to a City Project or to a supplier. The report shall contain a characteristic number or date and shall identify the City Project or supplier to which the material is shipped. All reports shall be signed by an individual having legal authority to act for the manufacturer's Laboratory or independent Laboratory, as applicable.

Change Order A document issued by the City after execution of the Contract Form, which authorizes a change in the Work or an adjustment or alteration in the Contract price or the time for Contract Completion. A Change Order which requires only use of contingency funds (a "Field Change Order") may be approved by the Engineer. A Change Order which increases the Contract price must be approved by the City Manager and/or City Commission.

City The City of Dayton, an Ohio municipal corporation.

Claim Affidavit A sworn document containing a claim on funds that are due to a Contractor, created by statute in favor of a Person supplying labor, materials or services for the value of labor, materials or services supplied.

Conduit Any pipe or similar passageway for electricity, gas, water, Sewer or other utility.

Construction Schedule The schedule for the construction of the Work showing the time for completion of the Work, the planned sequence for performing the Work, the Contractor's resource loading curve and the interrelationship of the Contractor's activities with the activities of other Contractors, if any, the Engineer, and the City.

Contingency Fund Moneys reserved by the City within the contract to pay costs resulting from Change Orders, unanticipated conditions, compliance with rulings on building or other codes, incompleteness or inaccuracy of Contract Documents and settlements on judgments related to the Project.

Contract The agreement between the City and the Contractor as set forth in the Contract Documents.

Contract Bond Performance and payment bond or bonds, as applicable, furnished by the Contractor and the Contractor's Surety to provide assurance that the Contractor will perform the Contract and make required payments.

Contract Completion The date upon which all deficiencies noted in the Punch List have been corrected, the Contractor's Work is one hundred percent complete, the as-built drawings have been approved by the Engineer, and the Contractor has complied with all conditions precedent to final payment and release of retainage. When the Contract Documents specify a date for Contract Completion, Contract Completion shall occur on or before the specified date, even if the specified date is a Saturday, Sunday or legal holiday. When the Contract Documents provide that Final Acceptance shall occur a specified number of consecutive days after the date for commencement of Work set forth in the Notice to Proceed, that period of time shall be the time for Contract Completion.

Contract Cost Breakdown A statement furnished by the Contractor to the City reflecting the portions of the Contract price allocated to the various portions of the Work and used as the basis for reviewing the Contractor's Payment Requests.

Contract Documents Collectively, the Plans, plan notes, standard construction Drawings identified in Plans, Specifications, supplemental Specifications, Addenda, definitions,

Legal Notice, instructions to Bidders, equal opportunity requirements, electronic Bid, Bidder's affidavit, non-collusion affidavit, Bid guaranty, Substitution sheet, Contract Form, Contract Bond or Bonds, as applicable, wage rates and Special Provisions, Change Orders and approved Working Drawings, if any.

Contract Form The form furnished by the City that, when completed and signed by the Contractor and the City, evidences the entry into the Contract.

Contractor A Person with whom the City has entered into a Contract for the performance of Work on the Project in cooperation with other Persons and in accordance with the Contract Documents.

Culvert Any Structure not classified as a Bridge that provides an opening under a Roadway.

Day Calendar day, i.e., every day of the year, unless otherwise expressly specified to mean a business day. A business day is any day other than a Saturday, Sunday or legal holiday.

Defective When modifying the word Work, refers to Work that does not conform to the Contract Documents, or does not meet the requirements of any applicable statute, rule or regulation, policy, inspection, reference standard, test or approval, or has been damaged prior to Final Acceptance, unless responsibility for the protection thereof has been expressly assumed by the City, or that is not free from defects in workmanship, material or Equipment during the period of a Guarantee.

Director The Director of the City Department under which the Project is being performed, or the duly authorized designee of the applicable Director.

Drawings See Plans.

Electronic Bidding Service The electronic service used by the City to disseminate bidding information and documents to Bidders and to receive Bids and related documents from Bidders.

Engineer Unless otherwise specified in the Contract Documents, the Engineer of the Department of Public Works, the Water Engineering Manager of the Department of Water of the City of Dayton or the Planning and Engineering Manager of the Department of Aviation under which the Project is being performed, or the duly authorized designee of the Engineer or Manager, as applicable.

Engineer's Estimate An estimate of cost for a Project or a Contract for a Project prepared by the Engineer prior to Bid Deadline.

Equipment All machinery and Equipment, together with the necessary supplies for upkeep and maintenance, tools and apparatus necessary for the construction of the Work.

Fabricator The Subcontractor that fabricates structural metals or prestressed concrete members.

Final Acceptance The City's acceptance of the Work from the Contractor upon approval by the Authorized Representative of the Certificate of Contract Completion.

Final Inspection Final review of the Work of the Contractor by the Engineer to determine whether certification of Contract Completion is appropriate.

Guarantee Legally enforceable assurance, for a period after Contract Completion, of quality or performance of the Contractor's workmanship, material and Equipment.

Inspector A Person assigned by the Engineer to make detailed inspections of the Work.

Laboratory The testing Laboratory designated by the City or determined in accordance with the Contract Documents.

Legal Notice The public announcement inviting Bids for Work.

Liquidated Damages The sum established in the Contract Documents as the predetermined measure of damages to be paid to the City due to the Contractor's failure to complete the Work, or portions thereof, within a stipulated time.

Maintenance Bond A bond furnished by the Contractor and the Contractor's Surety to provide assurance that the Contractor will perform the Guarantee.

Materials Any substances, supplies, products or other items specified or reasonably intended for use in the construction of the Project and its appurtenances.

Material Supplier A Person who furnishes materials for Work on the Project, in any tier.

Mathematically Unbalanced The lump sum amount or Unit Price in a Bid that does not include reasonably sufficient amounts for labor, material, Equipment, overhead and other applicable costs and profit.

Notice of Commencement The notice prepared by the City identifying the Project, the Contractor, the Surety for the Contractor and the name of the Person upon whom a Claim Affidavit may be served.

Notice of Intent to Award The notice provided to the apparently successful Bidder stating that upon satisfactory compliance with all conditions precedent for execution of the Contract Form, within the time specified, the City intends to execute a Contract Form with the Bidder.

Notice to Proceed A notice provided by the Engineer to the Contractor authorizing the Contractor to proceed with the Work and establishing the date for commencement of the Work.

Or Equal See Approved Equal.

Owner See City.

Partial Occupancy or Use The stage in the progress of the Work when the Project, or a designated portion thereof, is sufficiently complete in accordance with the Contract Documents so the City can occupy or utilize the Project, or the designated portion thereof, for its intended use, if the City chooses.

Payment Request The form furnished by the City that is to be used by the Contractor in requesting progress payments and which when signed by the Contractor shall serve as an affidavit that payment requests are in proportion to the Work completed as shown by the Contract Cost Breakdown and that payments previously paid by the City have been applied by the Contractor to discharge in full all of Contractor's obligations incurred in connection with the Work covered by all prior Payment Requests.

Pedestrian Bridge A Bridge designed and constructed to provide means of traverse for pedestrian traffic only; also known as a foot Bridge.

Permittee Any Person issued a permit by the City to perform Work in accordance with these Specifications in a street, alley, Public Way or place, but not having a Contract with the City.

Person An individual, corporation, business trust, estate, limited liability company, partnership, association or other entity, public or private.

Plans The graphic and pictorial portions of the Contract Documents, showing the design, type of construction, location, dimension and character of the Work to be provided by the Contractor, generally including Drawings, elevations, sections, details, schedules, diagrams, notes, and Specifications, in whole or in part.

Profile Grade The trace of a vertical plane intersecting the top surface of the proposed wearing surface, usually along the longitudinal center line of a Roadbed. Profile Grade means either elevation or gradient of such trace according to the context.

Project The improvement to be constructed, of which the Work performed under the Contract Documents may be the whole or a part.

Project Schedule The schedule for the construction of the Project showing the time for completing the Work, the planned sequence for performing the Work, the Contractor's resource loading curve and the interrelationship between the activities of the Contractor, other Contractors, the Engineer, and the City.

Proposal The offer of the Contractor to complete the Work set forth in a Bulletin.

Proposed Equal Article, device, material, Equipment, form of construction or other item proposed by the Bidder for incorporation or use in the Work as being equivalent to essential attributes of a standard specified in the Contract Documents.

Public Way (or Place) A street, road, walk, alley or path used for public travel.

Punch List A list of items of Work to be completed or corrected by the Contractor as a condition precedent to Contract Completion.

Record Drawings Drawings or computer files revised by the Engineer to show the changes made during the construction process, based on the As-built Drawings furnished by the Contractor to the Engineer.

Request for Information Written request from the Contractor to the Engineer seeking an interpretation or clarification of the Contract Documents.

Right-of-Way Land, property, or interest therein, usually in a strip, acquired for or devoted to a road and includes the Roadway, Shoulders or berm, ditch and slopes extending to the Right-of-Way limits under control of the City.

Road A Public Way for purposes of vehicular travel, including the entire area within the Right-of-Way.

Roadbed The graded portion of a road within top and slide slopes, prepared as foundation for the pavement Structure and Shoulder.

Roadside The areas between the outside edges of the Shoulders and Right-of-Way boundaries. Unpaved median areas between inside Shoulders of divided highways and infield areas of interchanges are included.

Roadside Development Those items necessary to the complete road that provide for the preservation of landscape materials and features; the rehabilitation and protection against erosion of all areas disturbed by construction through seeding, sodding, mulching and the placing of other ground covers; such suitable planting and other improvements as may increase the effectiveness and enhance the appearance of the road.

Roadway The portion of a road within the limits of construction.

Samples Physical examples furnished by the Contractor to illustrate materials, Equipment or workmanship and to establish criteria by which the Work will be judged.

Schedule of Values See Contract Cost Breakdown.

Sewer Pipe or Conduit intended for carrying storm drainage or sanitary drainage.

Shop Drawings Drawings, diagrams, illustrations, schedules, performance charts, brochures, catalog data and other data specially prepared or provided by the Contractor, a Subcontractor or Material Supplier to illustrate some portion of the Work.

Shoulder The portion of the road contiguous to the traveled way for accommodation of stopped vehicles, for emergency use, and for lateral support of base and surface courses.

Sidewalk That portion of the road constructed for the use by pedestrians.

Special Provisions Amendments to the Specifications or supplemental Specifications, which describe conditions unique to a particular Project.

Specifications Those portions of the Contract Documents consisting of the detailed written requirements and standards for materials, Equipment, construction systems and workmanship as applied to the Work and certain procedural details applicable thereto.

Standards The items named in the Specifications to denote kind, quality or performance requirement for the Work. All Bids and Proposals shall be based on the Standards as set forth in the Specifications.

State The State of Ohio.

Street See road.

Structure Bridge, Culvert, catch basin, curb inlet, drop inlet, retaining wall, cribbing, manhole, endwall, building, curb, pavement, Sewer, water main, service pipe, underdrain, foundation drain, and any other features which may be encountered in the Work and not otherwise defined herein.

Subcontractor A Person who undertakes to perform any part of the Work on the Project under a Contract with any Person other than the City, in any tier.

Subgrade The portion of a Roadbed upon which the pavement structure and Shoulders are constructed.

Substitution An item proposed by the Bidder to be used instead of a standard, but not considered in determining the lowest and best Bidder.

Substructure The part of a structure below the bearings of simple and continuous spans, skewbacks of arches and tops of footings of rigid frames, together with backwalls and wings.

Superintendent The Contractor's Authorized Representative in charge of the Work.

Superstructure The entire structure except the Substructure.

Supplemental Specifications Detailed Specifications supplemental to or amending or superseding the Specifications.

Surety A Person providing a Bid guaranty, Contract Bond or Maintenance Bond to a Bidder or Contractor, as applicable, to indemnify the City against all direct and consequential damages suffered by failure of the Bidder to execute the Contract Form or of the Contractor to perform the Contract and to pay all lawful claims of Subcontractors, Material Suppliers and laborers or to perform the Guarantee, as applicable.

Unit Price An amount stated in the Bid as the price per unit of measurement for Materials or services described in the Contract Documents, which cost shall include overhead, profit and any other expense for the applicable Work.

Warranty Legally enforceable assurance for the specified duration from Final Acceptance of quality or performance of Materials or Equipment.

Waste Area A location in which natural Materials are to be deposited when not used in the Work.

Work The construction services required by the Contract Documents, to include all labor, Materials, Equipment, tools, transportation, supplies, incidental and services performed or provided by the Contractor for the Project.

Working Drawings Stress sheets, shop Drawings, erection Plans, false work Plans, framework Plans, cofferdam Plans, bending diagrams for reinforcing steel, or any other supplementary Plans or similar data which the Contractor is required to submit for acceptance.

ITEM 103 INSTRUCTION TO BIDDERS

103.01 Contract Completion and Critical Path Scheduling
103.02 Delay Claims
103.03 Giving Notice
103.04 Examination of Contract Documents
103.05 Evaluation of Work Season and Project Site
103.06 Subsurface and Concealed Physical Conditions
103.07 Pre-bid Meeting
103.08 Request for Information or Clarification
103.09 Interpretation or Clarification by Addendum
103.10 Standards
103.11 Proposed Equals
103.12 Approval or Disapproval of Proposed Equals
103.13 Substitutions
103.14 Electronic Bid
103.15 Alternates
103.16 Submission of Bid
103.17 Submittals with Bid
103.18 Unit Prices
103.19 Changes to Unit Price Work
103.20 Change in Bid Amount
103.21 Timely Submission of Bids
103.22 Bid Letting
103.23 Bid Deadline Extension
103.24 Bid Evaluation Criteria
103.25 Bid Evaluation Procedures
103.26 Lowest Bidder
103.27 Rejection of Bids
103.28 Best Bidder
103.29 Information
103.30 Notice of Intent to Award
103.31 Withdrawal of Bid
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103.01 Contract Completion and Critical Path Scheduling. Unless otherwise provided in the Contract Documents, the time for completion of the Project indicated on the Bid or Electronic Bidding Service shall be the time for Contract Completion applicable to the Bidders. Critical path scheduling methods shall be utilized, unless waived by the Authorized Representative in writing.

103.02 Delay Claims. The only delays for which the Bidder is entitled to additional compensation are those delays which the Bidder has established were proximately caused by an improper action or failure to act by the Owner.

103.03 Giving Notice. Whenever any provision of the Contract Documents requires the giving of notice prior to the execution of the Contract Form, such notice shall be deemed to have been validly given if delivered personally to the Person for whom the notice is intended, or if delivered at or sent by registered or certified mail, postage prepaid, to the last business address of such Person known to the giver of the notice. All notices provided to the Bidder by the Engineer shall be copied to the Authorized Representative. All notices provided to the Engineer by the Bidder shall be copied to the Authorized Representative. All notices provided to the Authorized Representative by the Bidder shall be copied to the Engineer.

103.04 Examination of Contract Documents. Contract Documents are available through the Electronic Bidding Service. The Bidder shall examine all Contract Documents, including without limitation the Drawings and Specifications for all divisions of Work for the Project, noting particularly all requirements which will affect the Bidder's Work in any way prior to submitting the Bidder's Bid. Failure of a Bidder to be acquainted with the amount and nature of Work required to complete any of the Work, in conformity with all requirements of the Project as a whole wherever set forth in the Contract Documents or reasonably inferred therefrom, will not be considered as a basis for additional compensation.

103.05 Evaluation of Work Season and Project Site. The Bidder shall evaluate when the Work may be performed and examine and evaluate the Project site and related Project conditions where the Work will be performed prior to submitting the Bidder's Bid, including without limitation the following:

(a) The condition, layout and nature of the Project site and surrounding area, including Borrow Areas and Waste Areas, if any;

(b) The availability and cost of labor;

(c) The availability and cost of Materials, supplies and Equipment;

(d) The cost of temporary utilities required;

(e) The cost of any permit or license required by a local or regional authority having jurisdiction over the Project;

(f) The usual weather conditions;

(g) Conditions bearing upon transportation, disposal, handling, and storage of Materials and waste.

103.06 Subsurface and Concealed Physical Conditions. The Contractor may rely upon the general accuracy of the technical data contained in reports and drawings provided to the Contractor by the Owner and, except for such reliance on technical data, the Contractor shall not rely upon or make any claim against the City with respect to: (1) the completeness of such reports and drawings for the Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by the Contractor, and safety precautions and programs incident thereto; or (2) other data, interpretation, opinions, and information contained in such reports or shown or indicated in such drawings; or (3) any Contractor interpretation of or conclusion drawn from any technical data or any such other data, interpretations, opinions, or information. For example, all interpolations and extrapolations of data performed by the Contractor to estimate locations or quantities of subsurface strata are independent factual assumptions which the Owner does not warrant. Subject to the foregoing, if during the progress of the Work subsurface or concealed physical conditions are encountered at the site differing materially from those indicated in the Contract Documents, or if subsurface or concealed physical conditions of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in the Work provided for in the Contract Documents, are encountered at the site, the Contractor shall notify the Engineer of the specific differing conditions before they are disturbed or the affected Work is performed. Upon notification, the Engineer will investigate the conditions and if it is determined that the conditions materially differ and cause an increase or decrease in the cost or time required for the performance of any Work under the Contract, a Change Order may be issued in accordance with Item 117. The City may decline to issue a Change Order if the notice required by 117.11 is not timely provided by the Contractor. If the Contractor fails to timely provide the notice required by 117.11, the Contractor shall be deemed to have waived any and all claims for additional compensation or time extension for the related subsurface or concealed physical conditions.

103.07 Pre-Bid Meeting. All Bidders are required to attend the pre-Bid meeting, where the Engineer will answer questions regarding the Contract Documents. If not given in the Legal Notice, notice of the time and place of any pre-Bid meeting to be held will be given by the Engineer to each Person of record holding Contract Documents. A Bidder's failure to attend the pre-Bid meeting will result in his or her bid being rejected as non-responsive.

103.08 Request for Information or Clarification. If the Bidder finds any perceived ambiguity, conflict, error, omission or discrepancy on or between any of the Contract Documents, including without limitation the Drawings and Specifications, or between any Contract Documents and any applicable provision of law, the Bidder shall submit a written request to the Engineer for an interpretation or clarification. Such requests must be submitted to the Engineer at least seven Days before the Bid Deadline.

103.09 Interpretation or Clarification by Addendum. If the Engineer determines that an interpretation or clarification is warranted, the Engineer shall issue an Addendum through the Electronic Bidding Service. Any interpretation or clarification of the Contract Documents made by any Person other than the Engineer, or in any manner other than an Addendum issued through the Electronic Bidding Service, shall not be binding and the Bidder shall not rely upon any such interpretation or clarification. The Bidder shall not, at any time before or after the execution of the

Contract Form, be compensated for a claim alleging insufficient data, incomplete, ambiguous, conflicting or erroneous Contract Documents, any discrepancy on or between Contract Documents or incorrectly assumed conditions regarding the nature, extent or character of the Work, if no request for interpretation or clarification regarding such matter was made by the Bidder prior to the Bid Deadline in compliance with 103.08.

103.10 Standards. The articles, devices, Materials, Equipment, forms of construction, fixtures and other items named in the Specifications to denote kind, quality or performance requirement for each significant portion of the Work shall be known as Standards and all Bids shall be based upon those Standards. Where two or more Standards are named, the Bidder may furnish any one of those Standards. Items which are not Standards may be used only if accepted pursuant to the requirements of 103.11 and 103.12.

103.11 Proposed Equals. If the Bidder proposes to use an article, device, material, Equipment, form of construction, fixture or item other than those Standards named in the Specifications, the Bidder shall submit such a proposal to the Engineer, not later than ten Days prior to the Bid Deadline, certifying that the item is equal in quality, and in all aspects of performance and appearance, to the Standards specified. In addition, the Bidder shall submit information to the Engineer not later than ten Days prior to the Bid Deadline, which information shall include:

(a) The name and a complete description of the Proposed Equal, including Drawings, performance and test data, and other information necessary for a complete evaluation of the Proposed Equal;

(b) A statement setting forth any changes which the Proposed Equal will require in the Contract Documents or the Project.

103.12 Approval or Disapproval of Proposed Equals. If the Engineer, in the exercise of the Engineer's sole unfettered discretion, approves the Proposed Equal as a Standard, the Engineer shall issue an Addendum to that effect through the Electronic Bidding Service. If the Engineer does not approve the Proposed Equal as a Standard, the Engineer shall inform the Bidder of the disapproval in writing, no later than ninety-six hours prior to the Bid Deadline, excluding Saturdays, Sundays and legal holidays, which decision shall be final. The Engineer shall have the discretion to reject a Proposed Equal for any reason, including, but not limited to, the Bidder’s failure to provide sufficient information to enable the Engineer to completely evaluate the Proposed Equal without delaying the scheduled Bid Deadline.

103.13 Substitutions. If no Addendum is issued approving the Proposed Equal as a Standard, the Bidder may list the item on the Substitution sheet. A Bidder desiring consideration for the use of an article, device, material, Equipment, form of construction, fixture or item other than those Standards named in the Specifications shall submit a Proposal for the Substitution of same for the applicable standard, using the Substitution sheet provided in the Electronic Bidding Service and listing, for each proposed Substitution: the standard specified, the Substitution, and the change in Bid amount, (or indicate no change, if applicable). The name and a complete description including Drawings, performance and test data, and other information necessary for

a complete evaluation of each Substitution shall be furnished to the Engineer by the Bidder promptly upon request. Any Substitution accepted by the City must be incorporated in the Contract in writing. Substitutions shall not be considered in determining of the lowest and best Bid but may be considered in rejecting all Bids.

103.14 Electronic Bid. Each Bid shall contain the name of every Person interested therein and be submitted through the Electronic Bidding Service. Instructions for using the Electronic Bidding Service are available on the City's website. Failure to properly submit a Bid through the Electronic Bidding Service may cause a Bid to be rejected as nonresponsive. Unless the Bidder withdraws the Bid as provided in 103.31, the Bidder will be required to comply with all requirements of the Contract Documents, regardless of whether the Bidder had actual knowledge of the requirements and regardless of any statement or omission made by the Bidder which might indicate a contrary intention.

103.15 Alternates. When an Alternate is listed in the Electronic Bidding Service, the Bidder shall complete the applicable portion, indicating an amount which will increase or decrease the Base Bid. The City reserves the right to accept or reject any or all Bids on Alternates, in whole or in part, and the right to reject any Alternate or Alternates and to accept any remaining Alternate or Alternates. Alternates may be accepted or rejected in any order.

103.16 Submission of Bid. If the Bidder is a corporation, limited liability company, partnership or sole proprietorship, an officer, member, partner or principal of the Bidder, as applicable, shall submit and electronically sign the Bid through the Electronic Bidding Service. If the Bidder is a joint venture, an officer, member, partner or principal, as applicable, of each participant of the joint venture shall electronically sign the Bid on behalf of that participant, where applicable. By submitting a Bid, the Bidder warrants that it is not now, and will not become subject to an unresolved finding for recovery under Section 9.24 ORC, prior to the award of any Contract arising out of this Project, without notifying the City of such findings. Section 9.24, ORC prohibits the City from awarding a Contract to any Bidder against whom the Auditor of State has issued findings for recovery if the findings for recovery are unresolved at the time of award. The completed Bid submission of the Bidder with whom the City executes a Contract Form shall be incorporated into the Contract Form as if fully rewritten therein.

103.17 Submittals with Bid. Where indicated in the Electronic Bidding Service, the Bidder must download all documents that are shown as requiring a download and submit every document that is shown as requiring submission. A Bid shall be rejected if the Bidder fails to submit, or submits not fully complete, any document that is shown as requiring submission.

103.18 Unit Prices. When Unit Prices are requested in the Electronic Bidding Service, any scheduled quantities listed by the City are not binding upon the City and are to be used only for the comparison of Bids for purposes of determining the lowest and best Bidder and to determine the maximum quantity to be provided without a Change Order. If Unit Prices are stated to be sought only for informational purposes, they shall not be used for comparison of Bids. Unless otherwise specified in the Contract Documents, the Unit Prices and the totals or extensions thereof set forth shall include all Materials, Equipment, insurance, labor, delivery, installation, overhead, profit and any other cost or expense, in connection with or incidental to,

the performance of that portion of the Work to which the Unit Prices apply. The Bidder shall submit Unit Prices for all items listed unless other instructions are stated.

103.19 Changes to Unit Price Work. The Bidder agrees that the City may increase, decrease or delete entirely the scheduled quantities of Work to be done and Materials to be furnished after execution of the Contract Form without invalidating the Contract. Payments, except for lump sum items in Unit Price Contracts, will be made to the Contractor only for the actual quantities of Work performed or Materials furnished in accordance with the Contract Documents, but not in excess of the maximum set by the scheduled quantities. The Contractor must obtain a Change Order prior to performing Work or furnishing Materials in excess of the scheduled quantities in order to be compensated for the excess.

103.20 Change in Bid Amount. The Bidder may amend or withdraw its Bid through the Electronic Bidding Service at any time prior to the Bid Deadline.

103.21 Timely Submission of Bids. It is the responsibility of the Bidder to submit its Bid through the Electronic Bidding Service prior to the Bid Deadline. Bids arriving after the Bid Deadline shall not be considered.

103.22 Bid Letting. Bidders may submit Bids through the Electronic Bidding Service up to the Bid Deadline. At the Bid Deadline, all Bids will be tabulated and the tabulation made public. The public bid tabulation is for informational purposes only and is not to be construed as an acceptance or rejection of any Bid submitted. The electronic Bid submissions shall be a public record and open for inspection, upon request, at any time after the Bid Deadline, except for any information which is not subject to disclosure as provided by applicable law.

103.23 Bid Deadline Extension. If any Addendum is issued within Seventy-two hours prior to the published Bid Deadline, excluding Saturdays, Sundays and legal holidays, the Bid Deadline shall automatically be extended one week, with no further advertising required. If any Addendum is issued more than seventy-two hours prior to the published Bid Deadline, excluding Saturdays, Sundays, and legal holidays, the Bid Deadline may be revised by the Addendum, at the City's discretion.

103.24 Bid Evaluation Criteria. The City reserves the right to accept or reject any or all Bids, in whole or in part, and reserves the right to reject any Bid or Bids and to award the Contract to any remaining Bidder the City determines to be the lowest and best Bidder. The City reserves the right to accept or reject any or all Alternates, in whole or in part, and the right to reject any Alternate or Alternates and to accept any remaining Alternate or Alternates. Alternates may be accepted or rejected in any order. The City may reject the Bid of any Bidder who has engaged in collusive Bidding, been involved in violations of ethics laws or who has an unresolved finding against it by the Auditor of State as provided in Section 9.24, ORC, as not the lowest and best Bid. The City reserves the right to waive, or to allow any Bidder a reasonable opportunity to cure a minor irregularity or technical deficiency in a Bid, provided the irregularity or deficiency does not affect the Bid amount or otherwise give the Bidder a competitive advantage. Noncompliance with any requirements of the Contract Documents may cause a Bid to be rejected.

103.25 Bid Evaluation Procedures. The Contract will be awarded to the lowest and best Bidder as determined in the discretion of the City or all Bids will be rejected in accordance with the procedures set forth in 103.26 through 103.31.

103.26 Lowest Bidder. In determining which Bidder is the lowest, the City shall consider the Base Bid and any Alternate or Alternates which the City determines to accept. Substitutions shall not be considered. The total of the Bids for the accepted Alternate(s) shall be added to or deducted from the Base Bid, as applicable, for the purpose of determining the lowest Bidder. If the Project involves multiple Contracts, the City may also receive combined Bids for two or more Contracts, if provided in the Electronic Bidding Service, but no Contract for the entire job or for more than one Contract shall be awarded unless the separate Bids do not cover all the Work and Materials required or unless the combined Bid is lower than the applicable separate Bids in the aggregate. The City may also receive Bids for multiple Projects if provided in the Electronic Bidding Service.

103.27 Rejection of Bids. In addition to any other reason provided for in this Item, a Bid shall be rejected if:

(a) the Bid fails to respond to the Contract Documents in all material respects;

(b) the Bid contains irregularities or deviations from the Contract Documents which would affect the amount of the Bid or otherwise give the Bidder a competitive advantage;

(c) the Bid contains a Bid guaranty executed by a Surety not licensed in Ohio; or

(d) a Bid guaranty that is otherwise determined to be insufficient by the City.

In addition to any other reason provided for in this Item, a Bid may be rejected if:

(a) the Bid is Mathematically Unbalanced;

(b) the Bid does not contain an executed Non-collusion affidavit;

(c) the Bidder fails to furnish Samples and a complete statement of the origin, composition and manufacture of any or all Materials to be used for the Work, when so requested; or

(d) the Samples provided by the Bidder fail to demonstrate that Materials are of sufficient quality or fitness for the Work.

103.28 Best Bidder. In determining whether a Bidder is best, factors to be considered include, without limitation:

(a) Preferences required by law, where applicable;

(b) The experience of the Bidder;

(c) The financial condition of the Bidder;

(d) Compliance by the Bidder and related Persons with ethics laws and City ordinances and regulations, including without limitation submission of an affirmative action program in accordance with Section 35.16 R.C.G.O.;

(e) The conduct and performance of the Bidder on previous Bids and Contracts with the City or other owners, which shall include, without limitation, compliance with prevailing wage laws, Workers' compensation, income tax laws and equal opportunity requirements;

(f) The facilities of the Bidder, including without limitation machinery, plant and Equipment, as applicable;

(g) The management skills of the Bidder;

(h) The ability of the Bidder to execute the Contract properly, including whether the Bidder's existing workload may hinder or prevent timely completion of the Work;

(i) The ability of the Bidder to perform at least fifty-one percent of the Work with its own employees;

(j) The evaluation of a Bid below the median of other Bids pursuant to 103.37.

A Bidder who submits a Bid for Work for electrical, plumbing, hydronics, refrigeration or heating, ventilating and air conditioning shall provide evidence of a valid Contractor's license from the Ohio Construction Industry Licensing board or successor.

103.29 Information. A Bidder shall submit to the Engineer, upon request, any information the Authorized Representative deems appropriate to the consideration of factors showing that such Bidder's Bid is best, including without limitation the following:

(a) Overall experience of the Bidder, including number of years in business under present and former business names;

(b) Names and qualifications of key Bidder personnel;

(c) Complete listing of all ongoing and completed public and private construction Contracts of the Bidder in the last three years, including the nature, status and value of each Contract and a name, address, and phone number for a representative of the Owner of each related Project;

(d) Complete listing of any EPA, (OSHA) or other regulating entity issues or citations in the last ten years;

(e) Complete listing of all outstanding liens against the Bidder;

(f) Certified financial statement with trade and bank references;

(g) Description of relevant facilities of the Bidder;

(h) Description of the management experience of the Bidder's Project manager(s) and Superintendent(s); who will be assigned to the Project;

(i) Complete list of all Subcontractors and Material Suppliers;

(j) To support a Contract Bond, a current and signed certificate of compliance required under Section 9.311 ORC, issued by the Department of Insurance, showing the Surety is licensed to do business in Ohio;

(k) Current Ohio Workers' Compensation Certificate.

If the Bidder is a foreign corporation, i.e., not incorporated under the laws of Ohio, a certificate of good standing from the Secretary of State showing the right of the Bidder to do business in the State; or, if the Bidder is an individual or partnership, the Bidder has filed with the Secretary of State a Power of Attorney designating the Secretary of State as the Bidder's agent for the purpose of accepting service of summons in any action brought under Section 153.05, ORC, or under Sections 4123.01 through 4123.94, inclusive, ORC.

The Engineer may obtain such information from several Bidders simultaneously. Each Bidder shall provide requested information within such time limits as the Engineer shall establish.

103.30 Notice of Intent to Award. The City shall notify the apparent lowest and best Bidder that upon satisfactory compliance with all conditions precedent for execution of the Contract Form, within the time specified, the Bidder will be awarded the Contract. The City reserves the right to rescind any Notice of Intent to Award at any time prior to the execution of the Contract if the City determines the Notice of Intent to Award was issued in error.

103.31 Withdrawal of Bid. A Bidder may withdraw its Bid at any time prior to the Bid Deadline through the Electronic Bidding Service. All Bids submitted through the Electronic Bidding Service which were not withdrawn prior to the Bid Deadline shall remain valid and open for acceptance for a period of at least sixty Days after the Bid Deadline; provided, however that during that period a Bidder may withdraw a Bid from consideration if the Bid amount was substantially lower than the amounts of other Bids, providing the Bid was submitted in good faith, and the reason for the Bid amount being substantially lower was a clerical mistake, as opposed to a judgment mistake, and was actually due to an unintentional and substantial arithmetic error or an unintentional omission of a substantial quantity of Work, labor or material made directly in the compilation of the Bid amount. Notice of such a request to withdraw a Bid must be made in writing filed with the Authorized Representative within two business Days after the Bid Deadline. The City reserves the right to request that the Bidder submit evidence substantiating the Bidder's request to withdraw the Bid. No Bid may be withdrawn after the Bid Deadline when the result would be the awarding of the Contract on another Bid to the same Bidder. If a Bid is withdrawn after the Bid Deadline, the City may award the Contract to another Bidder that the City determines to be the lowest and best Bidder, or reject all Bids and advertise for other Bids. If the City advertises for other Bids, the withdrawing Bidder shall pay the costs incurred by the City in connection with the rebidding if the City finds that such costs would not have been incurred but for such withdrawal. A Bidder may withdraw its Bid at any time after the expiration of the described sixty Day period by written notice to the Authorized Representative.

103.32 Refusal to Accept Withdrawal. If the City intends to contest the right of the Bidder to withdraw a Bid after the Bid Deadline, a hearing shall be held by the Authorized Representative within ten Days after the Bid Deadline and an order shall be issued by the City allowing or denying the claim of such right within five Days after such hearing is concluded. The City shall give the withdrawing Bidder timely notice of the time and place of any such hearing. The City shall make a stenographic record of all testimony, other evidence, and rulings on the admissibility of evidence presented at the hearing. The Bidder shall pay the costs of the hearing. If the City denies the claim for withdrawal and the Bidder elects to litigate or otherwise refuses to perform the Contract, the City may reject all Bids or award the Contract to the next lowest and best Bidder, as determined by the City, without waiving any claims against the non-performing Bidder.

103.33 Effect of Withdrawal. No Bidder who is permitted to withdraw a Bid after the Bid Deadline shall for compensation supply any material or labor to, or perform any subcontract or other Work agreement for, the Person to whom the Contract is awarded or otherwise benefit, directly or indirectly, from the performance of the Project for which the withdrawn Bid was submitted, without the written approval of the City. The Person to whom the Contract is awarded and the withdrawing Bidder shall be jointly liable to the City in an amount equal to any compensation paid to or for the benefit of the withdrawing Bidder without such approval. A Bidder who is permitted to withdraw a Bid after Bid Deadline may be considered not the best for future City Contracts.

103.34 Bid Estimate. In no instance shall Contracts be let either as a whole, or in aggregate, if Bids for parts of the Work are taken, which exceed one hundred ten percent of the estimate for the improvement contemplated.

103.35 Review of Low Bid. The City may reject a Bid which is

(a) more than twenty percent below the median of all higher Bids received for a Contract where the estimate is one hundred thousand dollars or more; or

(b) more than twenty-five percent below the median of all higher Bids received for a Contract where the estimate is less than one hundred thousand dollars.

In determining whether to reject such a bid, the City may at its discretion, but is not required to:

(a) Conducts an interview with the Bidder to determine what, if anything has been overlooked in the Bid, and to analyze the process planned by the Bidder to complete the Work;

(b) Require the Bidder to submit to the City a certified financial statement and a list of recent public Contracts which the Bidder has performed; and/or

(c) Notify the Bidder's Surety in writing that the Bidder with whom the City intends to enter a Contract submitted a Bid determined to be substantially lower than the median of all higher Bids.

103.36 Bid Guaranty. The Bidder must file with the Bid a Bid guaranty, payable to the City of Dayton, in the form of the signed Bid guaranty and Contract Bond contained in the Contract Documents, for the full amount of the Base Bid plus add Alternates. The Bid guaranty shall be submitted through the Electronic Bidding Service. The Bid guaranty shall be in form and substance satisfactory to the City and shall serve as an assurance that the Bidder will, upon acceptance of the Bidder's Bid, comply with all conditions precedent for execution of the Contract Form and execute the Contract Form within the time specified by the City. ANY BID GUARANTY MUST BE PAYABLE TO THE CITY OF DAYTON. A Bid may be rejected if the Bid guaranty is payable to any other Person. IF THE BLANK LINES FOR THE AMOUNT ON THE BID GUARANTY AND CONTRACT BOND ARE NOT FILLED IN, THE PENAL SUM WILL AUTOMATICALLY BE THE FULL AMOUNT OF THE BASE BID PLUS ADD ALTERNATES. If those blank lines are filled in, the amount must not be less than the full amount of the Base Bid plus add Alternates, stated in dollars and cents. A PERCENTAGE IS NOT ACCEPTABLE. The Bid guaranty and Contract Bond must be signed by an authorized agent with Power of Attorney from a Surety. The Bid guaranty and Contract Bond must be issued by a Surety authorized by the Department of Insurance to transact business in Ohio. The requirements of Section 3905.41, ORC, may be applicable to require the Bid guaranty and Contract Bond be countersigned by an Ohio resident agent. The Bidder must determine whether this requirement is applicable to the Bidder's Surety. Bid guaranties will be returned to all unsuccessful Bidders seventy-five Days after the Bid Deadline or upon execution of the Contract Form by the apparently successful Bidder, whichever is earlier.

103.37 Bid Guaranty Forfeiture. If for any reason, other than as authorized by 103.31 or 103.38, the Bidder fails to execute the Contract Form, and the City awards the Contract to another Bidder which the City determines is the lowest and best Bidder, the Bidder who failed to execute the Contract Form shall be liable to the City for the difference between such Bidder's Bid and the Bid of the lowest and best Bidder, or for a penal sum not to exceed ten percent of the defaulting Bidder's Bid amount, whichever is less. If the City then awards a Contract to another Bidder which the City determines is the lowest and best Bidder and such Bidder also fails or refuses to execute the Contract Form, the liability of such lowest and best Bidder shall, except as provided in 103.38, be the amount of the difference between the Bid amounts of such lowest and best Bidder and another Bidder which the City determines is the lowest and best Bidder, but not in excess of the liability specified in 103.31. Liability on account of an award to each succeeding lowest and best Bidder shall be determined in like manner. If the City does not award the Contract to the another Bidder which the City determines is the lowest and best Bidder but resubmits the Project for Bidding, the Bidder failing to execute the Contract Form shall, except as provided in 103.38, be liable to the City for a penal sum not to exceed ten percent of such Bidder's Bid amount or the costs incurred by the City in connection with the rebidding, whichever is less.

103.38 Exception to Bid Guaranty Forfeiture. A Bidder with the City for a Contract with the City costing less than five hundred thousand dollars may withdraw a Bid from consideration if the Bidder's Bid for some other Contract with the State or any political subdivision, district, institution or agency thereof, excluding ODOT, costing less than five hundred thousand dollars has already been accepted, if the Bidder certifies in good faith that the total price of all such

Bidder's current Contracts is less than five hundred thousand dollars, and if the Bidder's Surety certifies in good faith that the Bidder is unable to perform the subsequent Contract because to perform such Contract would exceed the Bidder's Bonding capacity. If a Bid is withdrawn pursuant to 103.38, the City may award the Contract to another Bidder which the City determines is the lowest and best Bidder or reject all Bids and resubmit the Project for Bidding, and neither the withdrawing Bidder nor such Bidder's Surety shall be liable for the difference between the Bidder's Bid and that of another Bidder which the City determines is the lowest and best Bidder, for a penal sum, or for the costs incurred by the City in connection with the rebidding.

103.39 Contract Bond. If the Bidder executes the Contract Form, the Bidder shall, at the time of signing the Contract Form, provide the Contract Bond required by law in form and substance, and from a Surety, satisfactory to the City. The Contract Bond shall be in the full amount of the Contract to indemnify the City against all direct and consequential damages suffered by failure of the Contractor to perform according to the provisions of the Contract Documents and in accordance with the Plans, Specifications, details and bills of material therefore and to pay all lawful claims of Subcontractors, Material Suppliers, and laborers for labor performed or Materials furnished in carrying forward, performing or completing the Contract. A Contract Bond must be signed by an authorized agent with Power of Attorney from the Surety.

103.40 Personal Property Tax Statement. The successful Bidder shall provide a properly completed and executed affidavit in a form satisfactory to the City in order to fulfill the requirements of Section 5719.042 ORC, which provides as follows:

> After the award by a taxing district of any Contract let by competitive Bid and prior to the time the Contract is entered into, the Person making a Bid shall submit to the district's fiscal officer a statement affirmed under oath that the Person with whom the Contract is to be made was not charged at the time the Bid was submitted with any delinquent personal property taxes on the general tax list of personal property of any county in which the taxing district has territory or that such Person was charged with delinquent personal property taxes on any such tax list, in which case the statement shall also set forth the amount of such due and unpaid delinquent taxes and any due and unpaid penalties and interest thereon. If the statement indicates that the taxpayer was charged with any such taxes, a copy of the statement shall be transmitted by the fiscal officer to the county treasurer within thirty Days of the date it is submitted.
>
> A copy of the statement shall also be incorporated into the Contract, and no payment shall be made with respect to any Contract to which 103.40 applies unless such statement has been so incorporated as a part thereof.

103.41 Conditions Precedent for Execution of Contract Form by City. The award of the Contract and the execution of the Contract Form are based upon the expectation that the lowest and best Bidder will execute the Contract Form and comply with all conditions precedent for execution of the Contract Form within ten Days of the date of the issuance of the Notice of Intent to Award. Failure to execute the Contract Form or noncompliance with the conditions precedent for execution of the Contract Form within ten Days of the date of the issuance of the Notice of Intent to Award shall be cause permitting the City to cancel the Notice of Intent to Award for the Bidder's failure to be best, and to award the Contract to another Bidder which the City determines is the lowest and best Bidder or to resubmit the Contract for Bidding, at the discretion

of the City. The City may extend the time for submitting the conditions precedent for execution of the Contract Form for good cause shown. No extension shall operate as a waiver of the conditions precedent for execution of the Contract Form. The conditions precedent for execution of the Contract Form by the City are as follows:

(a) Contract Form;

(b) Contract Bond and to support the Contract Bond, a power of attorney for any attorney-in-fact signing the Contract Bond and a certificate of compliance issued by the Ohio Department of Insurance showing the Surety is licensed to do business in Ohio;

(c) Ohio Workers' Compensation Certificate;

(d) Certificate of Insurance (ACORD form is acceptable) clearly setting forth all exclusions and deductibles and copy of additional insured or loss payee endorsement. The City reserves the right to request a certified copy of the Contractor's insurance policies, including all endorsements.

(e) If the Bidder is a foreign corporation, i.e., not incorporated under the laws of Ohio, a Certificate of good standing from the Secretary of State showing the right of the Bidder to do business in the State will be required. If the Bidder is an individual or partnership, the Bidder has filed with the Secretary of State a Power of Attorney designating the Secretary of State as the Bidder's agent for the purpose of accepting service of summons in any action brought under Section 153.05 ORC, or under Sections 4123.01 through 4123.94, inclusive, ORC.

(f) Personal property Tax Statement; and

(g) Evidence of registration of the Contractor and all of the Contractor's Subcontractors with the Building Department and the City's Department of Finance, Division of Revenue and Taxation.

(h) Material Declaration of Assistance/Non-Assistance to Terrorist Organization, when required.

(i) If requested by the City, the Bidder shall immediately submit evidence that the Person signing the Contract is authorized to bind the Bidder.

103.42 Time Limits. A Contract Form is not executed until it has been signed on behalf of both the Bidder and the City by Persons authorized to bind the Bidder and the City, respectively. The failure to award the Contract and to execute the Contract Form within ninety Days of the Bid Deadline invalidates the entire Bid process and all Bids submitted, unless the time is extended by written consent of the apparent lowest and best Bidder and the City concurs with such extension. If the Contract is awarded and the Contract Form is executed within ninety Days of the Bid Deadline, any increases in material, labor and subcontract costs shall be borne by the Bidder without alteration of the amount of the Bid. If the cause of the failure to execute the Contract within ninety Days of the Bid Deadline is due to matters for which the City is solely responsible, the Contractor shall be entitled to a Change Order authorizing payment of verifiable increased costs in Materials, labor or subcontracts. If the cause of the failure to execute the

Contract within ninety Days of the Bid Deadline is due to matters for which the Contractor is responsible, no request for increased costs will be granted.

103.43 Notice to Proceed and Submittals. The Authorized Representative shall issue the Contractor a Notice to Proceed which shall establish the date for commencement of the time for Contract Completion. The Contractor shall, within ten Days of the date of the Notice to Proceed, furnish the Engineer the following submittals:

(a) Contract Cost Breakdown;

(b) Preliminary schedule including shop Drawings and submittals;

(c) List of Subcontractors;

(d) List of Material Suppliers;

(e) Outline of qualifications of proposed Superintendent.

103.44 Wage Rates and Payment Dates. The Bidder shall base its Bid upon the prevailing rates of wages as ascertained by the Ohio Department of Commerce, Division of Labor & Worker Safety, Wage and Hour bureau or the U.S. Department of Labor, as applicable, for the Project as provided in Sections 4115.03 and 4115.14, ORC, or the Davis-Bacon Act, respectively. The Contractor shall, within ten Days of the date of the Notice to Proceed, provide to the Engineer for the prevailing Wage Coordinator a schedule of dates during the term of the Contract on which wages will be paid to employees for the Project.

103.45 Written Submissions in lieu of Electronic Bidding Service. Where a Bidder is required by a provision in this Item 103 to make a submission through the Electronic Bidding Service, such submission may be made in paper form only upon prior written authorization from the Engineer. The determination whether to grant such prior written authorization is left to the Engineer and may be exercised by the Engineer's sole unfettered discretion. Submissions outside the Electronic Bidding Service without such prior written authorization may result in a determination that the Bid is non-responsive.

ITEM 104 GENERAL REQUIREMENTS

104.01 Contract Documents
104.02 Applicable Law and ODOT Matters
104.03 Jurisdiction
104.04 Assignment of Antitrust Claims
104.05 Captions
104.06 Nondiscrimination Generally
104.07 City's Nondiscrimination Requirements
104.08 Notice of Commencement
104.09 Giving Notice
104.10 Computation of Time
104.11 Facsimile Transmission and Electronic Mail
104.12 Intent
104.13 Requests for Information
104.14 Ownership and Use of Drawings and Specifications
104.15 Access to Documents
104.16 As-Built Drawings
104.17 Substitutes for Standards or Approved Equals
104.18 Sales and Use Taxes

104.01 Contract Documents. The Contractor, the Engineer and the Authorized Representative shall be familiar with all provisions of the Contract Documents.

104.02 Applicable Law and ODOT Matters. The Contractor and the City shall comply with all applicable Federal, State and local codes, statutes, ordinances and regulations in the performance of the Work on the Project. When the Federal government or the State pays all or any portion of the cost of the Project, the Work shall be subject to the inspection of the appropriate federal or State agency. No such inspection shall make the Federal government or State a party to the Contract and will in no way affect the rights and obligations of the City and the Contractor under the Contract. Any such inspection is solely for the benefit of the City and the Federal or State agency making it, and neither the Contractor nor the Surety shall be entitled to rely upon it for any purpose. References to ODOT matters shall be as set forth in the CMS current as of the Bid Deadline. In such instances, the CMS is incorporated only to the extent that it is not inconsistent with the Specifications.

104.03 Jurisdiction. The Montgomery County Court of Common Pleas, or the United States District Court for the Southern District of Ohio if required by law, shall be the exclusive jurisdiction in which any action or proceeding concerning any Bid, Contract, agreement or performance under the Contract Documents or in connection with the Project shall be filed. In any such action or proceeding the Contract Documents shall be construed in accordance with the laws of the State which shall govern to the exclusion of the law of any other jurisdiction.

104.04 Assignment of Antitrust Claims. By executing the Contract Form, the Contractor assigns, conveys and transfers to the City any right, title and interest to any claims or

causes of action it may have or acquire under State or Federal antitrust laws relating to any goods, products, or services purchased, procured or rendered to the City pursuant to the Contract.

104.05 Captions. Captions throughout the Contract Documents are for convenience and reference only and the words contained in a caption shall in no way be held to explain, modify, amplify or aid in the interpretation, construction or meaning of the provisions of the Contract Documents. Rights and responsibilities of the Contractor, the Engineer and the City are set forth throughout the Contract Documents and are included under different titles, articles and paragraphs for convenience.

104.06 Nondiscrimination Generally. During the performance of the Contract, the Contractor agrees that in the hiring of employees for the performance of Work, including without limitation Work to be performed by a Subcontractor, no Contractor or Subcontractor, and no Person acting on behalf of the Contractor or Subcontractor, shall, by reason of race, religion, national origin, age, sex, disability, or color, discriminate against any citizen in the employment of labor or workers who are qualified and available to perform the Work to which the employment relates. The Contractor further agrees that no Contractor or Subcontractor, and no Person acting on behalf of the Contractor or Subcontractor, shall, in any manner, discriminate against or intimidate any employee hired for the performance of Work on account of race, religion, national origin, age, sex, disability, or color. In the event of the Contractor's noncompliance with the nondiscrimination clauses, the contract may be terminated or suspended in whole or in part, and the Contractor may be declared ineligible for further City Contracts or such other sanctions as provided by law. Any provision of a hiring hall Contract or agreement which obligates a Contractor to hire, if available, only such employees as are referred to the Contractor by a labor organization shall be void as against public policy and unenforceable with respect to employment under any public improvement Contract unless, at the date of execution of such hiring hall Contract or agreement, or within thirty Days thereafter, such labor organization has in effect procedures for referring qualified employees for hire without regard to race, color, religion, national origin, or ancestry and unless such labor organization includes in its apprentice and journeymen membership, or otherwise has available for job referral without discrimination, qualified employees.

104.07 City's Nondiscrimination Requirements. The Contractor shall comply with RCGO, Section 35.14 which provides as follows and any amendments thereto:

> (A) The [Contractor] shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, ancestry, national origin, place of birth, age, marital status, or handicap. The [Contractor] shall take affirmative action in accordance with terms outlined in its [Proposal] and the provisions of this [Contract] to insure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, sexual orientation, gender identity, ancestry, national origin, place of birth, age, marital status, or handicap. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The [Contractor] agrees to post in conspicuous places, available to employees and applicants, notices to be provided by the [City] setting forth the provisions of the nondiscrimination clauses.

(B) The [Contractor] shall in all solicitations or advertisements for employees placed by or on behalf of the [Contractor], state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, ancestry, national origin, place of birth, age, marital status, or handicap.

(C) The [Contractor] shall send to each labor union or representative of workers with which [the Contractor] has a collective bargaining agreement or other contract or understanding, a notice to be provided by the [City] advising the labor union or workers' representative of the [Contractor's] commitments, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(D) The [Contractor] shall comply with all rules, regulations, and relevant orders promulgated by the Human Relations council pursuant to its duties created by ordinance.

(E) The [Contractor] shall file, and shall cause each of [the Subcontractors and Material Suppliers] to file, compliance reports with the Human Relations Council as may be directed. Compliance reports shall be filed within such times and shall contain such information as to the practices, policies, programs, and employment policies, programs and employment statistics of the [Contractor, Material Supplier, or Subcontractor] and shall be in such form as the Human Relations Council may prescribe.

(F) The [Contractor] shall furnish all information and reports required by this [Contract] and by the rules, regulations, and orders of the Human Relations Council pursuant hereto, and shall permit reasonable access to the [Contractor's] books, records, and accounts by the Human Relations Council or its representative, as necessary for purposes of investigation to ascertain compliance with this [Contract] and rules, regulations and orders.

(G) In the event of the [Contractor's] failure to comply with the equal employment opportunity and affirmative action provisions of this [Contract], including the affirmative action undertaking outlined in it is [Proposal], or with any of the rules, regulations, or orders herein referred to, it is agreed that the [City], at its option, may do any or all of the following:

(1) Cancel, terminate, or suspend this [Contract], in whole or in part [...].

(2) Declare the [Contractor] ineligible for further [City Contracts].

(3) Recover from the [Contractor] by set-off against the unpaid portion of the [Contract], or otherwise pursuant to this [Contract], the sum of fifty dollars per [Day], as [Liquidated Damages] and not as a penalty, for each [Day] that the [Contractor] shall fail to comply with these provisions of the [Contract], as determined by the Human Relations Council in accordance with its rules and regulations, the said sum being fixed and agreed upon by and between the [Contractor] and the [City] because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages which the [City] would sustain in the event of such a breach of contract, and that amount is agreed to be the amount of damages which the [City] would sustain.

(4) Impose such other sanctions as may be imposed by the Human Relations Council pursuant to ordinances passed by the Commission, or seek such other remedies as may be provided by law.

(H) The [Contractor] shall include the provisions of this [Contract] in every subcontract, so that such provisions shall be binding upon each [Subcontractor]. The [Contractor] shall take such action with respect to any subcontracts as the Human Relations Council may direct as means of enforcing such provisions, including sanctions for noncompliance. However, in the event the [Contractor] becomes involved in, or is threatened with litigation with a [Subcontractor] as a result of such direction by the Human Relations Council, the [Contractor] may request the City to enter into such litigation to protect the interests of the City.

104.08 Notice of Commencement. The Authorized Representative shall prepare a Notice of Commencement in affidavit form identifying the name and address of the City, the Project, the name, address of the Contractor, the date of execution of the Contract, and the name and address of the Surety for the Contractor, in addition to the name and address of the Authorized Representative upon whom a Claim Affidavit may be served. The Notice of Commencement shall be made available upon request.

104.09 Giving Notice. Whenever any provision of the Contract Documents requires the giving of any notice after the execution of the Contract Form, such notice shall be deemed to have been validly given if delivered personally to the Person for whom the notice is intended, or if delivered at or sent by registered or certified mail, postage prepaid, to the last business address of such Person known to the giver of the notice. All notices provided to the Contractor by the Engineer shall be copied to the Authorized Representative. All notices provided to the Engineer by the Contractor shall be copied to the Authorized Representative. All notices provided to the Authorized Representative by the Contractor shall be copied to the Engineer.

104.10 Computation of Time. When any period of time is referred to in the Contract Documents by Days, it shall be computed to exclude the first and include the last Day of such period. If the last Day of any such period falls on a Saturday, Sunday or a legal holiday, such day will be omitted from the computation and such period shall be deemed to end on the next succeeding day which is not a Saturday, Sunday or legal holiday.

104.11 Facsimile Transmission and Electronic Mail. Any notice required to be given by the Contract Documents may be given by facsimile transmission or electronic mail, provided the original signed notice is delivered within two Days after the date of the facsimile transmission or electronic mail. Facsimile transmittals in excess of 10 pages are discouraged.

104.12 Intent. The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all. The Contractor shall provide all labor, Equipment and Materials necessary for the entire completion of the Work described in the Contract Documents and reasonably inferred therefrom to produce the intended results. The Specifications may not be superseded or amended by the Drawings

unless so provided in supplemental Specifications or Special Provisions prepared by the Engineer and approved in writing by the Authorized Representative. The Drawings shall generally govern dimensions, details and locations of the Work and calculated dimensions shall govern over scaled dimensions. The Specifications shall generally govern quality of Materials and workmanship. The organization of the Specifications in divisions, sections and articles, and the arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade. In the event of inconsistencies within or between the Contract Documents, the Contractor shall provide the better quality or greater quantity of Work, and shall comply with the stricter requirement. Unless otherwise specified in the Contract Documents, words which have well-known technical or construction industry meanings are used in accordance with such recognized meanings.

104.13 Requests for Information. If the Contractor finds any perceived ambiguity, conflict, error, omission or discrepancy on or between any of the Contract Documents, including without limitation, the Drawings and Specifications, or between any of the Contract Documents and any applicable provision of law, the Contractor, before proceeding with the Work, shall submit a written Request for information to the Engineer for an interpretation or clarification. The Contractor shall be responsible for the prompt delivery of any such Request for information. The Engineer shall respond in writing to any and all requests for information within three business Days of receipt. Any interpretation or clarification of the Contract Documents made by any Person other than the Engineer, or in any manner other than in writing, shall not be binding and the Contractor shall not rely upon any such interpretation or clarification. If any change to the Work is made to accommodate unforeseen circumstances, the Engineer shall initiate the appropriate action and notify the Authorized Representative.

104.14 Ownership and Use of Drawings and Specifications. All Drawings and Specifications are the property of the City. In making copies of the Drawings and Specifications available, the City does not confer a license or grant permission for any use other than Work on the Project. Unless otherwise specified in the Contract Documents, the Engineer shall furnish to the Contractor, free of charge, 7 sets of Drawings and Specifications if the Contract price is five hundred thousand dollars or less, and 10 sets of Drawings and Specifications if the Contract price is in excess of five hundred thousand dollars. The Contractor may obtain additional copies of the Contract Documents from the Engineer, upon request, at the cost of reproduction, if any.

104.15 Access to Documents. The Contractor shall maintain in good order at the Project site one copy of all Drawings, Specifications, Bulletins, Addenda, approved Shop Drawings, catalog data, manufacturer operating and maintenance instructions, certificates, warranties, Change Orders, and other modifications, including As-built Drawings. The Contractor shall at all times permit access to the documents described in 104.15, and any other Contract Documents by the Authorized Representative and the Engineer.

104.16 As-Built Drawings. For Projects administered by the Water Engineering Manager of the City's Department of Water, or the Planning and Engineering Manager of the Department of Aviation, the Contractor shall keep an accurate record of all approved changes made to the Drawings to show Work as actually performed where such Work varies from Work as originally shown, including the exact location and depth of underground utility lines. During the performance of the Work, the Contractor shall record, prior to the submission of each Contractor

Payment Request, any approved changes on the Drawings, neatly in a contrasting color, noting new information not shown on the original Drawings. Failure to so record such changes may cause payment to be withheld or delayed. Where shop Drawings are used, the Contractor shall cross reference the corresponding sheet numbers on the Drawings and sections of the Specifications. The Contractor shall note related Change Order numbers where applicable. The Contractor shall keep a record of any change made to the Specifications, noting particularly any variation from manufacturer's instructions and recommendations. 104.16 shall not apply to any Project administered by the Engineer of the Department of Public Works unless required in the supplemental Specifications or Special Provisions for the Project.

104.17 Substitutes for Standards or Approved Equals. Requests for substitutes for standards or Approved Equals shall not be considered after the Bid Deadline unless listed on the Substitution sheet or after the Contractor can conclusively demonstrate to the Engineer one of the following conditions:

(a) All applicable standards and Approved Equals are not available through no fault of the Contractor or the Contractor's Subcontractors and Material Suppliers;

(b) All applicable standards and Approved Equals are no longer produced;

(c) All applicable standards and Approved Equals will not perform as designed or intended.

104.18 Sales and Use Taxes. Only those Materials which ultimately become a part of the completed Structure or improvement which constitutes the Project will be exempt from State sales tax as provided in Section 5739.02 ORC, and State use tax as provided in Section 5741.01 ORC. The purchase, lease or rental of material, Equipment, parts or expendable items such as form lumber, tools, oils, greases and fuels, which are used in connection with the Work, are subject to the application of State sales tax and State use tax.

ITEM 105 CITY'S RIGHTS AND RESPONSIBILITIES

105.01 Generally
105.02 Right to Perform and Backcharge
105.03 Right to Partial Occupancy or Use
105.04 City's Right to File Suit
105.05 No Personal Liability of Public Officials
105.06 No Waiver of Legal Rights
105.07 No Estoppel

105.01 Generally. Information and services required of the City may be furnished through the Engineer or the Authorized Representative and shall be furnished in good faith and in a timely manner to avoid interference with, delay, hindrance, disruption or impact to the progress of the Project. The City and the City's officials, employees, consultants, agents and representatives as determined by the Engineer shall at all times have access to the Work whenever the Project is in preparation or progress. Upon the issuance of the Notice to Proceed or at a reasonable time thereafter, the City shall provide the Contractor the Project site in such condition to permit the Contractor to perform the Work. The foregoing are in addition to other rights and responsibilities of the City enumerated herein and especially those in respect to the City's right to prosecute the Work, approve payments and accept the Project.

105.02 Right to Perform and Backcharge. If the Contractor provides Defective Work or fails or neglects to perform the Work with the necessary diligence so as to complete the Work within the time specified in the Contract Documents or any portion of the Work by the applicable milestone completion date as set forth in the current Project, the Engineer shall notify the Contractor in writing of such failure or neglect. If such Defective Work, failure, or neglect results in a threat to the safety of any person or property, the Contractor shall immediately commence to correct such Defective Work, failure, or neglect upon receipt of written or oral notice thereof. Otherwise, if the Contractor fails or refuses to cure such Defective Work or failure or neglect within three business Days after receipt of the written notice or immediately in the case of a threat to any person or property, the Engineer shall recommend enforcement of the Contract to the City pursuant to 106.02 and 106.03. Without prejudice to any other remedy the City may have, the City may employ upon the Work the additional force, or supply the Materials or such part of either as is appropriate, to correct the deficiency in the Contractor's Work, as determined by the Authorized Representative. In all such cases of Defective Work, failure, or neglect, a Change Order shall be issued deducting from payments then or thereafter due the Contractor the costs arising out of or related to investigating and correcting such Defective Work, failure or neglect, including without limitation, the City's attorneys' and consultants' fees and Liquidated Damages. If the payments then or thereafter due the Contractor are not sufficient to cover such costs, the Contractor and the Contractor's Surety shall pay the amount of the insufficiency to the City. The decision of the Authorized Representative to backcharge the Contractor shall be final, subject to proceedings in accordance with 118.01 through 11

The City reserves the right to furnish at any time such Materials and labor and to prosecute such Work in addition to the Work of the Contractor as the City may desire; provided, however, that if such prosecution of additional Work should unreasonably interfere with, disrupt, hinder, delay or impact the Work of the Contractor, the Contractor shall be entitled to a reasonable extension of time in accordance with these Specifications.

105.03 Right to Partial Occupancy or Use. If the City finds it necessary to occupy or use the Project, or a designated portion of the Project prior to Contract Completion, such use may be accomplished if the Engineer informs the City that the portion in question has been approved for occupancy use, including by the Department of Building Services, if applicable. If Partial Occupancy or Use is approved by the City, the Engineer may process either a Change Order or a Certificate of Partial Occupancy or Use for the applicable portion of the Project listing the uncompleted or Defective Work under the Contract for approval by the City, provided that no such occupancy or use shall commence before any insurers providing property insurance have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. From the date of execution of the Change Order or Certificate of Partial Occupancy or Use by the Engineer, the Contractor shall be relieved of obligation to maintain the accepted portion of the Work, but shall remain obligated to correct any incomplete or Defective Work, including, without limitation any Punch List items then uncorrected. The Contractor shall continue to carry the appropriate insurance during performance of any such Work. Partial Occupancy or Use of the Project by the City shall not constitute acceptance of any Work not in conformity with the Contract Documents. Partial Occupancy or Use shall not relieve the Contractor of liability for any express or implied warranties or from responsibility for Defective Work.

105.04 City's Right to File Suit. The City may maintain an action in its own name for violations of any law relating to the Project, for any injury to Persons or property pertaining to the Work or for any other cause which is necessary in the performance of the City's duties.

105.05 No Personal Liability of Public Officials. In carrying out the provisions of the Contract Documents, or in exercising any power or authority granted to them by or within the scope of the Contract Documents, there shall be no liability upon the officers and employees of the City, whether personally or as officials of the City, it being understood that in all such matters they act solely as agents and representatives of the City.

105.06 No Waiver of Legal Rights. No action or omission by the City or the City's officers and employees, nor any approval of any request for payment, claim, or Change Order, nor any payment for or acceptance of any Work, nor any extension of time, nor any possession taken by the City or the City's officers or employees shall operate as a waiver of any provision of the Contract Documents, or of any power herein reserved to the City, or any right to damages herein provided; nor shall any waiver of any breach of the Contract be held to be a waiver of any other subsequent breach.

105.07 No Estoppel. The City shall not be precluded or estopped by any return or certificate given by the Contractor either before or after the final completion and acceptance of the Work from showing the true and correct amount and character of the Work done and Materials furnished, or from showing at any time that any such return or certificate is untrue and incorrect or improperly made, or from showing that the Work, Materials or Equipment do not conform to the Contract Documents or from demanding and recovering from the Contractor such damages as the City may sustain by reason of the Contractor's failure to comply with the Contract Documents.

ITEM 106 THE ENGINEER

106.01 Project Inspection
106.02 Rejection of Work
106.03 Contract Administration
106.04 Monitoring Progress
106.05 Interpretation
106.06 Authorization of Inspection, Testing and Approval
106.07 Review of Payment Requests
106.08 Review of Submittals
106.09 Preparation of Change Orders
106.10 Final Inspections
106.11 Claims Services
106.12 Project Rules and Hours
106.13 Construction Schedule

106.01 Project Inspection. The Engineer or Inspector shall inspect the progress and quality of the Work, including the preparation, fabrication or manufacture of Materials and Equipment, for conformity to the Contract Documents. The Engineer shall be provided access to all parts of the Project and shall be furnished with such information and assistance by the Contractor as is required to make a complete and detailed inspection. Inspection by the Engineer or an Inspector is solely for the benefit of the City and shall not relieve the Contractor of any of its responsibilities under the Contract Documents. When any unit of government, political subdivision or railroad corporation is to pay a portion of the cost of the Work, its representatives shall have the right to inspect the Work. Such inspection shall in no sense make any unit of government, political subdivision or railroad corporation a party to the Contract, and shall in no way interfere with the rights of the City or the Contractor under the Contract. The Inspector is not authorized to issue instructions contrary to the Contract Documents or to act for, or for the benefit of, the Contractor. Changes to the Contract Documents must be made in accordance with 117.01 through 117.12. No inspection performed pursuant to this Section shall constitute acceptance of the Work.

106.02 Rejection of Work. The Engineer or an Inspector shall have the authority to disapprove or reject any item of Work which is Defective, or that the Engineer or Inspector believes will not produce a Project that conforms to the Contract Documents, or that will prejudice the integrity of the design concept of the Project as a functioning whole as indicated by the Contract Documents. The Engineer or Inspector shall immediately notify the Authorized Representative and the Contractor at any time that Work has been disapproved or rejected. The Engineer or Inspector shall not be responsible for construction means, methods, manners, techniques, sequences, procedures, safety precautions and programs in connection with the Work, or for the Contractor's failure to carry out the Work in conformity with the Contract Documents. No failure of the Engineer or Inspector to reject the Work shall constitute acceptance of the Work.

106.03 Contract Administration. The Engineer or his designee shall provide administration of the Contract for the Project as provided by the applicable agreement between the City and the Engineer, if any, and the Contract Documents. The Engineer shall attend any

and all progress and coordination meetings. The Engineer shall prepare a written report of each progress and coordination meeting and transmit it to the Authorized Representative within three business Days of the meeting. The Engineer shall not delegate the duty to prepare the written report of any Project and coordination meeting attended. The Engineer or Inspector may authorize minor changes or alterations in the Work not involving additional costs or time and not inconsistent with the overall intent of the Contract Documents but has no authority to authorize the Contractor to perform additional or extra Work for which the Contractor will seek compensation in addition to the Contract price or extension of the time for Contract Completion. The Engineer shall review and approve, or recommend approval, of all forms required under the Contract Documents. The Engineer shall render decisions in connection with the Contractor's responsibilities under the Contract Documents and submit recommendations to the Authorized Representative for enforcement of the Contract as necessary.

106.04 Monitoring Progress. The Engineer shall monitor the progress of the Work for conformance with the Construction Schedule and shall initiate revisions of the Construction Schedule as required by the Contract Documents. In the event of default by the Contractor, the Engineer may pursue the Contractor's Surety to Contract Completion. The Engineer shall keep a daily log containing a record of weather, number of workers on site, identification of Equipment, Work accomplished, problems encountered, and other similar relevant data.

106.05 Interpretation. The Engineer will be the initial interpreter of all requirements of the Contract Documents. All decisions of the Engineer shall be subject to final determination by the City. Contractor acknowledges that Engineer, within its limited agency for the City, may consult with the City's legal counsel and that all such consultation and communications are privileged.

106.06 Authorization of Inspection, Testing and Approval. The Engineer shall authorize special inspection, testing or approval of the Work, as provided in 107.31, whenever in the Engineer's reasonable opinion such action is necessary or advisable to insure conformity with the Contract Documents.

106.07 Review of Payment Requests. Based upon the Engineer's on-site observations and evaluation of the Contractor's Payment Request, the Engineer shall review and certify the amounts due the Contractor. The Authorized Representative may recommend to the City that payment be withheld from, or Liquidated Damages be assessed against, a Contractor's Payment Request, stating the reasons for such recommendation. The Engineer's certification for payment shall constitute a representation to the City that the Work has progressed to the point indicated and that, to the best of the Engineer's knowledge, information and belief, the Work is in conformity with the Contract Documents and the Contractor is entitled to payment in the amount certified.

106.08 Review of Submittals. The Engineer shall review and approve or take other appropriate action upon the Contractor's submittals within the required time for the purpose of checking for conformity with the Contract Documents. Such review and approval shall not relieve Contractor of its duty to strictly conform to the Contract Documents.

106.09 Preparation of Change Orders. The Engineer shall prepare all Bulletins and Change Orders, including a cost estimate and supporting documentation and data. Once executed, a Change Order shall constitute the full and complete satisfaction for all claims of all direct and indirect costs, overhead costs of all kinds, inefficiency costs, acceleration costs, the cumulative impact of the Change Order and other Change Orders executed prior to it, the impact of the Change Order on unchanged work and interest related thereto, which has been or may be incurred by Contractor in conjunction with the change in scope and/or project extension set forth in the Change Order.

106.10 Final Inspections. The Engineer shall conduct inspections to determine the date of Contract Completion and shall receive, review and forward to the appropriate Person all Project record submittals required by the Contract Documents. Such inspection shall not constitute acceptance of the Work, nor shall it relieve Contractor from its duty to correct defective or non-confirming work not noted during the inspection.

106.11 Claims Services. The Engineer shall render analyses, written recommendations, or decisions, within the time specified, on all claims, disputes, or other matters in question between the Contractor and the City and shall provide information or services to the City until final disposition of all such claims, disputes, and matters. If Engineer does not approve a Contractor claim or fails to act within the required time, Contractor's claim shall be considered to be denied.

106.12 Project Rules and Hours. The Engineer shall consult with the Authorized Representative to obtain full knowledge of all City rules, regulations or requirements affecting the Project. The Engineer shall establish the regular working hours with the Contractors, subject to approval of the Engineer.

106.13 Construction Schedule. The Engineer shall review the Construction Schedule together with a schedule of submittals which is coordinated with the Construction Schedule in accordance with 109.05 through 109.09. If the Contractor fails to prosecute the Work in accordance with the Construction Schedule, the provisions of 105.02 may be invoked.

ITEM 107 THE CONTRACTOR

107.01 Construction Procedures
107.02 Cutting, Fitting and Patching
107.03 Excavation
107.04 Borrow and Waste Areas
107.05 Construction and Demolition Debris
107.06 Manufacturer's Recommendations
107.07 Construction Supervision
107.08 Protection of Project, Property and Utilities
107.09 Load Restrictions
107.10 Materials and Equipment
107.11 Storage
107.12 Labor
107.13 Maintenance of Utilities
107.14 Maintenance of Traffic
107.15 Safety Precautions
107.16 Work Stoppage Due to Hazardous Materials
107.17 Vehicle Damage Claims
107.18 Fire Hydrants
107.19 Engineer Facilities
107.20 Meeting Spaces
107.21 Temporary Heat
107.22 Water
107.23 Hoists and Elevators
107.24 Electricity
107.25 Temporary Facilities
107.26 Drainage
107.27 Environmental Protection
107.28 NPDES General Permit
107.29 Building Permits
107.30 Other Permits
107.31 Inspection, Testing, and Approval
107.32 Uncovering the Work
107.33 Correction of the Work
107.34 Interruption of Existing Services
107.35 Clean Up
107.36 Explosives and Blasting
107.37 Emergency
107.38 Royalties and Patents

107.01 Construction Procedures. The Contractor shall be responsible for and have control over all construction means, methods, manners, techniques, sequences and procedures for all portions of the Contractor's Work and shall be responsible for any injury or damage which may result from the Contractor's Work or from improper construction, installation, maintenance or operation to the fullest extent permitted by law. Unless otherwise specified in the Contract Documents, the Contractor shall be responsible for properly and accurately laying out all lines, levels, elevations, grades and measurements for all the Work required by the Contract Documents and for the preservation of all related stakes and markers.

107.02 Cutting, Fitting and Patching. The Contractor shall do any cutting, fitting or patching required for the Contractor's Work and shall not endanger the Project by cutting, excavating or otherwise altering the Project, or any part of it. If Contractor requires sleeves, the Contractor shall furnish and coordinate the installation of the sleeves. The Contractor shall be responsible for the exact location and size of all holes and openings required to be formed or built for the Work, to permit coordination with any Work performed by other Persons on the Project. The Contractor shall allow sufficient time for installation of any Work performed by other Persons before covering or closing the applicable portion of the Project. Patching shall match and blend with the existing or adjacent surface. Any patching required because of Defective or ill-timed Work shall be done by and at the expense of the Contractor.

107.03 Excavation. The Contractor shall not cut away any Structure or dig under any foundation or into any wall, or any other part of the Project, without the written approval of the Engineer. Unless otherwise specified in the Contract Documents, the Contractor, prior to starting excavation or trenching, shall give notice at least two business Days in advance to the Owners of underground utilities registered with the Ohio Underground Utility Protection Services (OUPS) at www.oups.org, or by phone at (800) 362-2764 and the Owners of underground utilities shown on the Drawings and Specifications who are not registered members of OUPS. The Owner of an underground utility is required within forty-eight hours of notice, excluding Saturdays, Sundays and legal holidays, to stake, mark or otherwise designate the location of its utilities in the construction area together with its approximate depth. If any underground utility Owner fails to timely perform, the Contractor shall immediately notify the Engineer and contact the Owner of the underground utility. If any underground utility must be moved or adjusted, the Contractor shall notify the Owner of the underground utility in a timely manner so that the Work will not be delayed. Unless otherwise provided in the Contract Documents, any movement or adjustment of any underground utility or utility appurtenances, including without limitation electrical and gas meters, water and gas valves and light standards within the Project site is made by the Owner of the utility at the utility Owner's expense. In performing any excavation or trenching, the Contractor shall exercise caution and implement appropriate safety precautions to avoid property damage and personal injury. The Contractor shall backfill any excavation with the material specified and approved by the Engineer. The right to construct or reconstruct any utility service in the street or right of way or to grant permits for same, at any time, is hereby expressly reserved to the City and the Contractor shall not be entitled to any damages for the digging up of the street or Right-of-Way in accordance with such a permit. Any Person wishing to make an opening in the street must secure a permit from the City. The Contractor shall allow Persons bearing such permits, and only those Persons, to make openings in the street or Right-of-Way. When required by the Engineer, the Contractor shall make all necessary repairs due to such openings under the same conditions as the Work. Any adjustment of the Contract price or of the time for Contract Completion resulting from any such opening or repair may be made by Change Order. When the Work includes construction of underground lines and Structures, the Contractor shall make temporary restoration of street surfaces immediately upon completion of the underground lines and Structures, shall remove surplus excavated Materials and shall grade the street and put it into a safe and passable condition. The Contractor shall immediately refill any settlement in or adjacent to trenches for such construction to the proper grade.

107.04 Borrow and Waste Areas. A Change Order may be issued in accordance with 117.01 to 117.12 to permit the Contractor to use natural Materials found on the site of the Project.

Whenever Materials are to be borrowed or wasted in borrow or Waste Areas or, if allowed by the Contract Documents, wasted on the Project site, the Contractor shall prior to beginning borrow or wasting operations, obtain the Engineer's written approval of a detailed operation plan that addresses the following concerns:

(a) Control of drainage water;

(b) Cleanup, shaping, and restoration of disturbed areas;

(c) Disposal of regulated Materials;

(d) Avoidance of regulated areas;

(e) Excavation and filling of waste and Borrow Areas;

(f) Saving of topsoil;

(g) Measures to minimize sediment runoff, including keeping sediment and other contaminants from leaving the Project site and from entering streams, lakes, or reservoirs by using methods provided in the Contract Documents.

The Contractor shall use the current versions of ODOT's *Sediment and Erosion Control Handbook* and the *Location and Design Manual, Volume 2, Drainage Design* to design and plot a sedimentation and erosion control plan on Project plan sheets and ensure the plan complies with all current provisions of ORC, Chapter 6111 and the NPDES permit. The Contractor shall not waste material and discharge dredge or fill Materials into the "Waters of the United States" or an isolated wetland without the required permits from U.S. Army Corps of Engineers (404 Permit) and the Ohio EPA (401 Permit). The Contractor shall have the proposed borrow and Waste Areas reviewed by a qualified environmental consultant approved by the City and have the environmental consultant certify that the proposed borrow and waste operations will not impact the "Waters of the United States" or an isolated wetland. If consultant certification is not provided, the Contractor shall obtain the 404/401 Permits necessary to perform the operations as proposed and have the environmental consultant certify that the Work conforms to the requirements of the permits. The Contractor shall provide copies of all documentation submitted to obtain the appropriate permits and copies of the permits to the Engineer. The Contractor shall not waste or borrow material from a cultural resource site or a site eligible for the national Register of Historic Places. For sites found to have historic or prehistoric human remains, the Contractor shall comply with the requirements of Sections 2909.05 and 2927.11, ORC. If the Contract Documents require a cultural resource investigation, a qualified environmental consultant approved by the City for cultural resource investigation shall be used to review and certify that the waste or Borrow Area:

(a) does not impact a cultural resource;

(b) is not a cultural resource;

(c) is not eligible for the national Register of Historic Places; or

(d) does not consist of historic or prehistoric human remains.

If burning is permitted under the OAC-3745-19 and Section 1503.18, ORC, the Contractor shall submit a copy of the Ohio EPA permit and the Ohio DNR permit to the Engineer and copies

of all information used to obtain the permit. All damage to surrounding property resulting from the instability of borrow and Waste Areas, the removal of borrow Materials, the placement of waste Materials, or the hauling of material to and from these areas is the sole responsibility of the Contractor. Prior to the disposal of waste Materials outside the Project site, the Contractor shall submit to the City an executed copy of the Contract or permission statement from the property Owner. The Contract or permission statement must indicate that the waste Materials are not the property of the City, that the City is not a party to the Contract or permission statement and that the Contractor and property Owner will hold the City harmless from claims that may arise from their Contract or permission statement. Restoration of all borrow and Waste Areas includes cleanup, shaping, replacement of topsoil, and establishment of vegetative cover by seeding and mulching according to the Contract Documents. The Contractor shall ensure that the restored area is well drained unless approval is given by the Engineer to convert a pit area into a pond or lake, in which case the Contractor shall confine restoration measures to the disturbed areas above the anticipated normal water level, and that any proposed waste location is not within the FEMA mapped one hundred year floodplain. If the proposed waste location is within the FEMA mapped one hundred year flood plain, the Contractor shall submit written approval from the local floodplain coordinator for the site. The floodplain coordinator contacts for each county are available through the Ohio DNR, Division of Water, (614) 265-6750. No extension of time or additional compensation will be paid for any delays due to not having the written permit(s) to waste in a floodplain.

107.05 Construction and Demolition Debris. OAC-3745-37, OAC-3745-400, and Chapter 3714 ORC, regulate the use and disposal of construction and demolition debris. The Contractor shall notify the local Board of Health or the local Ohio EPA office seven Days before placing clean hard fill off the Project site or Right-of-Way and submit copies of this notification to the Engineer. The Contractor shall dispose of debris containing wood, road metal, or plaster at a licensed construction and demolition debris site. The disposal of brush, trees, stumps, tree trimmings, branches, weeds, leaves, grass, shrubbery, yard trimmings, crop residue, and other plant matter is restricted. If allowed by the Contract Documents, the Contractor may waste brush, trees, stumps, tree trimming, branches, weeds, leaves, grass, shrubbery, yard trimmings, crop residue, and other plant matter within the Project site or the Right-of-Way. Otherwise, the Contractor shall submit a plan and any required permits to legally dispose of these Materials off the Project site or Right-of-Way to the Engineer and shall provide all documents submitted to obtain this permit to the Engineer. If the Project contains garbage or solid and hazardous waste, the Contractor shall comply with applicable laws and any applicable provisions of the Contract document for the removal of these items. When wasting PCC, the Contractor shall mix the PCC with at least thirty percent natural soil to construct an inner core in the Waste Area, cover this inner core with 3 feet of natural soil on the top and eight feet on the side slopes and place and compact the material according to the Contract Documents to prevent future settlement and sliding.

107.06 Manufacturer's Recommendations. The Contractor shall install all Work in accordance with the Contract Documents and any recommendations of the manufacturer, including required temperature and humidity for installation of the various Materials.

107.07 Construction Supervision. The Contractor shall provide continuous supervision at the Project by a competent Superintendent when any Work is being performed, unless waived by the Authorized Representative. The Superintendent shall have responsibility and authority to

act on behalf of the Contractor. All communications to the Superintendent shall be as binding as if given directly to the Contractor. The Contractor shall submit an outline of the qualifications and experience of the Contractor's proposed Superintendent, including references, to the Engineer within ten Days of the Notice to Proceed. The City reserves the right to reject the Contractor's proposed Superintendent. Any such rejection shall be determined by the Authorized Representative. Failure of the Authorized Representative to notify the Contractor of such rejection within thirty Days of receipt of the required information shall constitute notice that the City has no objection. If the City rejects the Contractor's proposed Superintendent, the Contractor shall replace the Superintendent at no additional cost to the City. The Contractor shall not change or terminate the Superintendent without written approval of the Authorized Representative. If the Contractor proposes to change or terminate the Superintendent, the Contractor shall submit to the Engineer a written justification for the change or termination, along with the name and an outline of qualifications experience of the Contractor's proposed new Superintendent, not less than ten Days prior to any change or termination. The procedure provided above shall be applied to evaluate the Contractor's proposed new Superintendent. If in the City's sole discretion, the performance of the Superintendent is unsatisfactory at any time, the City may require that Contractor replace such Superintendent with a Superintendent satisfactory to the City at no additional cost to the City.

107.08 Protection of Project, Property and Utilities. The Contractor shall protect the Work from weather, and shall maintain the Work and all Materials, including Materials delivered to the Contractor by the City, apparatus, fixtures and other items on or adjacent to the Project site free from injury or damage until Final Acceptance. Non-rubber tired vehicles or Equipment shall not be moved on City streets and off road vehicles shall not be used on bases or pavements without the written approval of the Engineer. Work or items likely to be damaged shall be covered or protected at all times to prevent damage. Any Work or item damaged by failure of the Contractor to provide coverage or protection shall be removed and replaced with new Work or a new item, as applicable, at the Contractor's expense. The Contractor shall perform the Work within the site of the Project and any applicable easement or Right-of-Way. Any adjacent property, including without limitation roads, walks, shrubbery, plants, trees or turf, damaged during the Contractor's Work shall be properly repaired or replaced at the Contractor's expense. Unless otherwise specified in the Contract Documents, the Contractor shall protect the Project and existing or adjacent property and utilities from damage at all times and shall erect and maintain necessary barriers, furnish and keep lighted necessary danger signals at night, and take precautions to prevent injury or damage to individuals or property. When mailboxes, road or street name signs and supports are within the Project site, the Contractor shall remove and erect them in a temporary location during construction in a manner satisfactory to the Engineer. After completion of the Work, the Contractor shall erect the mailboxes, road or street name signs and supports in a permanent location in accordance with the Drawings unless otherwise required by Change Order. Removal, temporary erection and permanent erection shall be in accordance with United States postal regulations. When cornerstones, monuments and property corner pins are encountered in the performance of the Work, and monument covers are not listed in the Bid, the City will supply them and supervise their precise location and installation, and the Contractor will furnish all the labor, Materials and Equipment required for such installations. 105.02 may be invoked for the cost to the City for repair, re-evaluation of location and replacement of any cornerstone, monument or property corner pin within the Project, damaged, destroyed or made inaccessible during the progress of the Work by the Contractor. Existing surface or overhead Structures or utility lines are not necessarily shown on the Drawings and the locations of those shown are approximations. The Contractor shall make such investigations as are necessary to determine the extent to which existing surface or overhead Structures may interfere with the

performance of the Work. Any sizes, locations, and depths for such Structures are approximations and the Contractor shall make such investigation or exploration as may be necessary to determine the actual sizes, locations and depths. The Contractor shall field locate all existing utilities before setting line and grade. Unless otherwise specified in the Contract Documents, the Contractor shall remove all snow and ice as may be required for access to and performance of the Work.

107.09 Load Restrictions. The Contractor shall not load, nor permit any part of the Project to be loaded, in any manner that will endanger the Project, or any portion thereof, nor shall the Contractor subject any part of the Project or existing or adjacent property to stress or pressure that will endanger the Project or property. The Contractor shall provide all temporary bracing, shoring and other structural support required for safety of the Project and proper execution of the Work, including without limitation all necessary support and protection of the property of any utility. The Contractor shall comply with all legal load restrictions in the hauling of Materials on public roads and shall operate Equipment of a weight or so loaded as to not cause damage to Structures, Roadway, or other construction. A special permit will not relieve the Contractor of sole liability for damage which may result from the moving of Equipment or Materials. The Contractor shall not haul on concrete pavement, base or Structures before the expiration of the curing period.

107.10 Materials and Equipment. The Contractor shall provide only new Materials and Equipment of the quality specified in the Contract Documents. The Contractor shall immediately remove Materials or Equipment not conforming to the requirements of the Contract Documents. The Contractor shall not incorporate Materials or Equipment, the defects of which have been corrected without written approval from the Engineer. If the City is to furnish any Materials, the City shall deliver them in accordance with the Contract Documents. The Contractor shall coordinate and schedule sufficient time for any such delivery. The Contractor shall provide domestically produced steel as required by law including Sections 153.011 and 5525.21, ORC, and Federal laws and regulations, if applicable. The Contractor shall furnish documentation to the Engineer evidencing the domestic origin of applicable steel and iron products before they are incorporated into the Project. Steel and iron products without a traceable, documented domestic origin will be treated as non-domestic products. The City may reject any item or material provided by a Contractor in violation of this requirement. The Contractor shall notify the Engineer of proposed sources of Materials prior to delivery. The Engineer may approve Materials at the source of supply before delivery. If the proposed source of supply cannot produce the specified Materials, the Contractor shall furnish Materials from Alternate sources without adjustment of the Contract price or the time for Contract Completion.

107.11 Storage. Only the material and Equipment which are to be used directly in the Work shall be brought to or stored at the Project by the Contractor and the Contractor's Subcontractors and Material Suppliers. The Contractor shall be responsible for the proper handling and storage of all material and Equipment brought or delivered to the Project to assure preservation of their quality and fitness for the Project and to facilitate inspection of them. Aggregates shall be transported from any storage site to the Project in tight vehicles so constructed as to prevent loss or segregation of Materials after loading and measuring in order that there may be no inconsistencies in the quantities of Materials intended for incorporation in the Project as loaded, and the quantities as actually received at the site of the Project. After any material or Equipment is no longer required for the Work, the Contractor shall promptly remove

such material and Equipment from the Project. The Contractor's Materials and Equipment shall not be stored in any Right-of-Way unless the location of such storage is approved by the Engineer. The Contractor shall, before storing Materials in gutters, lay suitable drains of sufficient size to carry all the storm water flowing in such gutters. Where the drainage from cross streets or alleys is interfered with or cut off by reason of the nature of the Work, the Contractor shall provide suitable crossings for pedestrians. No material or Equipment shall be stored within 20 feet of any fire hydrant. Private property shall not be used for storage of material and Equipment without the prior written permission of the Owner or lessee of the private property, and if requested by the Engineer, the Contractor shall provide a copy of the written permission to the Engineer. The Contractor shall restore all storage sites to their original conditions. The Contractor's material and Equipment shall not cause damage to the Project or adjacent property and shall not endanger any individual at, or in the vicinity of, the Project. Any injury to any individual or damage to property resulting from the Contractor's material or Equipment shall be the responsibility of the Contractor.

107.12 Labor. The Contractor shall maintain a sufficient workforce to timely perform the Work and enforce good discipline and order among the Contractor's employees and the employees of the Contractor's Subcontractors and Material Suppliers. The Contractor shall not permit employment of individuals not skilled in tasks assigned to them. The Contractor shall dismiss from the Project any individual employed by the Contractor or the Contractor's Subcontractors and Material Suppliers who is found by the Authorized Representative, pursuant to a recommendation from the Engineer, to be incompetent, guilty of misconduct, or detrimental to the Project. The Contractor shall employ all legal efforts to minimize the likelihood or effect of any strike, Work stoppage or other labor disturbance. Informational pickets shall not justify any Work stoppage.

107.13 Maintenance of Utilities. The Contractor shall at all times provide and maintain access to fire hydrants, water valves, water service boxes, gas valves, gas service boxes, manholes and other similar appurtenances. During the course of construction, the Contractor shall be solely responsible to notify any utility or other service when such utility or service is encountered. The Contractor shall protect all above ground utilities, Structures and appurtenances and shall replace any damaged portions thereof. The Contractor shall protect all below ground utilities, Structures and appurtenances that may be accurately located by removing manhole covers, valve box covers, and other access point coverings with reasonable effort using hand tools for such removal and shall replace any damaged portions thereof.

107.14 Maintenance of Traffic. Vehicular and pedestrian public traffic shall be maintained during the Project whether it is traffic through the Project or only cross traffic at intersections, unless otherwise provided in the Contract Documents. The Contractor shall make all repairs to roads necessary to maintain traffic to the satisfaction of the Engineer. If there are locations on the Project where Sewer or water line construction only is called for and a part of the existing pavement will remain in place, traffic shall be maintained and ingress and egress to all public and private entrances shall be provided. The Contractor shall provide all necessary flaggers. The Contractor shall provide and maintain access to adjacent property including by constructing necessary temporary walks, driveways, Bridges, crossings, and Roadways. The Contractor shall notify the applicable fire and police department whenever a street or alley, or a portion of a street or alley is about to be closed to traffic and shall provide notice when such street or alley or portion thereof is to be opened. In the event of the complete closure of any street,

alley or private drive, the City shall give notification to the occupants of all premises affected by the closure. The Contractor shall promptly notify the Engineer of all unforeseen effects of the Project on traffic. Unless the Contract Documents provide otherwise, all traffic control devices shall be furnished, erected, maintained and removed by the Contractor in accordance with the OMUTCD.

107.15 Safety Precautions. The Contractor shall take reasonable, diligent precautions and shall be responsible for the safety of individuals on or adjacent to the Project and shall comply with all applicable provisions of federal, State and municipal safety laws, regulations, and building codes to prevent injury to individuals on or adjacent to the Project. The Contractor shall comply with the rules, regulations and orders of OSHA. The Contractor shall be responsible for any fine or cost incurred as a result of any violation or alleged violation of such rules, regulations or orders. The Contractor shall take reasonable, diligent precautions and shall be responsible for the safety of the Project, including without limitations all Materials and Equipment incorporated or to be incorporated in the Project. Prior to the start of any Work, the Engineer shall meet with the Contractor and other applicable Person to coordinate the Contractor's methods and Equipment for protecting the Project, other property and individuals from damage or injury, in accordance with applicable regulations. The Engineer efforts at coordination shall not relieve the Contractor of any responsibility for safety or ensure the Engineer to become responsible for safety. Methods and Equipment for protecting the Project, other property and individuals shall be subject to inspection and approval of the appropriate authority having jurisdiction over the Project site.

107.16 Work Stoppage Due to Hazardous Materials. In the event the Contractor, except a licensed abatement Contractor, encounters Materials reasonably believed to contain asbestos, polychlorinated biphenyl (PCB) or other hazardous waste or material, which has not been rendered harmless, the Contractor shall immediately stop Work in the area affected and report the condition to the Authorized Representative and the Engineer in writing. A licensed abatement Contractor shall report the condition to the Authorized Representative and the Engineer in writing and shall remove the waste or material or render it harmless. The Work in the affected area shall be resumed upon written notice from the Engineer that the waste or material has been removed or rendered harmless. The term "rendered harmless" shall mean that the level of exposure is less than any applicable exposure standards set forth by OSHA or other applicable regulations. Hazardous Materials to be used at the Project shall be identified by a MSDS. The applicable MSDS shall be prepared by the Contractor and submitted to the Engineer prior to a hazardous material being brought to the Project site. The Contractor shall maintain all applicable MSDS on site whenever Work is in preparation or progress.

107.17 Vehicle Damage Claims. When a Person reports damage to a vehicle, whether orally or in writing, to the Contractor, the Contractor shall file a written report, including copies of applicable police reports, with the Authorized Representative within three Days.

107.18 Fire Hydrants. The Contractor shall make any necessary arrangements with the City Department of Water for any use of fire hydrants in connection with the Work and shall pay for all water used from the hydrants. Permits from the Department of Water for use of fire hydrants shall be provided to the Engineer upon request.

107.19 Engineer Facilities. Unless otherwise specified in the Contract Documents, the Contractor shall provide and maintain in a clean condition the following temporary facilities, Equipment and services for use by the Engineer:

(a) If space is available near the Project, 2 separate office spaces, both of which shall be adequately heated, lighted, air conditioned, and with doors which lock, the keys to which shall be provided to the Engineer;

(b) If space is not available near the Project, a standard width job trailer shall be provided, which shall be adequately heated, lighted, air conditioned, and with doors which lock, the keys to which shall be provided to the Engineer;

(c) Each office space shall be equipped with at least 1 desk, 1 desk chair and 2 side chairs and reasonable circulation space;

(d) Each office space shall have 1 four-drawer filing cabinet or equivalent;

(e) A plan rack and 4 by 8 foot plan table shall be provided in 1 office space;

(f) Each office space shall have at least 1 telephone in service;

(g) Use of a facsimile and copy machine shall be provided for use either in one of the office spaces or in an adjacent office space;

(h) One office space shall have a computer to the City's criteria with electronic mail capabilities.

107.20 Meeting Spaces. Unless otherwise specified in the Contract Documents, the Contractor shall provide adequate space, Equipment and furnishings to conduct progress and coordination meetings for the Project. The meeting area shall be furnished with an appropriate meeting table and an appropriate number of folding or stacking chairs to adequately seat all participants at the meetings.

107.21 Temporary Heat. Unless otherwise specified in the Contract Documents, the Contractor shall provide temporary heat necessary so that the Work shall proceed expeditiously during inclement weather, and to protect the Contractor's Work and Materials from damage. From a date of partial occupancy, the City is responsible for the cost of providing heat for the occupied portion of the Project.

107.22 Water. Unless otherwise specified in the Contract Documents, the Contractor shall provide all water necessary for the Contractor's Work. From a date of partial occupancy, the City is responsible for the cost of water consumed for the occupied portion of the Project.

107.23 Hoists and Elevators. The Contractor shall provide and maintain adequate hoisting and elevator facilities as required for the Contractor's Work in coordination with the Engineer. If electric service requirements of hoisting or elevator facilities differ from that available at the Project site, the Contractor requiring use of such hoisting or elevator facilities shall make

and pay for all necessary connections. Unless otherwise specified in the Contract Documents, the Contractor requiring use of hoisting or elevator facilities, after the Project is enclosed, shall be responsible for transporting individuals and Materials as required for the Contractor's Work.

107.24 Electricity. Unless otherwise specified in the Contract Documents, the Contractor shall make all arrangements for temporary light and power services and shall pay all charges, both for service installation and removal, if required, and for energy consumed until Final Acceptance of the Project. Unless otherwise specified in the Contract Documents, the Contractor requiring any electrical service requirements relating to temporary hoists, cranes, welding Equipment or elevators shall subcontract with a licensed Contractor for such service requirements and shall be responsible for all costs of such services. From a date of partial occupancy, the City is responsible for the cost of energy consumed for the occupied portion of the Project.

107.25 Temporary Facilities. Unless otherwise specified in the Contract Documents, the Contractor shall provide, and maintain in a clean condition, adequate and approved sanitary facilities for use by all Persons at the Project in coordination with the Engineer.

107.26 Drainage. The Contractor shall be responsible for all temporary drainage necessary for the Contractor’s Work and shall employ pumps, trenches, drains, sumps or other necessary elements as required to afford satisfactory working conditions for the protection, execution and completion of the Project.

107.27 Environmental Protection. The Contractor shall comply with all applicable federal, State and local laws and regulations relating to pollution of the environment and shall take precautions to prevent pollution of water with fuels, oils, bitumens, calcium chloride, sediments and other Materials. When the work area is located in or adjacent to streams and other watercourses, the area shall be separated from the main stream by a dike or barrier to keep sediment from entering the stream. The Contractor shall take care during the construction and removal of such barriers to minimize siltation of the stream and watercourse. Control of ground water and water in excavations shall be accomplished in a manner that will prevent degradation of the quality of any surface water. Wells and well points shall be installed with suitable screens and filters where necessary to prevent the continuous pumping of fines. The discharge of sediment laden water from pumping shall be performed in a manner to prevent degradation of streams, watercourses, lakes, ponds, or other areas of water impoundment. Such prevention may require, without limitation, the use of ditch check dams, sediment traps, sediment basins, sediment pits, filters, filtration bags or other control devices and methods necessary to prevent adverse effects to surface waters as provided in Chapter 3745-1-04 OAC. The cost of constructing and maintaining these measures shall be borne by the Contractor. Water from aggregate washing or other operations containing sediment shall be treated by filtration, settling basins or other measures sufficient to reduce the sediment concentration to not more than that of the stream, watercourse, lake, pond or the area of water impoundment. The Contractor shall not cause or permit the handling or transporting or storage of any material in a manner which allows or may allow unnecessary amounts of particulate matter to become airborne or cause or permit the Project to be constructed, used, repaired or demolished without applying all such reasonable measures as may be required to prevent particulate matter from becoming airborne. The Engineer may require necessary measures to prevent particulate matter from becoming airborne including without limitation the paving or frequent cleaning of roads, driveways and parking lots,

the application of dust-free surfaces, the application of water and the planting and maintenance of vegetative ground cover. When dust, fumes, gases, mist, odorous matter, vapors, or any combination thereof escape from the Project or Equipment in such manner and amount as to cause a nuisance or to violate any regulation, the Engineer may require that the Project or Equipment in which processing, handling and storage are done be tightly closed and ventilated in such a way that all air and gases and air or gas-borne material leaving the Project or Equipment are treated by removal or destruction of air contaminants be discharged to the open air.

107.28 NPDES General Permit. The Contractor shall secure any required NPDES general permit by submitting a notice of intent application form to the Ohio EPA at least forty-five Days prior to the start of construction. When required by law, the Contractor shall prepare and certify a storm water pollution prevention plan and process the required notice of termination prior to completion of the Project. The Contractor shall comply with all requirements and conditions of any NPDES general permit, including, but not limited to, implementing and maintaining the control measures specified in the storm water pollution prevention plan, maintaining records of construction activities, and removing Materials no longer required and taking proper action if there is a reportable quantity spill.

107.29 Building Permits. Unless otherwise specified in the Contract Documents, the Contractor shall secure the required general building permits. The Contractor shall schedule and attend all intermediate and Final Inspections required for any permit certification. The Contractor shall schedule inspection for occupancy permits with the appropriate local fire authority and State Fire Marshal. The Contractor shall give the Engineer and the Authorized Representative reasonable notice of the date arranged for any inspection.

107.30 Other Permits. Unless otherwise specified in the Contract Documents, the Contractor shall apply for, secure and pay the fees for any permit, license or tap in required by State or local authorities having jurisdiction over the Project, except the NPDES permit and the general building permits secured by the Engineer in accordance with 107.29. The Contractor shall give the Engineer and the Authorized Representative reasonable notice of the date arranged for any related inspection.

107.31 Inspection, Testing and Approval. Unless otherwise specified in the Contract Documents, the Contractor shall apply for, secure and pay for any inspection, testing or approval required by the Contract Documents, laws, ordinance, rules, regulations or orders of any public authority having jurisdiction over the Project. The Contractor shall give the Engineer and the Authorized Representative reasonable notice of the date arranged for such inspection, testing or approval. The Contractor shall provide an original report of the inspection, testing or approval to the Engineer for approval. If, after the commencement of the Work, the Engineer determines that any portion of the Work requires special inspection, testing or approval, in addition to any inspection, testing or approval provided for or required by the Contract Documents, in order to insure conformance to the Contract Documents, the Engineer may instruct the Contractor in writing to order such special inspection, testing, or approval, or the Engineer may make the arrangements for same. If such special inspection, testing or approval reveals a failure of the Work to comply with the requirements of the Contract Documents, the Contractor shall pay all costs associated with such special inspection, testing or approval. If such special inspection, testing or approval reveals that the Work is in compliance with the Contract Documents, the

Contractor will be paid, by appropriate Change Order, for all costs associated with such special inspection, testing or approval. Neither the observations of the Engineer in the administration of the Contract, nor any inspections, tests or approvals by Persons other than the Contractor shall relieve the Contractor from the Contractor's obligation to perform the Work in conformity with the Contract Documents.

107.32 Uncovering the Work. If any Work is covered contrary to the requirements of the Contract Documents or contrary to the written request of the Engineer, such Work must, if required by the Engineer in writing, be uncovered for observation and replaced, if not in conformity with the Contract Documents, and recovered at the Contractor's expense. If any Work has been covered in accordance with the Contract Documents and is Work which the Engineer had not requested the opportunity to observe prior to covering, the Engineer may request that such Work be uncovered by the Contractor. If such Work is found not to be in conformity with the Contract Documents, the Contractor shall pay all costs of uncovering, correcting, replacing, and recovering the Work. If such Work is found to be in conformity with the Contract Documents, a Change Order will be processed to pay the Contractor for the cost of uncovering, correcting, replacing, and recovering the Work, subject to final approval by the City Commission.

107.33 Correction of the Work. The Engineer shall notify the Contractor in writing if any Work is found by the Engineer to be Defective, whether observed before or after Contract Completion. The Engineer shall specify in the written notice the time within which the Contractor shall correct the Defective Work. The Contractor shall bear all costs of correcting such Defective Work, including the cost of any consequential damages. If the Contractor fails to correct any Defective Work within the time fixed in the written notice, the City may correct such Work and obtain recovery of all costs, including without limitation any consequential damages, and all attorneys' and consultants' fees, from the Contractor or the Contractor's Surety.

107.34 Interruption of Existing Services. Whenever it becomes necessary to interrupt existing services in use by the City or its residents, such as Sewer, water, gas, and steam lines, electric or telephone and cable service, the Contractor shall continue the Work on a non-stop twenty-four hour per Day basis until the Work is completed and the service restored, or at such Alternate time required by the Authorized Representative. Before beginning such Work, the Contractor shall apply in writing to and receive approval in writing from the Authorized Representative and the Person with appropriate jurisdiction over the Project, to establish a time when interruption of the service will cause a minimum of interference with the activities of the City, its tenants, if any, and the public.

107.35 Clean Up. During the progress of the Work, the Contractor shall be responsible for the removal and off-site disposal of all waste, excess Materials and rubbish, including without limitation layout stakes, sediment control devices and temporary Structures, attributable to the Work to an appropriate disposal site. Temporary on-site storage of waste, excess Materials and rubbish may be permitted as designated by the Engineer. Unless otherwise provided in the Contract Documents, the Contractor shall perform daily broom cleaning in the area of the Contractor's Work and shall, at the end of each working Day or upon notice from the Engineer, remove all waste Materials and rubbish from the Project. The Contractor shall, as required for the Project or upon notice from the Engineer, clean and remove any waste Materials or rubbish from areas adjacent to the Project. The Contractor shall, as required for the Project or upon

notice from the Engineer, take all necessary actions to minimize and clean dust and mud from the Project and adjacent property in accordance with City ordinances and regulations. If the Contractor fails to clean up during the progress of the Work, the provisions of 105.02 may be invoked. If the Contractor fails to maintain the areas adjacent to the Project clean and free of dust, mud, waste, excess Materials and rubbish, upon written notice from the Engineer, the Authorized Representative shall direct the local jurisdiction having responsibility for the area to clean the area or shall employ City employees or another Person to clean the area. The cost of cleaning the area adjacent to the Project shall be deducted from the Contractor as the Engineer recommends and the Authorized Representative determines to be appropriate. The decision of the Authorized Representative shall be final, subject to proceedings in accordance with 118.01 through 118.11.

107.36 Explosives and Blasting. Blasting will not be permitted and explosives may not be brought onto or kept on the site of the Project, except with prior written approval of the Authorized Representative and any other authorities having jurisdiction, including without limitation the City's Fire Department. All blasting and all purchasing, storing and handling of explosives shall be done as prescribed in any applicable federal, State or City statutes, ordinances or regulations by Persons experienced in such Work. The Contractor shall carry appropriate liability insurance and shall be responsible for any injuries to individuals or damage to property resulting from any blasting operation. The Contractor shall provide a copy of the policy of such insurance to the Engineer prior to bringing any explosives to the Project and to the Authorized Representative upon request. The Contractor shall take all necessary precautions to protect the Project, existing or adjacent property, water lines, and other underground Structures from blasting. Where there is danger to Structures or property from blasting, the charges shall be reduced and the material shall be covered with suitable timber, steel or rope mats. The Contractor shall notify all Owners of adjacent or utility property which may be affected of any intention to use explosives at least eight hours before blasting is commenced. Any inspection of use of explosives by the Engineer does not in any way reduce the responsibility of the Contractor or its Surety for damages that may be caused by such use.

107.37 Emergency. In the event of an emergency affecting the safety of the Project, other property, or individuals, the Contractor, without special instruction or authorization, shall act to prevent any threatened damage, injury, or loss. The Contractor shall give the Engineer and the Authorized Representative prompt written notice if the Contractor believes that any significant change in the Work or variation from the Contract Documents has been caused by any emergency or action taken in response to an emergency. If the Engineer recommends that a change in the Contract Documents be made because of any emergency or action taken in response to an emergency, and the Authorized Representative approves, a Change Order will be processed, subject to final approval by the City Commission, if applicable.

107.38 Royalties and Patents. The Contractor shall pay all royalties and license fees and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents and if, to the knowledge of the Engineer, use of the specified item is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by the Engineer in the Contract Documents. If the Contractor has reason to believe that use of the specified item is subject to

patent or copyright protection, the Contractor shall immediately notify the Authorized Representative.

ITEM 108 - SUBCONTRACTORS AND MATERIAL SUPPLIERS

108.01 Approval by City
108.02 Replacement
108.03 Contractor's Responsibility
108.04 Warranty and Guarantee
108.05 Prompt Payment
108.06 Prompt Payment Reduction and Interest
108.07 Affidavit of Claim
108.08 Claims Against Contract Bond
108.09 Assignment of Contract

108.01 Approval by City. Within ten Days of the Notice to Proceed, the Contractor shall list the Contractor's proposed Subcontractors and Material Suppliers on forms approved by the Authorized Representative and submit such forms to the Engineer for approval by the Authorized Representative. The City reserves the right to reject any Subcontractor or Material Supplier for any reason, in its sole discretion. Failure of the Engineer to notify the Contractor of rejection within ten Days of receipt of the forms shall constitute notice that the City has no objection. If the City rejects any Subcontractor or Material Supplier, the Contractor shall replace the Subcontractor or Material Supplier at no additional cost to the City.

108.02 Replacement. The Contractor shall not replace any Subcontractor or Material Supplier after execution of the Contract Form without written approval of the Authorized Representative. The Contractor shall submit to the Engineer amended approval forms and a written justification for the change of the Contractor's Subcontractors or Material Suppliers. The Contractor shall submit to the Engineer amended forms whenever any listed information changes for the Contractor's Subcontractors or Material Suppliers. The City may withhold approval of any such proposed replacement for any reason, in its sole discretion.

The City may require the Contractor to replace any Subcontractor or Material Supplier previously approved at no additional cost to the City if the Contractor is in default because of the Subcontractor's or Material Supplier's performance.

108.03 Contractor's Responsibility. The Contractor shall be fully responsible for all acts and omissions of the Contractor's Subcontractors and Material Suppliers and shall be responsible for scheduling and coordinating the Work of the Contractor's Subcontractors and Material Suppliers. Interference, disruption, hindrance, delay or impact attributable to the Contractor's Subcontractors or Material Suppliers shall be deemed to be interference, disruption, hindrance, delay or impact within the control and responsibility of the Contractor. The Contractor shall require that each of the Contractor's Subcontractors have a competent supervisor at the Project whenever Work is being performed by the Subcontractor. The Contractor agrees to bind the Contractor's Subcontractor and Material Supplier to the terms of the Contract Documents, so far as applicable to the Work of such Subcontractor or Material Supplier, and shall not agree to any provisions which seek to bind the City to terms inconsistent with or at variance from the terms of the Contract Documents. Contractor shall require the City to be named as an intended third-party beneficiary of all contracts between Contractor and Subcontractors and Material Suppliers such that the City will be entitled to enforce any rights thereunder to its benefit.

108.04 Warranty and Guarantee. The Contractor shall require each Subcontractor and Material Supplier to fully warrant and Guarantee, for the benefit of the City, the effectiveness, fitness for the purpose intended, quality and merchantability of any Work performed or item provided or installed by such Subcontractor or Material Supplier.

108.05 Prompt Payment. If a Subcontractor or Material Supplier requests payment in time to allow the Contractor to include the request in the Contractor's Contractor Payment Request, the Contractor shall pay within ten Days after receipt of payment from the City:

(a) To a Subcontractor an amount equal to percent of completion allowed by the City for the Subcontractor's Work;

(b) To a Material Supplier an amount equal to all or a portion of the Material Supplier's request for Materials furnished.

108.06 Prompt Payment Reduction and Interest. The Contractor may reduce the amount to be paid to a Subcontractor or Material Supplier pursuant to 108.05 by the amount of any retainage withheld from the Contractor and may withhold amounts necessary to resolve disputed liens or claims involving the Work of the Subcontractor or Material Supplier. If the Contractor fails to comply with the provisions of 108.05, the Contractor shall pay to the applicable Subcontractor or Material Supplier eighteen percent interest on any unpaid amount beginning on the eleventh Day after receipt of payment from the City.

108.07 Affidavit of Claim. In order to establish lien rights, Subcontractors and Material Suppliers not in privity of Contract with the Contractor must serve a notice of furnishing on the Contractor whose Contract is the Contract under which the Subcontractor or Material Supplier is performing. The notice of furnishing must be served upon the Contractor within twenty-one Days of performing the Work or furnishing the Materials. Subcontractors and Material Suppliers not in privity of Contract with the Contractor must, at the time of filing a Claim Affidavit with the Authorized Representative, provide a copy of the notice of furnishing and proof that it was received by the Contractor. In order to establish lien rights, a claimant must file a Claim Affidavit with the Authorized Representative, within one hundred twenty Days from the date of the last Work or furnishing of Materials. In order to receive priority over similar claims, the claimant must file a copy of the claim with the Montgomery County Recorder's office within thirty Days of serving the Authorized Representative. All claimants who serve the Authorized Representative, and file with the Montgomery County Recorder within thirty Days, have no priority among themselves and share in the funds prorata. Claimants, who file with the Authorized Representative, but not with the Montgomery County Recorder, are paid only if there are sufficient funds left after paying those claimants who file with the Montgomery County Recorder. The Authorized Representative shall notify the Contractor of the receipt of the claim within five Days of receiving the Claim Affidavit. A copy of the Claim Affidavit and a statement advising the Contractor of the Contractor's right to dispute the claim will accompany the notice. The Contractor shall have twenty Days to dispute the claim. If the Contractor does not notify the Authorized Representative in writing of an intention to dispute the claim within twenty Days after receipt of the Claim Affidavit, the Contractor is deemed to have assented to its correctness. The City shall detain the amount stated in the Claim Affidavit from subsequent Contractor Payment Requests and deposit said amount in an escrow

account in accordance with a general escrow agreement between the City and a bank. The escrow agent shall hold the deposit and any interest earned thereon until receipt of notice from the Authorized Representative specifying an amount to be released and the Person to whom the amount is to be released. The City reserves the right to pay a Claim Affidavit which is not timely disputed.

108.08 Claims Against Contract Bond. Laborers, Subcontractors or Material Suppliers who have furnished or delivered labor or Materials to the Project may, at any time after performing the labor or delivering the Materials, but not later than ninety Days after Final Acceptance of the Project, by the City, furnish the Surety a statement of the amount due. After furnishing the statement, laborers, Subcontractors or Material Suppliers must wait sixty Days to bring a suit for the amount due. If the Surety has not paid the claim at the expiration of sixty Days, laborers, Subcontractors or Material Suppliers may bring suit for amounts not paid, but must bring the suit within one year of Final Acceptance of the Project, by the City.

108.09 Assignment of Contract. The Contractor shall not sell, transfer, assign or otherwise dispose of the Contract or any portion thereof, or of any right, title or interest therein, without written consent of the Authorized Representative. No sale, transfer, assignment or other disposition of the Contract shall in any case release the Contractor of liability under the Contract and the Contract Bond.

ITEM 109 CONSTRUCTION PHASE SCHEDULING

109.01 Compliance with Schedule
109.02 Responsibility of Contractor
109.03 Preceding Work
109.04 Coordination with City
109.05 Construction Schedule
109.06 Schedule Information
109.07 Construction Schedule Requirements
109.08 Use of Schedule and Float
109.09 Approval and Acceptance Schedule
109.10 Weekly Contractor Reports
109.11 Monthly Progress Reports
109.12 Time Recovery Plan
109.13 Project Meetings

109.01 Compliance with Schedule. The Contractor shall complete portions of the Work in such order and time as provided in the current Construction Schedule.

109.02 Responsibility of Contractor. The Contractor shall afford other Persons on the Project reasonable opportunity for the introduction and storage of Materials and Equipment and execution of Work and shall properly connect and coordinate the Contractor's Work with the Work of other Persons on the Project. The Contractor shall perform the Work so as not to interfere with, disturb, hinder, delay, or impact the Work of other Persons on the Project. If the Contractor, or any of the Contractor's Subcontractors or Material Suppliers, causes damage or injury to the property or Work of any other Person on the Project, or by failure to perform the Work with due diligence, delays, interferes with, hinders, disrupts or impacts any other Person on the Project, who suffers damage, injury or expense thereby, the Contractor shall be responsible to the other Person for such damage, injury or expense. Claims, disputes or actions between the Contractor and other Persons on the Project concerning such damages, injury or expense shall not delay completion of the Work which shall be continued by the parties to any such claim dispute or action. The Contractor shall coordinate the Work with the activities and responsibilities of other Persons on the Project, the Engineer and the City to complete the Project in accordance with the Contract Documents. In the event the Contractor fails to prosecute the Work in accordance with the Project Schedule, the Engineer may recommend that the provisions of 105.02 be invoked.

109.03 Preceding Work. If any part of the Contractor's Work is preceded by the Work of another Person, the Contractor shall inspect such preceding Work before commencing any Work, and report in writing to the Engineer any defects which render the preceding work unsuitable as related to the Contractor's work. Failure of the Contractor to make such inspection and report in writing shall constitute an acceptance of the preceding work as fit and proper for the reception of the Contractor's work, except for latent defects which such an inspection would fail to disclose.

109.04 Coordination with City. The Contractor shall supervise and coordinate the Work in conformity with any coordination from the Engineer and the Authorized Representative, as provided in the Contract Documents. The Contractor shall give reasonable notice to the Engineer

when the Engineer's presence is required for special consultations, decisions or recommendations, as required by the Contract Documents. The Contractor shall consult with the Engineer and the Authorized Representative to obtain full knowledge of all rules, regulations or requirements affecting the Project. The Contractor shall establish the regular working hours, subject to approval by the Engineer and the Authorized Representative. Night working hours and working hours on Sundays and holidays are not permitted without the prior written consent of the Engineer and the Authorized Representative. Such consent will not be provided unless the Contractor has given at least forty-eight hours' notice in writing to the Engineer. The Contractor shall cooperate with the Engineer and the Authorized Representative so as not to interfere with, disturb, hinder or delay the responsibilities of the Engineer and the City.

109.05 Construction Schedule. The Contractor shall prepare the Construction Schedule for the Project and a schedule of submittals which is coordinated with the Construction Schedule within thirty Days of the date of the Notice to Proceed or such longer period as mutually agreed between the Engineer and the Contractor in writing upon timely written request by the Contractor. The Contractor shall, within seven Days of the date of the Notice to Proceed, furnish to the Engineer a preliminary Construction Schedule for the prosecution of Work on the Project. The Engineer shall, within seven Days of receipt of the Contractor's preliminary Construction Schedule, provide comments on the preliminary Construction Schedule to the Contractor. The Contractor shall, within five Days of receipt of the comments, prepare a revised Construction Schedule to incorporate those comments and submit the revised Construction Schedule to the Engineer together with all information requested and required by the Engineer. The Engineer shall submit 4 copies of the revised Construction Schedule, together with any recommendation thereon in writing, to the Authorized Representative within three Days of receipt. The Construction Schedule shall not exceed the time limits specified in the Contract Documents and the Notice to Proceed, shall provide for reasonable, efficient and economical execution of the Work and shall be coordinated with the Work of all other Persons or the entire Project to the extent required by the Contract Documents. The Construction Schedule shall be used to plan, organize, and execute the Work, record and report actual performance and progress and show how the Contractor Plans to coordinate all Work to Contract Completion. In preparing the Construction Schedule the Contractor shall use critical path scheduling methods and shall provide without limitation, the information listed in 109.06, unless waived by the Authorized Representative in writing upon the written recommendation of the Engineer.

109.06 Schedule Information. In accordance with 109.05, the Contractor shall provide the following information:

(a) A graphic presentation of the sequence of the Work for the Project which includes, without limitation, the Contractor's resource loading curve in the media and format required by the Engineer;

(b) Identification of each phase of the Work and any milestone completion dates;

(c) Identification of activities and durations for all shop drawing and other submittal review and approval, fabrication and review of mock-up Work, product review and procurement, fabrication, shop inspection and delivery including, without limitation, lead time, coordination drawing delivery, Punch List, Punch List corrections, Project close-out requirements, Contract Completion, and occupancy or utilization requirements;

(d) Identification of disruptions and shutdowns due to other operations, facilities and functions, if any;

(e) Identification of the critical path of the Work;

(f) Identification of crew size and total resource hours for each activity in the Construction Schedule;

(g) The Contractor's signature and date thereof on the Construction Schedule.

109.07 Construction Schedule Requirements. The Engineer shall provide complete Specifications for the paper and electronic formats of the Construction Schedule. The Contractor shall develop the Construction Schedule using commercially available Personal computer software acceptable to the Engineer, in graphic and tabular form. Final copies shall be provided in color and in such size as is appropriate for the level of detail and shall clearly and legibly show all relevant information. The Contractor shall provide monthly updates of the Construction Schedule and shall update the Construction Schedule if a time recovery plan is approved in accordance with 109.12, in electronic and paper formats, to the Engineer in graphic and tabular form. All base line and updated schedules shall be submitted electronically to the Engineer, in graphic and tabular form. The Contractor shall provide clear graphics, legends and other necessary data, including without limitation, milestones, constraints and items required by the Project and the Engineer. Unless waived by the Authorized Representative in writing upon written recommendation of the Engineer, each baseline and updated schedule shall show the Project name and Contract and contain lines for signatures and dates of signature for all Contractors involved in the Project. Each baseline and updated schedule shall provide activity identification and a description for each activity broken down to a maximum fifteen Day duration, responsibility of each applicable Contractor, the Contractor's resources and crew size for each activity, early start dates, early finish dates, late start dates, late finish dates, predecessor and successor activities for each activity, free float, total float and percentage completion. Each baseline and updated schedule shall identify the logic relationship between all activities and shall show all submittal dates, coordination drawing preparation, Working Drawing submittals and mark-up review and approval durations. Together with each updated schedule, the Contractor shall provide a list of all changes to the previously approved base line Construction Schedule or the previous updated Construction Schedule, including without limitation logic, float and actual start and finish dates of activities.

109.08 Use of Schedule and Float. The Construction Schedule and the Project Schedule, if applicable, shall be used as a tool for scheduling and reporting sequenced progress of the Work using early start dates and early finish dates. Free float and total float are resources of the Project and the use of float associated with an activity is not permitted without the concurrence of the Engineer, and other Contractors, if any.

109.09 Approval and Acceptance Schedule. The Contractor shall review and sign each updated Construction Schedule. The Contractor's signature or any base line or updated Construction Schedule shall serve as an affirmation of the Contractor's approval of and agreement to the Construction Schedule and a representation that the Contractor can meet the requirements of the Construction Schedule without additional compensation. Immediately after the Contractor has signed the Construction Schedule, the Engineer shall submit it and the

schedule of submittals to the Authorized Representative or return them to the Contractor with recommendations for revision. In the absence of a Construction Schedule approved by the Contractor and accepted by the Authorized Representative, the City may withhold payment from the Contractor in accordance with 114.08 and 114.09. Alternatively, the City, in its sole discretion, may backcharge the Contractor in accordance with 105.02, reassign scheduling responsibility or suspend or terminate the Contract in accordance with 119.01 through 119.04.

109.10 Weekly Contractor Reports. Unless otherwise specified by the Contract Documents, the Contractor shall, on a bi-weekly basis, prepare and submit to the Engineer a written report describing activities begun or finished during the preceding week, work in progress, expected completion of the Work, a Projection of all activities to be started or finished in the upcoming two weeks including without limitation the Contractor's workforce crew size with respect to each activity of Contractor, and total resource hours associated with such Work and any other information requested by the Engineer.

109.11 Monthly Progress Reports. Unless otherwise specified in the Contract Documents, the Engineer shall provide monthly progress reports to the Authorized Representative, which shall include recommendations for adjusting the Construction Schedule or the Project Schedule, as applicable, to meet milestone completion dates and Contract Completion dates.

109.12 Time Recovery Plan. When it is apparent to the Engineer that critical path activities, scheduled milestone completion dates, or Contract Completion dates will not be met, the Engineer shall submit to the Contractor a time recovery plan to avoid or minimize any delay. A time recovery plan may include, without limitation, increasing the Contractor's workforce in such quantities as will eliminate the backlog of Work, increasing the number of working hours per shift, shifts per workday, workdays per week, the amount of construction Equipment, or any combination thereof, rescheduling of activities to achieve maximum practical concurrency of work efforts and, if appropriate, time extensions. If the Contractor approves the time recovery plan within ten Days of receipt, a revised Construction Schedule shall be prepared by the Contractor and signed and accepted in accordance with 109.11 and, if applicable, a revised Project Schedule shall be prepared by the Engineer and approved and signed by the Contractors in accordance with 109.10. If the Contractor fails to approve a time recovery plan within ten Days of receipt, the Contractor shall immediately provide an Alternate time recovery plan to the Engineer in writing, for review and acceptance in accordance with 109.11 and, if applicable, 109.10.

109.13 Project Meetings. The Contractor and all appropriate Subcontractors shall attend Project meetings as requested by the Engineer. The purpose of the Project meetings may include, without limitation, review of progress in the Work, discussion of anticipated progress, and review of critical operations and existing and potential problems and safety matters. The Contractor shall be represented at every Project meeting by a Person authorized with signature authority to make decisions regarding possible modification of the Contract Documents. The Engineer shall notify the Contractor of the time and place of each Project meeting. The Contractor shall have any of the Contractor's Subcontractors and Material Suppliers attend a Project meeting as deemed advisable by the Contractor or as requested by the Engineer. The Engineer or the Engineer's designated representative shall prepare a written report of each Project meeting and distribute such report to the Authorized Representative and the Contractor. The Engineer or the Engineer's designated representative, as applicable, shall not delegate the duty to prepare a

written report of each Project meeting. If any Person objects to anything in a report of a Project meeting, the Person shall notify the Engineer, the Authorized Representative and any other affected Person in writing explaining the objection. The Engineer shall attach any objection made to a report of a Project meeting and any response thereto to the report.

ITEM 110 - WORKING DRAWINGS AND SAMPLES

110.01 Requirement to Provide
110.02 Samples, Tests, Cited Specifications
110.03 Source Sampling and Testing
110.04 Form of Submittals
110.05 Variation from Contract Documents
110.06 Contractor's Review
110.07 Engineer's Review
110.08 Risk of Nonpayment
110.09 Manufacturer's Statement

110.01 Requirement to Provide. Working Drawings, Samples and other submittals, including without limitation stress sheets, erection Plans, falsework Plans, cofferdam Plans, bending diagrams for reinforcing steel, formwork, Plans, and tunneling Plans, shall be provided by the Contractor for any item required by the Contract Documents but not fully described in the Drawings and Specifications, unless waived by the Engineer, and shall include, without limitation:

(a) Construction of the various parts, method of jointery, type of material, grade, quality and thickness of material, alloy of material, profiles of all sections, reinforcement, anchorage, type and grade of finish;

(b) Capacities, types of Materials and performance charts that are pertinent to the Materials and performance charts that are pertinent to the Work. Wiring diagrams, control diagrams, schematic diagrams, working and erection dimensions, arrangement and Specifications;

(c) Notwithstanding any measurements in Drawings or Specifications, where the Work involves repair, renovation, extension or alteration of, or addition to, an existing Structure, the Contractor shall make such measurements of the existing Structure as may be required to accurately attach the Work to the Structure.

110.02 Samples, Tests, Cited Specifications. Unless otherwise provided in the Contract Documents, the City shall test Samples of Materials in accordance with AASHTO, ASTM, AWWA or methods on file in the office of the Director at the expense of the City. Samples will be taken by a qualified representative of the City. References included in these Specifications to AASHTO, ASTM, AWWA, or federal Specifications shall be to the test method, sampling method or specification in effect upon the date of the notice to Bidders for the Contract. Copies of all test results will be furnished to the Contractor. The Contractor shall cooperate fully in the sampling and inspection of Materials and shall notify the Engineer immediately upon the arrival of Materials to be used in the Work. The City reserves the right to retest all Materials and Equipment that have been stored prior to incorporation of those Materials into the Project and to reject all Materials and Equipment which, when retested, do not meet the requirements of the Contract Documents. The Contractor, in all cases, shall furnish the required Samples without charge. Transports and distributors hauling bituminous material shall be equipped with an approved submerged bituminous Materials sampling device.

110.03 Source Sampling and Testing. The Engineer may undertake the sampling and testing of Materials at the source of supply. If source sampling and testing is undertaken:

(a) The Contractor shall cooperate and assist the Engineer, including without limitation in compliance with applicable inspection, sampling and test requirements, and shall provide all necessary documentation;

(b) The Contractor shall provide full entry at all times to the parts of the source as may concern the manufacture or production of the Materials being sampled and tested;

(c) If required by the Engineer, the Contractor shall arrange for an approved building for the use of the inspection which building shall be located conveniently near the source and independent of any building used by the Materials producer;

(d) The Contractor shall provide and maintain adequate safety measures at the plant at all times;

(e) The City reserves the right to retest all Materials that were tested at the source prior to the incorporation of those Materials into the Project and to reject all Materials which, when retested, do not meet the requirements of the Contract Documents.

110.04 Form of Submittals. The Contractor shall provide a submittal letter and shall stamp and submit the working Drawings or other submittals to the Engineer in accordance with a schedule established by the Engineer and the Contractor. Unless otherwise specified in the Contract Documents, the Contractor shall submit 3 prints of all working Drawings and 4 copies of any other submittal. Only 1 print copy of all working Drawings will be returned to the Contractor by the Engineer. If the Contractor requires more than 1 copy, additional copies must be provided to the Engineer at the time of the original submission. The Engineer will not produce copies of the working Drawings. The data shown on the working Drawings shall be complete with respect to quantities, dimensions, specified performance and design criteria, Materials and similar data to show the Engineer the Materials and Equipment which the Contractor proposes to provide. Each sample shall be identified clearly as to material, supplier, and pertinent data such as catalog numbers and the use for which intended and other uses as the Engineer may require to enable the Engineer to intelligently review the submittal. All working Drawings shall indicate the applicable plan sheet and Specifications.

110.05 Variation from Contract Documents. If the working Drawings or other submittals show variations from the requirements of the Contract Documents, the Contractor shall make specific mention of such variations in the Contractor's letter of submittal to the Engineer. If the variation is acceptable to the Engineer, the Engineer shall recommend acceptance of the variation to the Authorized Representative in writing. Upon written approval of the Authorized Representative, the variation shall be incorporated into the Contract Documents. The Contractor shall not be relieved of any responsibility for deviations from the requirements of the Contract Documents by the Engineer's review of working Drawings, Samples or other submittals.

110.06 Contractor's Review. All working Drawings, Samples and other submittals shall be reviewed and stamped by the Contractor prior to submittal to the Engineer. If it is apparent to the Engineer that the Contractor has not reviewed the submittals, or has conducted an incomplete

review, the Engineer shall reject the submittals. The Contractor shall field verify conditions as necessary and make corrections of dimensions, location of various items, encroachments of Work or variations from the requirements of the Contract Documents. If required by the Contract Documents or applicable law, the Contractor shall have the working Drawings or other submittals prepared by Persons possessing expertise and experience in an appropriate trade or profession or by a licensed Engineer, landscape architect, or other design professional.

110.07 Engineer's Review. The Engineer shall review and approve or disapprove working Drawings, Samples or other submittals within fifteen Days of receipt or in accordance with the approved submittal schedule or such other period of time as is mutually agreed by the Engineer and the Contractor. The Contractor shall make any corrections required by the Engineer and shall resubmit the required number of corrected copies of working Drawings, Samples or other submittals until approved, which resubmission shall be acted upon by the Engineer with fifteen Days of receipt or such other period of time as is mutually agreed by the Engineer and the Contractor. When resubmitting submittals, the Contractor shall direct the Engineer's attention to any revisions made by noting such revisions on the resubmitted submittal. All costs incurred by the Engineer, the City or other Persons due to the failure of the initial submittal to substantially meet the requirements of the Contract Documents, or due to excessive resubmittals, for attendant delay, interference, hindrance, disruption or impact of the Project, shall be paid by the Contractor. Resubmittals in excess of two may be deemed excessive by the City. The Engineer's review and approval of working Drawings, Samples and other submittals is to determine if the items covered by such submittals will, after installation and incorporation into the Work, conform to the Contract Documents and be compatible with the design concept of the Project as a functioning whole. The Engineer's review and approval shall not extend to means, methods, manners, techniques, sequences, procedure of construction or to safety precautions or programs incident thereto. The Engineer's review and approval of a separate item will not indicate approval of the assembly in which the item functions.

110.08 Risk of Nonpayment. No portion of the Work requiring a Working Drawing, sample or other submittal shall be commenced until the submittal, has been reviewed and approved by the Engineer. Any Work commenced by the Contractor prior to final approval of the Working Drawing, sample or other submittal by the Engineer shall be performed by the Contractor under risk that no payment will be approved or made by the City for such Work.

110.09 Manufacturer’s Statement. Working Drawings on all Equipment shall include the following written statement from the manufacturer of the Equipment:

"This Equipment submitted for approval shall perform as specified when installed by the Contractor in the arrangement shown on this drawing and in the Contract Documents and in conjunction with all other accessories such as flues, breachings, piping, controls and Equipment not furnished by this manufacturer but required as an accessory or supplement to this Equipment, providing that the accessory or supplementary items perform as specified and are installed as shown in the Contract Documents."

ITEM 111 PREVAILING WAGE RATES

111.01 Prevailing Wages
111.02 Prevailing Wage Determination
111.03 Fines and Penalties
111.04 Wage Schedule
111.05 Payroll Reports

111.01 Prevailing Wages. The Contractor shall pay the prevailing wage rates of the Project locality, as determined by the Ohio Department of Commerce, Division of Labor and Worker Safety, Wage and Hour bureau, or the U.S. Department of Labor to laborers and mechanics performing Work on the Project, as applicable. The Contractor shall comply with the provisions, duties, obligations, and is subject to the remedies and penalties of Sections 4115.03 to 4115.22, ORC or the Davis-Bacon Act, as applicable.

111.02 Prevailing Wage Determination. The Contract Documents include pages setting forth the prevailing rates of wages as ascertained by the Ohio Department of Commerce, Division of Labor and Worker Safety, Wage and Hour Bureau, or the U.S. Department of Labor for the Project, as applicable. The City shall, within seven business Days after receipt of a notice of a change in the prevailing rates, notify the Contractor of the change. The Contractor shall make the necessary adjustment in the prevailing wage rate and shall pay any wage increase during the term of the Contract.

111.03 Fines and Penalties. Whoever violates Section 4115.08 or 4115.09, ORC, shall be fined pursuant to the applicable provisions of the Ohio Revised Code. Whoever violates division (C) of Section 4115.071, or Section 4115.10 or 4115.11, ORC is guilty of a misdemeanor of the second degree for a first offense. For each subsequent offense such Person is guilty of a misdemeanor of the first degree. Fines and penalties under the Davis-Bacon Act shall be as determined by the U.S. Department of Labor and in accordance with applicable law.

111.04 Wage Schedule. Within ten Days of the date of the Notice to Proceed, the Contractor shall provide the City's prevailing wage Coordinator a schedule of dates during the term of the Contract on which wages will be paid to employees for the Project.

111.05 Payroll Reports. The Contractor shall submit weekly payroll reports with each Contractor Payment Request, which reports shall be certified by the Contractor that the payroll is correct and complete and the wage rates shown are not less than those required by the Contract. The Contractor shall be responsible for submitting all payroll reports of the Contractor's Subcontractors. The payroll report shall indicate the week covered and shall include a list containing the name, address and social security number of each employee of the Contractor and the Contractor's Subcontractors paid for the Work. The payroll report shall list the number of hours each employee worked each Day on the Project during the reporting period, the total hours each week on the Project, the employee's hourly rate of pay, job classification, fringe benefits and all deductions from wages and net pay. The payroll report shall also list each fringe benefit and state if it is paid as cash to the employee or to a named plan. The Contractor and the Contractor's

Subcontractors shall also submit apprenticeship agreements for all apprentices utilized on the Project.

ITEM 112 INSURANCE

112.01 Contractor's Liability Insurance
112.02 Policy Limits
112.03 Explosion, Collapsed and Underground Insurance
112.04 Builder's Risk Insurance
112.05 Coverage Amount
112.06 Railroad Protective Insurance
112.07 Insurance Policy Requirements
112.08 Renewal Certificates
112.09 Waivers of Subrogation

112.01 Contractor's Liability Insurance. The Contractor shall purchase and maintain such liability and other insurance as will protect the Contractor from claims described below which may arise out of or result from the Contractor's performance or obligations under the Contract Documents, whether due to action or inaction by the Contractor, a Subcontractor, any Person directly or indirectly employed by the Contractor or a Subcontractor or any Person for whom the Contractor or a Subcontractor is responsible, or by any Person for whose acts the Contractor or a Subcontractor may be liable:

(a) Claims under workers' compensation, occupational sickness or disease, disability benefit and other similar employee benefit acts;

(b) Claims for damages because of bodily injury, disease, illness, death or Personal injury, and other claims usually covered by bodily injury liability insurance;

(c) Claims for damages because of injury to or destruction of property and other claims usually covered by property damage liability insurance.

The Contractor shall comply with all provisions of the Ohio Workers Compensation Act and all rules of the Ohio Bureau of Workers' Compensation. In addition, if a portion of the Work is performed from a barge or a ship or requires unloading Materials from a barge or a ship on a navigable waterway of the United States, the Contractor shall arrange coverage for that portion of the Work under the Longshore and Harborworkers' Compensation Act, 33 U.S.C. Section 901, et seq., and the Jones Act, 5 U.S.C. Section 751, et seq. and shall provide proof of such coverage to the City. Comprehensive Automobile Liability Insurance shall cover owned, non-owned and hired vehicles.

112.02 Policy Limits. A Commercial General Liability policy and Business Automobile Liability policy shall be maintained to provide insurance as described below. An Umbrella or Excess Liability policy may be used in combination with the Commercial General Liability and business Automobile insurance to meet such limits:

(a)	**Policy Limits**	**Commercial General Liability**
	$2,000,000	General Aggregate
	$2,000,000	Products/Completed Operations Aggregate
	$1,000,000	Occurrence Limit
	$1,000,000	Personal and Advertising Injury Limit
	$100,000	Fire Legal Liability Limit
	$10,000	Medical Payments

(b)	**Policy Limits**	**Comprehensive Automobile Liability**
	$1,000,000	Bodily Injury & Property Damage Occurrence Limit

Contracts in the amount of one hundred thousand dollars or less shall require coverage in the amount of not less than two million dollars general aggregate and one million dollars per occurrence. Contracts in excess of one hundred thousand dollars, but not more than five million dollars shall require coverage in the amount of not less than three million dollars general aggregate and per occurrence. Contracts exceeding the amount of five million dollars shall require coverage in an amount to be determined by the Authorized Representative but in no case less than five million dollars general aggregate and per occurrence. Such policies shall be endorsed to provide that the General Aggregate Limit applies separately to each of the insured Contractor's Projects. By requiring such insurance and insurance limits herein, the City does not represent that coverage and limits will necessarily be adequate to protect the Contractor, and such coverage and limits shall not be deemed as a limitation on the Contractor's liability under the indemnities granted to the City.

112.03 Explosion, Collapsed and Underground Insurance. For any demolition, excavating, tunneling, shoring or similar operations, the Contractor shall purchase and maintain Explosion, Collapse and Underground (XCU) coverage with a limit of liability equal to such limit as specified in 112.02. In addition, if blasting is to be performed, the Contractor shall purchase and maintain XCU coverage providing a minimum Aggregate Limit of 5,000,000 dollars and Each Occurrence Limit of 1,000,000 dollars.

112.031 Pollution Liability Insurance. If required by the Contract Documents, Contractor shall purchase and maintain pollution liability insurance with a limit for any one incident of not less than $1,000,000 and an aggregate limit of not less than $2,000,000.

112.032 Completed Operations Insurance. Contractor shall purchase and maintain completed operations coverage to cover such claims for bodily injury or property damage arising out of the Contractor's completed operations, which coverage shall be maintained for no less than five (5) years following final payment.

112.04 Builder's Risk Insurance. Unless otherwise specified in the Contract Documents, the Contractor shall provide and maintain, during the progress of the Work and until the execution of the Certificate of Contract Completion by the Authorized Representative, a builder's risk insurance policy to cover all Work in the course of construction including falsework, temporary buildings and Structures and Materials used in the construction process, stored on or off site, or while in transit. The amount of coverage shall equal the total completed value of the Project (including the value of permanent fixtures and decorations). Such insurance shall be on a special cause of loss form, which provides coverage on an open perils basis insuring against the direct physical loss of or damage to covered property including flood and earthquake. It shall also include debris removal and demolition occasioned by enforcement of any applicable legal requirement, and shall cover reasonable compensation for the City's services and expenses required to limit further loss. Coverage must include provision to pay the reasonable extra costs of expediting temporary and permanent repairs to, or permanent replacement of, damaged property. This shall include overtime wages and the extra cost of "express" or other means for rapidly transporting Materials, Equipment and supplies necessary to such repair or replacement. The builder's risk policy shall protect both the Contractor and the City from loss and provide coverage for Materials in transit or stored off site and identified for the Project. Coverage for other perils may be required if specified in the Special Provisions.

112.05 Coverage Amount. Unless otherwise specified in the Contract Documents, the builder's risk policy shall be written in the amount equal to one hundred percent of the Contract price, including landscaping, paving and other sitework. The builder's risk policy shall specifically permit and allow for partial occupancy by the City prior to Final Acceptance of the Project by the City.

112.06 Railroad Protective Insurance. Where the Contract requires railroad Protective Insurance and no specific Bid item is provided in the Proposal for the payment of the premium therefore, the cost of such insurance shall be included in the various other Bid items in the Contract.

112.07 Insurance Policy Requirements. Each policy of insurance required to be purchased and maintained by the Contractor shall be obtained from an insurance company authorized by the Ohio Department of Insurance to do business in the State and shall name the City as an additional insured or loss payee, as applicable; provided, however, that such designation shall not cause any claim between the Contractor and the City to be waived except as set forth in 112.09. Each policy and the respective certificate of insurance shall expressly provide that no less than thirty Days prior written notice shall be given to the City in the event of cancellation, non-renewal, expiration or material alteration of the coverage contained in such policy or evidenced by such certificate of insurance. Each policy shall provide that the City shall be covered notwithstanding any action, omission or negligence of the Contractor. Each policy shall be primary and non-contributory. Each policy must include contractual liability insurance covering the Contractor's indemnity obligations. The Contractor shall furnish the City, when requested, a certified copy of any insurance or additional insured or loss payee endorsement required to be purchased or maintained by the Contract Documents. In no event shall any failure of the City to demand a certified copy of any required insurance or endorsement be construed as a waiver of the obligation of the Contractor to obtain insurance required to be purchased or maintained by the Contract Documents. Except for its completed operations insurance, the Contractor shall maintain all insurance in the required amounts, without interruption, from the date

of the execution of the Contract Form until the date of approval of the Certificate of Contract Completion by the Authorized Representative. The Contractor shall require all Subcontractors to provide Workers' Compensation, CGL, and Automobile Liability insurance with the same minimum limits specified herein, unless the Owner agrees to a lesser amount and require the City be named as an additional insured and/or loss payee under such policies. Failure to maintain the required insurance during the time specified shall be cause for termination of the Contract. If the Contractor fails to purchase and maintain, or require to be purchased and maintained, any insurance required under these Specifications, the Owner may, but shall not be obligated to, upon three (3) days written notice to the Contractor, purchase such insurance on behalf of the Contractor and shall be entitled to be reimbursed by the Contractor upon demand. Insurance policies required to be purchased and maintained by the Contractor may include a reasonable loss deductible and exclusions, which shall be the responsibility of the Contractor to pay in the event of loss. The prompt repair or reconstruction of the Work as a result of an insured loss or damage shall be the Contractor's responsibility and shall be accomplished at no additional cost to the City.

112.08 Renewal Certificates. If the Contractor provides certificates of insurance showing expiration prior to the date of final completion, the Contractor shall provide new certificates to the City showing continuing coverage prior to expiration.

112.09 Waivers of Subrogation. The City and the Contractor waive all rights against each other for damages caused by fire or other perils to the extent of actual recovery of any insurance proceeds under any property insurance obtained pursuant to Item 112 or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by the City as fiduciary.

ITEM 113 INDEMNIFICATION

113.01 Indemnification for Injury or Damage
113.02 Indemnification for Patent or Copyright Use

113.01 Indemnification for Injury, Damage or Breach of Contract. To the fullest extent permitted by law, the Contractor shall defend, indemnify and hold harmless the City, the Engineer, any participating railroad or railway company, any property Owner or lessee of adjacent property, or utilities and any private Person providing financing for the Project, their respective members, officials, officers, consultants, agents, representatives and employees, in both individual and official capacities, from and against all claims, damages, losses, and expenses, direct, indirect or consequential, including but not limited to all fees and charges of design professionals, attorneys, and other professionals and all court, arbitration, or other dispute resolution costs, arising out of or resulting from any claim or action, legal or equitable, caused or alleged to have been caused by the Contractor's performance of the Work or any breach of the Contractor's obligations under the Contract Documents, including but not limited to the breach of any warranty provided in the Contract Documents.

In the event of any such injury, including death, or loss or damage, or claims therefore, the Contractor shall give prompt notice thereof to the Engineer and the Authorized Representative. This provision is intended to be, and shall be construed, as consistent with, and not in conflict with, Section 2305.31 ORC, to the fullest extent permitted. The indemnification obligations of the Contractor under this 113.01 shall not extend to the liability of the Engineer, the Engineer's officials, consultants, agents, representatives or employees for negligent preparation or approval of Drawings, specification, Change Orders, opinions, and any other responsibility of the Engineer, except to the extent covered by the Contractor's insurance.

113.02 Indemnification for Patent or Copyright Use. To the fullest extent permitted by law, the Contractor shall indemnify, hold harmless and defend the City and the Engineer, their respective members, officials, officers, consultants, agents, representatives and employees, in both individual and official capacities from and against all claims, damages, losses and expenses arising out of the Contractor's infringement of patent rights or copyrights.

ITEM 114 CONTRACTOR PAYMENT

114.01 Contract Cost Breakdown
114.02 Contractor Payment Request
114.03 Payment Date
114.04 Labor Payments
114.05 Material Payments
114.06 Retainage
114.07 Retainage Reduction with Consent of Surety
114.08 Payments Withheld
114.09 Payments Detained
114.10 Measurement of Quantities
114.11 Final Payment Request
114.12 Final Payment Date
114.13 Waiver of City's Claims
114.14 Waiver of Contractor's Claims

114.01 Contract Cost Breakdown. The Contractor shall submit to the Engineer a full, accurate and detailed estimate (the Contract Cost Breakdown) of the various kinds of labor to be performed and material to be furnished, with separate amounts shown for labor and Materials for each branch of Work, following the preferred titles and sequences of sections in the format used by the Engineer in developing the Specifications. The grand total shown on the Contract Cost Breakdown must equal the total Contract price. The City reserves the right to use the approved Contract Cost Breakdown to determine the cost or credit resulting from any change in the Work. The first item should be actual aggregate cost of Contract Bond, insurance, permits and tests required for the Work. The amounts for labor and material shall accurately reflect the cost for each item. Separate items shall not be shown for overhead or profit, but shall be included in the totals for labor and Materials. Whenever the material allocation exceeds fifty-five percent of the Contract price, the Contractor shall provide, upon request, sufficient information to support such higher percentage. Subcontract Work shall show amounts for labor and Materials. Fringe benefits shall be shown as a part of labor costs. When more than one major Structure is included in the Contract, the Contract Cost Breakdown shall be subdivided accordingly if requested by the Engineer, with cost details for each Structure shown separately. A line item shall be included for commissioning, Punch List Work, Project record document submittals, delivery of inventory and specified training. The Contract Cost Breakdown will be returned to the Contractor for resubmittal if it does not meet the requirements set forth above or contains insufficient items or details of the Work. No payment will be made without an approved Contract Cost Breakdown.

114.02 Contractor Payment Request. The Contractor shall submit monthly to the Engineer an itemized Payment Request for Work performed based upon the Contract Cost Breakdown on a form satisfactory to the Authorized Representative. The Contractor Payment Request shall be supported by documentation substantiating the Contractor's right to payment. The Contractor shall supply any additional documentation the Engineer may request in connection with each payment to the Contractor. Certified payroll reports for the period of time indicated shall be attached to one copy of every Payment Request. The Contractor shall list on the Contractor Payment Request any approved Change Orders processed and performed during the time covered by the Payment Request.

114.03 Payment Date. Payment of an approved Payment Request shall be made within thirty Days from the date of approval by the Engineer. The City reserves the right to require proof of the renewal of required insurance as a condition precedent to payment. Payments due and not paid to the Contractor within such thirty Day period shall bear interest from the date payment is due under the Contract Documents at the rate paid by the STAR Account in accordance with 120.04. The amount of Liquidated Damages to which the City is apparently entitled under the Contract Documents may be deducted from any Payment Request by the Engineer and the Authorized Representative.

114.04 Labor Payments. Partial payments to the Contractor for labor performed under either a Unit Price or lump sum Contract shall be made at the rate of ninety percent of the amount invoiced through the Payment Request which shows the total Contract Completion at fifty percent or greater. After the Contract is fifty percent complete, as evidenced by payments in the amount of at least fifty percent of the Contract price to the Contractor, partial payments for labor performed under either a Unit Price or lump sum Contract shall be made at the rate of ninety-five percent of the amount involved.

114.05 Material Payments. Through the Payment Request which shows total Contract Completion at fifty percent or greater, the City shall pay to the Contractor a sum at the rate of ninety percent of the invoice cost, not to exceed the applicable Bid amount in a Unit Price or lump sum Contract, for material delivered on the site of the Project, or other point in the vicinity of the Project, or other storage site approved by the Engineer, provided the Contractor provides the following information with the Payment Request:

(a) A list of the fabricated Materials consigned to the Project, giving the place of storage, together with copies of invoices, in order to verify quantity and cost;

(b) A certification of Materials stored off site, prepared by the Contractor and signed by the Engineer to evidence that the Materials are in conformity with the Specifications and have been tagged with the Project name and number for delivery to the Project. All costs incurred by the Engineer to visit a storage site, other than the areas adjacent to the Project, shall be paid by the Contractor.

After the Contract is fifty percent complete, as evidenced by payments in the amount of at least fifty percent of the Contract price to the Contractor, partial payments for Materials furnished under either a Unit Price or lump sum Contract shall be made at the rate of ninety-five percent of the amount involved. When payment is allowed on account of material delivered on the site of the Project or in the vicinity thereof or under the possession and control of the Contractor but not yet incorporated therein, such material shall become the property of the City, but if such material is stolen, destroyed, or damaged by casualty before being used, the Contractor will be required to replace it at the Contractor's expense. Any such material not ultimately incorporated into the Project may, at the option of the City, be retained by the City or returned to the Contractor for credit to the City of a proportionate amount. Completed line items concealed, underground and buried and not subject to final Punch List may be paid for at the rate of one hundred percent. Such completed line items subject to a final Punch List requiring testing or start-up shall be paid at the rate of ninety-eight percent.

114.06 Retainage. The City will not deposit retainage in any escrow account and will not pay interest on retainage. Any contrary provisions of 153.12, 153.13, 153.14 and 153.63, ORC, do not apply to this Contract. Payment of retainage to the Contractor shall not be due until thirty Days after approval of a final Contractor Payment Request by the City and execution of the Certificate of Contract Completion by the City. Any reduction or release of retainage, or portion thereof, shall not be a waiver of the City's right to retainage in connection with other payments to the Contractor, or any other right or remedy the City has under the Contract Documents, at law or in equity.

114.07 Retainage Reduction with Consent of Surety. Upon consent by the Contractor's Surety, the City may reduce the amount of funds retained for the faithful performance of Work by fifty percent of the amount of funds required to be retained, provided the Contractor's Surety remains responsible for all damages that may be caused due to default by the Contractor, including without limitation, the following:

(a) Completion of the Work;

(b) All interference, disruption, hindrance, delay and impact claims;

(c) All Liquidated Damages; and

(d) All additional expenses incurred by the City.

114.08 Payments Withheld. The Engineer shall have the authority to recommend to the City that payments be withheld from, or Liquidated Damages be assessed against and withheld from, a Payment Request, stating the reasons for such recommendation. The City reserves the right to decline to approve any Contractor Payment Request or part thereof, or because of subsequent evidence or inspection, may nullify any previous Payment Request, in whole or in part, to such extent as may be necessary in the Authorized Representative's opinion to protect the City from loss because of:

(a) Defective Work not remedied;

(b) Damage caused by the Contractor;

(c) Failure to comply with the requirements of Sections 4115.03 to 4115.22, ORC or the Davis-Bacon Act as applicable; and/or

(d) Liquidated Damages.

(e) Other damages the City has incurred or is expected to incur due to Contractor's fault.

If a basis for withholding payment is removed, payment shall be made for the amount withheld because of the basis.

114.09 Payments Detained. Whenever the City receives a Claim Affidavit, the Authorized Representative shall detain the stated amount from the Contractor's subsequent Payment Requests unless the Contractor provides a release and waiver of lien with a Payment

Request. The release and waiver of lien shall be executed by the Person supplying labor, Materials or services on a Project, which has or may have a right of claim against the Contractor's proceeds. If the City detains an amount as set forth above, such action shall not be construed as conferring any right on such Subcontractor or Material Supplier, nor as enlarging or altering the application or effect of the existing lien law.

114.10 Measurement of Quantities. For all Contracts, except lump sum Contracts, after an item of the Work is completed and before final payment is made by the City, the Engineer will determine the quantities of various items of Work performed as the basis for final payment. The Contractor, in case of Unit Price items, will be paid as provided in 103.19. After issuance of a Certificate of Contract Completion in accordance with 115.05, the Engineer shall prepare a final estimate for payment based on the actual quantities of completed Work and deducting there from all previous payments made to the Contractor. Any prior estimate is subject to correction in the final estimate.

114.11 Final Payment Request. The Contractor, as a condition precedent to execution of the Certificate of Contract Completion and to final payment, shall provide all documents required pursuant to 115.06 for approval by the Engineer with the Contractor's final Payment Request.

114.12 Final Payment Date. Payment of the final Payment Request shall be made within thirty Days from the date of approval by the Engineer unless the City has reason to withhold amounts pursuant to the terms of this Agreement. Payments due and not paid to the Contractor within such thirty Day period shall bear interest from the date payment is due under the Contract Documents at the rate paid by the STAR Account in accordance with 120.04.

114.13 Waiver of City's Claims. The making of final payment by the City shall constitute a waiver of claims by the City except those relating to unresolved claims of the Contractor or the City and those arising after Contract Completion including, without limitation, the following:

(a) Defective or nonconforming Work;

(b) Error by Contractor;

(c) Outstanding liens, claims, security interests, or other encumbrances arising out of the Contract Documents and unsettled;

(d) Failure of the Contractor to comply with any warranties or Guarantees required by the Contract Documents;

(e) audits performed by the City after final payment;

(f) any claims, damages, losses, or expenses for indemnification under Item 113;

(g) Inadvertent overpayment by the City.

114.14 Waiver of Contractor's Claims. The acceptance of final payment by the Contractor shall constitute a waiver of all claims against the City except those that the Contractor has previously made in writing in accordance with 118.01 through 118.11 and which remain unresolved at the time of final payment. This provision is intended to be, and shall be construed as, consistent with, and not in conflict with, Section 4113.62 ORC, to the fullest extent permitted.

ITEM 115 FINAL INSPECTION AND ACCEPTANCE

115.01 Contractor's Request
115.02 Engineer's Punch List
115.03 Completion and Correction of Punch List Items.
115.04 Deferred Items
115.05 Certificate of Contract Completion
115.06 Project Record Document Submittals
115.07 Record Drawings
115.08 Guarantee
115.09 Warranty
115.10 Exercise of Guarantee or Warranty
115.11 Final Cleaning
115.12 Final Cleaning Remedies
115.13 Work After Final Cleaning

115.01 Contractor's Request. When the Work or a designated portion thereof, is nearly complete, the Contractor shall submit a request for a Final Inspection of the Work ("the "Final Inspection") to the Engineer in writing.

115.02 Engineer's Punch List. The Engineer shall, within seven Days of receipt of the request for Final Inspection, notify the Contractor of acceptance or rejection of the request for Final Inspection, stating reasons for any rejection. Upon acceptance of the Contractor's request, the Engineer shall conduct the Final Inspection to determine whether the Work or the designated portion thereof, is in conformity with the Contract Documents. The Engineer shall notify the Contractor and the Authorized Representative of the scheduled time of the Final Inspection. Within three Days of the Final Inspection, the Engineer shall notify the Contractor of any items of Work remaining in a Defective, incomplete or unacceptable condition. The list of such items shall be known as the Engineer's Punch List.

115.03 Completion and Correction of Punch List Items. Within fourteen Days of receipt of the notice required by 115.02, the Contractor shall complete and correct all items on the Engineer's Punch List. If the Contractor does not complete the items on the Engineer's Punch List within fourteen Days of receipt of the notice, the provisions of 105.02 may be invoked. If the Work on the Engineer's Punch List cannot be completed within fourteen Days of receipt of the notice, the Contractor shall justify to the reasonable satisfaction of the Engineer the reasons the items cannot be so completed, and the Contractor shall propose, for approval of the Engineer, a time when such items will be completed. If the Contractor fails to timely correct the items on the Punch List, the City, in its discretion, may perform the Work by itself or others and the cost thereof shall be charged against the Contractor. If the balance of the Contract price is insufficient, the Contractor and/or its surety will pay the Owner the balance on demand. The Contractor's warranties and obligations under the Contract Documents shall remain in full force and effect and cover any remedial work even if performed by others. Failure of the Engineer to include any items on the Engineer's Punch List shall not alter the responsibility of the Contractor to complete all the Work in accordance with the Contract Documents. If multiple inspections of items on the Engineer's Punch List are required due to the Contractor's failure to properly and timely complete

them, the Contractor shall be responsible for any additional costs incurred by the Contractor, other Persons, the Engineer and the City resulting from any attendant delay.

115.04 Deferred Items. With the approval of the Engineer, when upon Final Inspection, items of Work cannot be completed because of seasonal conditions, such as bituminous paving or landscaping, or if the Authorized Representative agrees that a particular item need not be completed until a subsequent date, the Authorized Representative may release payment to the Contractor less twice the cost of completing the remaining Work as determined in the sole discretion of the Authorized Representative.

115.05 Certificate of Contract Completion. When all items on the Engineer's Punch List have been corrected to the satisfaction of the Engineer and the provisions of 115.06 through 115.14 have been fulfilled, the Engineer shall process a Certificate of Contract Completion for execution by the Authorized Representative. The City reserves the right of Final Acceptance of the Project.

115.06 Project Record Document Submittals. The Contractor, as a condition precedent to execution of the Certificate of Contract Completion, release of retainage and final payment, shall provide all Project record documents to the Engineer for approval, which may include, without limitation:

(a) Certificate of occupancy, if required;

(b) Any inspection certificates required such as pressure piping, elevator, boiler, electrical, plumbing or piping purification;

(c) Letter of Approval for fire suppression system, if required;

(d) Any operating and maintenance manuals, which shall be organized into suitable sets of manageable size. Indexed data shall be bound in individual binders, with pocket folders for folded sheet information and appropriate identification shall be marked on the front and the spine of each binder;

(e) Neatly and accurately marked sets of As-built Drawings and other Contract Documents reflecting the actual construction of the Project;

(f) Reproducible detailed Drawings reflecting the exact location of any concealed utilities, mechanical or electrical systems and components;

(g) Assignment to the City of all warranties and guaranties, including the most recent address and telephone number of any Subcontractors, Material Suppliers, or manufacturers;

(h) An affidavit from the Contractor to certify that all Subcontractors and Material Suppliers have been paid in full for all Work performed or Materials furnished for the Project and an affidavit from each Subcontractor and Material Supplier that the Subcontractor or Material Supplier has been paid in full for all Work performed or Materials furnished for the Project;

(i) Final certified payroll reports;

(j) Affidavit to certify that the Contractor and an affidavit from each Subcontractor to certify that the Subcontractor has complied with all requirements of Sections 4115.03 to 4115.22, ORC, or the Davis-Bacon Act, as applicable.

115.07 Record Drawings. Unless otherwise provided in the supplemental Specifications or Special Provisions, upon completion of the Work on Projects administered by the Water Engineering Manager of the City's Department of Water or administered by the Chief Engineer of the Department of Aviation, the Contractor shall organize the As-built Drawings into manageable sets, bind the sets with durable paper cover sheets, certify to the accuracy of the As-built Drawings by signature thereon, and deliver the As-built Drawings to the Engineer. The Engineer shall revise the original Contract drawing tracings or computer files with the information contained on the As-built Drawings provided by the Contractor and create the Record Drawings. The City may thereafter use the As-built Drawings for any purpose relating to the Project including, without limitation, additions to or completion of the Project.

115.08 Guarantee. The Contractor shall provide a Guarantee to the City that all Work is in conformity with the Contract Documents and free from defects in workmanship, Materials and Equipment for full period permitted under Ohio law. The Contract Bond shall remain in effect for the full Guaranty period, unless the Contractor shall provide a Maintenance Bond in form and substance and from a Surety satisfactory to the City. The Guarantee time period shall commence on the date of approval of the Certificate of Contract Completion by the Authorized Representative, unless otherwise provided in writing. The Guarantee time period for any incomplete or uncorrected Work at the time of Partial Occupancy or Use, if any, shall commence with the date of approval of the Certificate of Contract Completion by the Authorized Representative, unless otherwise provided in writing. The Guarantee provided in this 115.08 shall be in addition to, and not in limitation of, any other Guarantee, Warranty or remedy provided by law or by the Contract Documents.

115.09 Warranty. The Contractor shall, prior to installing material or Equipment which is subject to a Warranty, provide a copy of the Warranty to the Engineer for review and approval.

115.10 Exercise of Guarantee or Warranty. If defects in workmanship, material or Equipment become apparent within the applicable Guarantee or Warranty period, the Authorized Representative shall notify the Contractor in writing and provide a copy of the notice to the Engineer. Within ten Days of receipt of the notice, the Contractor shall visit the Project in the company of a representative of the City to determine the extent of all defects and shall promptly repair or replace the defects, including all adjacent property damaged as a result of such defects or as a result of remedying the defects. If the repair or replacement is considered by the Authorized Representative to be an emergency, the Authorized Representative may require the Contractor to visit the Project within one Day of receipt of the notice. The Contractor shall be fully responsible for the cost of and all expenses associated with temporary Materials or Equipment required during the repair or replacement of the defects, including without limitation labor, permits and other incidentals. If the Contractor does not promptly repair or replace the defects, the City may repair or replace the defects and charge the cost thereof plus any Consultant and attorney fees incurred by the City in enforcing its Guaranty or warranty rights to the Contractor or the Contractor's Surety. Work which is repaired or replaced by the Contractor shall be inspected and

accepted by a representative of the City and shall be Guaranteed by the Contractor for the remainder of the original Guarantee time period.

115.11 Final Cleaning. At the completion of the Work, the Contractor shall restore all property not designated for alteration by the Contract Documents to as near its original condition as practicable and clean the site of the Project and adjacent property of all dust, mud, waste Materials, and rubbish attributable to the Work and shall remove any temporary controls required pursuant to the storm water pollution prevention plan and permit.

115.12 Final Cleaning Remedies. Final cleaning shall be done to the satisfaction of the Engineer and the Authorized Representative. If the Contractor fails to clean up at completion of the Work, the provision of 105.02 may be invoked. If a dispute arises as to responsibility for final cleaning, the Engineer may employ City employees or engage a qualified cleaning company, to perform the clean up and deduct the cost from amounts due to the Contractor as the Engineer recommends and the Authorized Representative determines to be appropriate. The decision of the Authorized Representative on the responsibility for such cost shall be final, subject to 118.01 through 118.11.

115.13 Work After Final Cleaning. If any Work is performed after a final cleaning by the Contractor, the Contractor shall clean any affected area again as provided in 115.11 and 115.12 so that upon Contract Completion, the Project shall be left ready for occupancy or utilization by the City.

ITEM 116 TIME

116.01 Time of Essence
116.02 Time Extensions
116.03 Critical Path
116.04 Extension Sole Remedy
116.05 Time for Contract Completion
116.06 Liquidated Damages

116.01 Time of Essence. Time is of the essence to the Contract Documents and all obligations thereunder. By executing the Contract Form, the Contractor acknowledges that the time for Contract Completion is, and by signing the Construction Schedule and Project Schedule, if applicable, that any specified milestone completion dates are, reasonable taking into consideration the usual weather and other conditions prevailing in the locality of the Project. The Contractor agrees that the Notice to Proceed shall establish the date for commencement of the Work. The Contractor agrees that the City has entered into, or may enter into, agreements or representations for use of all or part of the Project based upon the Contractor achieving Final Acceptance within the time for Contract Completion. The Contractor agrees that the Work will be prosecuted in a reasonable, efficient and economical sequence, in cooperation with the Engineer and in the order and time as provided in the current Construction Schedule and Project Schedule, if applicable. The Contractor shall perform the Work so as not to interfere with, disrupt, hinder, delay or impact the Work of other Persons on the Project and of such other Persons' Subcontractors and Material Suppliers. The Contractor agrees that the possibility that the Contractor may be subject to interference, disruption, hindrance, delay or impact in the progress of the Work from any and all causes is within the contemplation of the Contractor and the City and that the sole remedy for such interference, disruption, hindrance, delay or impact shall be an extension of time granted pursuant to 116.02, except where the Contractor establishes such interference, disruption, hindrance, delay, or impact was proximately caused by an improper action or failure to act by the Owner, in which case the Contractor may be entitled to additional compensation.

116.02 Time Extensions. If the Contractor is interfered with, disrupted, hindered, delayed or impacted at any time in the progress of the Work by any of the following causes, the time for Contract Completion shall be extended for such reasonable time which the Authorized Representative determines, in consultation with the Engineer, has been caused by the interference, disruption, hindrance, delay, or impact in the Work:

(a) Due to suspension of the Work for which the Contractor is not responsible; unusually severe weather conditions not normally prevailing in the particular season; labor dispute, excluding informational pickets; fire; or flood; or

(b) Due to any unforeseeable cause beyond the control and without fault or negligence of the Contractor;

(c) The Contractor shall request any extension of time pursuant to 117.01 through 117.11.

116.03 Critical Path. Notwithstanding any other provision of the Contract Documents, time extensions will depend upon the extent to which the Work on the critical path of the Construction Schedule is affected, or if the Project involves multiple Contractors the extent to which Work on the critical path of the Project Schedule is affected. A Change Order granting a time extension may provide that the time for Contract Completion will be extended for only those specific elements so interfered with, disrupted, hindered or delayed and that remaining milestone completion dates will not be altered and may further provide for adjustment of Liquidated Damages.

116.04 Extension Sole Remedy. Any extension of time granted pursuant to 116.02 shall be the sole remedy which may be provided by the City, unless Contractor has established that a delay was proximately caused by an improper action or failure to act by the Owner, in which case Contractor may be entitled to additional compensation. . It is within the contemplation of the Contractor and the City that the Contractor may accelerate its performance to meet the Construction Schedule and that such acceleration is solely within the discretion of the Contractor.

116.05 Time for Contract Completion. The Contractor shall diligently prosecute the Work and shall complete all Work so that Final Acceptance occurs on or before the number of consecutive Days set forth in the Contract Documents following the date set forth in the Notice to Proceed, unless the Contractor timely requests and the City grants an extension of time in accordance with the Contract Documents. The period of time established by the preceding sentence is referred to herein as the time for Contract Completion. Each applicable portion of the Work shall be completed upon the respective milestone completion date unless the Contractor timely requests and the City grants an extension of time in accordance with the Contract Documents.

116.06 Liquidated Damages. Upon failure to complete all Work within the time for Contract Completion, the City shall be entitled to retain or recover from the Contractor, as Liquidated Damages, and not as a penalty, the applicable amount set forth in the following table for each and every Day thereafter until Contract Completion, unless the Contractor timely requests and the City grants an extension of time in accordance with the Contract Documents.

LIQUIDATED DAMAGES	Contract
Contract Amount	Completion
$0 to $50,000	$150
more than $50,000 to $150,000	$250
more than $150,000 to $500,000	$500
more than $500,000 to $2,000,000	$1,000
more than $2,000,000 to $5,000,000	$2,000
more than $5,000,000 to $10,000,000	$2,500
more than $10,000,000	$3,000

The amount of Liquidated Damages is agreed upon by and between the Contractor and the City because of the impracticability and extreme difficulty of ascertaining the actual amount of damage the City, its taxpayers and the public would sustain. Liquidated Damages only replace the City's actual damages for delays, are not the City's exclusive remedy for breach by the Contractor and are not to be construed in any way as a limitation of any other rights or remedies available to the City under the Contract Documents or otherwise. If a delay of the critical path in

completion of the Project occurs which is caused by the City and the Contractor concurrently, the applicable Liquidated Damages shall be apportioned, and the specific number of Days for which the City is solely responsible for shall be deducted from the total number of Days of the concurrent delay used in calculating the Liquidated Damages and the Contractor shall pay Liquidated Damages for the remaining number of Days of delay. In addition to the amounts specified above, the City may charge the Contractor for all inspection regardless of any time extension.

ITEM 117 - CHANGES IN THE WORK

117.01 Change Order
117.02 Payment of Change Order
117.03 Requirement to Perform Changed Work
117.04 Change Order Price Determination
117.05 Change Order Procedures
117.06 Change Order Process
117.07 Paperwork Consolidation
117.08 Change Order Numbering System
117.09 Project Contingency Funds
117.10 Change Order Pricing Guidelines
117.11 Differing Site Conditions
117.12 Time Extension

117.01 Change Order. The City Commission or the Authorized Representative, without invalidating the Contract, may order changes in the Work consisting of additions, deletions or other revisions, including without limitation revisions resulting from an extension granted in accordance with 116.04. To the extent the time for Contract Completion or the Contract price is affected, the Contract may be adjusted by Change Order in accordance with 117.01 through 117.12. The Contractor shall proportionately increase the amount of the Contract Bond whenever the Contract price is increased. If notice of any change affecting the Contract is required by the provision of any Contract Bond, the giving of any such notice shall be the Contractor's responsibility, and the amount of each applicable Contract Bond shall be adjusted accordingly.

117.02 Payment of Change Order. The Contractor shall not proceed with any change in the Work without the required written Change Order. If the Contractor believes that any item is not Work required by the Contract Documents or reasonably inferred therefrom to produce the intended results, the Contractor shall obtain a Change Order before proceeding with such item. Except as provided in 118.01 through 118.11, failure to obtain such a Change Order shall constitute a waiver by the Contractor of any claim for additional compensation for such item. The Contractor understands and agrees that agreement to a Change Order is final and without reservation of any rights.

117.03 Requirement to Perform Changed Work. If the Contractor does not agree to, or fails or refuses to sign, a Change Order, the Contractor shall perform any Work related to the Change Order as required by the Authorized Representative in accordance with 117.04; provided, however, the Contractor may seek compensation and time extension in accordance with 117.04 and 117.10 through 117.12, as applicable, and 118.01 through 118.11 for any such Work performed. The City reserves the right to cancel or modify any Change Order authorization.

117.04 Change Order Price Determination. The maximum cost or credit resulting from a change in the Work shall be determined as provided in 117.04 through 117.10. Proposals which do not set forth all information required by 117.05 and 117.10 will not be considered or accepted under any circumstances. A Unit Price Proposal shall only be valid when incorporated into the Contract by Change Order; provided, however, that Unit Price Work set forth on the Bid, included

in the Contract price and which does not exceed the scheduled quantities on the Bid may be performed and paid for without a Change Order. The amounts allowed for overhead and profit are all-inclusive, include all Contractor Project costs relating to field and home office operations, and no additional or other amounts for overhead or profit shall be allowed. The maximum cost or credit as determined by 117.10 includes all compensation for direct, indirect, and cumulative impact costs and no additional or other amounts for impact costs shall be allowed. The Contractor shall not assign any portion of the Work to another whereby the Contractor would benefit directly or indirectly from the double application of charges for overhead or profit. If no agreement can be reached between the Contractor and the City as to the cost or credit resulting from a change in the Work or the Contractor fails or refuses to sign a Change Order, the cost or credit shall be determined by the Authorized Representative, upon the recommendation of the Engineer. The Contractor shall proceed with the Change Order Work when so required by the Authorized Representative in writing. The Contractor may dispute the Authorized Representative's determination of the cost or credit by filing a claim in accordance with 118.01 through 118.11. The City reserves the right to require certified payrolls for labor costs and certified invoices for material costs, together with any other documentation the City deems in its sole discretion to be useful in analyzing the Contractor's claim and reserves the right to audit the records of the Contractor and the Contractor's Subcontractors and Material Suppliers. Failure by the Contractor to provide all requested documentation within 10 days shall constitute an irrevocable waive of Contractor's claim.

117.05 Change Order Procedures. The Contractor must be certain to comply with the applicable procedures or payment may be delayed or denied. The Engineer has responsibility for:

(a) Preparing, reviewing, recommending, coordinating, monitoring and processing a Change Order and related documents;

(b) Reviewing the Contractor's pricing within the stated time period, verifying the pricing complies with the pricing guidelines set forth in 117.10 and negotiating pricing, if necessary, to an amount acceptable to the City;

(c) If the change is to have a not-to-exceed price based on performing the Work on a time and material basis or other cost-plus basis, monitoring the Contractor's progress toward completing the revised portion of the Work and requiring that the Contractor prepare daily records of additional labor, Materials and Equipment required along with a certification from the Contractor that the records are accurate and appropriate for the revised Work. The Engineer shall review these daily records and sign them, but solely for the purposes of signifying that the records are an accurate accounting of the items described therein, and provide a signed copy of the daily records to the Authorized Representative. The signed daily records are also to be attached to the Change Order. If the changed Work should cost less than the maximum amount noted on the Change Order, the Engineer is also responsible for preparing a deduct Change Order for the cost difference;

(d) Reviewing and resolving the Contractor's request for an extension of time related to a Change Order in accordance with 116.01 through 116.06 and 117.12;

(e) Confirming that the City concurs with the change and has available funds or a written commitment for funding the Change Order;

(f) Monitoring the overall Change Order process for timeliness and follow up.

The Contractor has responsibility for:

(a) Responding to requests for pricing within the stated time period;

(b) Preparing all necessary Proposals in sufficient detail for intelligent review with pricing and schedule impact, including those of all affected Subcontractors and Material Suppliers according to the pricing guidelines set forth in 117.10 or Unit Prices, as applicable, and negotiating pricing, if necessary;

(c) If the change is proposed to have a not-to-exceed price based on performing the Work on a time and material basis or other cost plus basis, furnishing and certifying detailed records of all labor, Materials and Equipment provided. If the changed Work should cost less than the maximum amount noted on the Change Order, the Contractor is also responsible for executing a deduct Change Order prepared for the cost difference;

(d) Proceeding with the Work upon receipt of a fully signed Change Order;

(e) If the Contractor performs Work without the appropriate, required Change Order, the Contractor does so at the Contractor's own risk that payment for such Work may not be approved or made, unless the City has required the Contractor to perform the Work in accordance with 117.03 and 117.04;

(f) Providing the changed Work in a timely manner and as authorized by the Change Order, all in accordance with the requirements of the Contract Documents; and

(g) Timely providing to Engineer and the Authorized Representative all requested backup documentation.

117.06 Change Order Process. When a change to the Work is ordered, the Engineer shall:

(a) Prepare an estimate of the cost of the changed Work and verify with the Authorized Representative that the change is ordered and that funds are available in the amount of the estimate for the Work;

(b) Prepare a detailed scope of Work in Bulletin form, including any necessary Drawings;

(c) Submit the Bulletin to the Authorized Representative for approval, along with a justification letter indicating the reason for the change in the Work;

(d) Upon receipt of approval by the Authorized Representative, release the Bulletin to the Contractor with a date specified for the Contractor to return a Proposal. If the Contractor fails to respond to the Engineer within the time specified, or as otherwise agreed to in writing by the Contractor and the Engineer, the Contractor shall be responsible for any additional costs incurred by the Contractor, the Engineer and the City resulting from any attendant delay;

(e) Review the Contractor's Proposal, verifying that pricing complies with the pricing guidelines set forth in 117.10 or Unit Prices, as applicable, and negotiate the price if required to obtain a price less than the maximum established by the pricing guidelines or different from the amount calculated using Unit Prices where appropriate. Within seven Days of receipt of the Contractor's Proposal, the Engineer shall notify the Contractor whether the Proposal is acceptable in form or advise the Contractor in writing of the reasons for disapproval. If negotiation of the price is necessary, any failure of the Contractor to respond appropriately and within the time specified, or as otherwise agreed to in writing by the Contractor and the Engineer shall cause the Contractor to be responsible for any additional costs incurred by the Contractor, the Engineer and the City resulting from any attendant delay;

(f) Determine the basis for pricing the Work and confirm whether the Work is for a fixed price, or for a not-to-exceed price based on performing the Work on a time and material basis, or other cost-plus basis. Verify that any Subcontractor and Material Supplier pricing is included and complies with the pricing guidelines set forth in 117.10 or Unit Prices, as applicable. Review any requested time extension with the Authorized Representative to be determined according to 116.01 through 116.06 and 117.12 and obtain written recommendation of approval of the Change Order from the Engineer and the applicable Director if other than the Engineer. Sign and obtain the Contractor's signature on the Change Order;

(g) Submit the Proposal to the Authorized Representative or the City Commission, as applicable, for approval along with the written recommendation of approval or disapproval of the Proposal of the City Engineer and other City Department head, if applicable;

(h) Deliver multiple copies of the signed Change Order package to the Authorized Representative for signing and any necessary fund certification. Upon signing by the Authorized Representative, the Authorized Representative shall return copies of the executed Change Order to the Contractor and the Engineer. The Contractor may bill for Work covered by the Change Order only after this final step.

117.07 Paperwork Consolidation. Related transactions occurring at or about the same time shall, whenever possible, be consolidated into the same Bulletin or Change Order, or both. Add and deduct items may be included on the same Change Order, as well as items with different reasons for changed Work so long as the reason and pricing for each item is separately stated.

117.08 Change Order Numbering System. Unless otherwise provided in the Contract Documents, the Engineer shall assign a number to each change which shall be stated on the Bulletin, starting with number 001. All Contractors affected by the change will be recorded under the same number. The Engineer will establish and maintain a Change Order log to track all activities related to Change Order processing and taking care not to duplicate or reuse any Change Order number throughout the Project.

117.09 Project Contingency Funds. Project Contingency Funds shall be reserved to pay costs resulting from Change Orders, unanticipated job conditions, to comply with rulings regarding building and other codes, to pay costs related to errors and omissions in Contract Documents, and to pay the cost of settlements and judgments related to the Project. Change

Orders for which there are sufficient moneys in the Contract price including the Project Contingency Funds must be approved by the Engineer and the Authorized Representative. Change Orders which would increase the Contract price must be approved by the City Commission.

117.10 Change Order Pricing Guidelines. For each change, the Contractor shall furnish a detailed, written Proposal itemized according to these pricing guidelines. Any Subcontractor or Material Supplier pricing shall also be itemized according to these pricing guidelines. Where Unit Prices were included in the Bid and the Contract price, the Engineer may also require incorporation of such Unit Prices or preparation of an Alternate Proposal incorporating such Unit Prices. These pricing guidelines are intended to establish the maximum amount which the City will pay for any Change Order, including without limitation all amounts for interference with, delay, hindrance, disruption or impact of the Work. A Change Order may provide that the City may pay less than the amount established by these pricing guidelines if such amount is negotiated by the Engineer in accordance with 117.06 or is determined in accordance with 118.01 through 118.11. As provided in 114.01 the Contract Cost Breakdown may be used by the City to determine any cost or credit. In order to expedite the review and approval process, all Proposals shall be prepared in the categories and in the order listed below. This provision is intended to be, and shall be construed as, consistent with, and not in conflict with, Section 4113.62, ORC to the fullest extent permitted. The pricing guidelines are:

(a) LABOR - All field labor shall be priced at the current base rate, excluding fringe benefits, of the prevailing wage in the Project locality. The Proposal and documentation is to include number of hours and rate of pay for each classification of worker. If the Contractor pays an employee a base rate exceeding prevailing wage, the Contractor shall submit certified payroll records that substantiate that rate. Any Contractor performing Work on a time and material basis or the cost-plus basis Work shall submit certified payroll records for all employees performing that Work;

(b) FRINGES - All established payroll taxes, assessments and fringe benefits on the labor. This may include, without limitation, FICA, Federal and State Unemployment, Health and Welfare, pension Funds, Workers' Compensation and Apprentice Fund. Each of the fringes is to be a separate line item. The Contractor shall submit documentation supporting the calculation of the amounts for each fringe for each worker classification;

(c) EQUIPMENT RENTALS - All charges for certain non-owned heavy or specialized Equipment at up to one hundred percent of the documented rental cost. No rental charges will be allowed for hand tools, minor Equipment, simple scaffolds, etc. Downtime due to repairs, maintenance and weather delays will not be allowed. The Contractor shall submit copies of actual paid invoices to substantiate rental costs;

(d) OWNED EQUIPMENT - All charges for certain owned, heavy or specialized Equipment at up to one hundred percent of the cost listed by the Associated Equipment Dealers Green book rental rates and Specifications for construction Equipment. No recovery will be allowed for hand tools, minor Equipment, simple scaffolds, etc. The longest period of time that the Equipment is to be required for the Work will be the basis for the pricing. Downtime due to repairs, maintenance and weather delays will not be allowed;

(e) TRUCKING - A reasonable delivery charge or per-mile trucking charge for delivery of required Materials or Equipment. Charges for use of a pick-up truck will not be allowed;

(f) OVERHEAD - Overhead on items in 117.10 (a)-(d) up to ten percent, which shall include all costs required to schedule and coordinate the Work. Overhead includes, without limitation, telephone, telephone charges, facsimile, electronic mail, telegrams, postage, photos, photocopying, hand tools, simple scaffolds (1 level high), tool breakage, tool repairs, tool replacement, tool blades, tool bits, home office estimating and expediting, home office clerical and accounting support, home office labor (management, supervision, engineering), all other home office expense, legal services, travel and parking expenses; provided, however, shop or engineering labor, which shall not be subject to prevailing wage rates, for steel Fabricators, sheet metal Fabricators and sprinkler system Fabricators will be allowed under 117.10 (a)-(d);

(g) MATERIALS - All Materials purchased by the Contractor and incorporated into the changed Work, showing costs, quantities, or Unit Prices of all items, as appropriate. Reimbursement of material costs shall only be allowed in the amount of the Contractor's actual cost, including any and all discounts, rebates or related credits. One-third of the cost of reusable Materials for each use, such as formwork lumber, shoring or temporary enclosures;

(h) PROFIT - Profit on items in 117.10 (a)-(g) up to ten percent;

(i) SUBCONTRACTOR - The reasonable cost of all labor and material provided by a Subcontractor whose pricing is included and which complies with these pricing guidelines;

(j) CONTRACTOR MARK-UP ON SUBCONTRACTOR - Mark-up on items in 117.10 (i) up to five percent or 2,500 dollars, whichever is less;

(k) MISCELLANEOUS - The following items are allowable as the cost of the Work, with no overhead or profit:

.1 Any additional bond or insurance premium specifically incurred as a result of the Change Order;

.2 Fees for permits, licenses, inspections, test, etc.; and

(l) Costs which will not be reimbursed for Change Order Work include the following:

.1 Overnight lodging, travel and food;

.2 Employee Profit Sharing Plans - regardless of how defined or described, the Contractor will pay these charges from
Contractor profit and will not be reimbursed; and

.3 Voluntary Employee Deductions - examples are United Way and U.S. Savings Bonds.

(m) State sales tax shall be allowed on items as described in 104.18.

117.11 Differing Site Conditions. Subject to 103.06, during the progress of the Work, if subsurface or concealed conditions are encountered at the site differing materially from those indicated in the Contract Documents or if subsurface or concealed physical conditions of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in the Work provided for in the Contract Documents, are encountered at the site, the Contractor shall promptly notify the Engineer in writing of the specific differing conditions before they are disturbed or the affected Work is performed and if such notice is not possible, in no event later than 2 Business Days after Contractor first observed the conditions. Upon notification, the Engineer will investigate the conditions and if it is determined that the conditions materially differ and cause an increase or decrease in the cost or time required for the performance of any Work under the Contract, a Change Order may be issued in accordance with the 117.01 through 117.12, as applicable. The City may decline to issue a Change Order if the notice required by this 117.11 is not timely provided by the Contractor. If the Contractor fails to timely provide the notice required by this 117.11, the Contractor shall be deemed to have waived any and all claims for additional compensation or time extensions for the related subsurface or concealed physical condition.

117.12 Time Extension. Notwithstanding any other provision of the Contract Documents, time extensions for changes in the Work will depend upon the extent to which the change causes delay in Work on the critical path of the Construction Schedule or if the Project involves multiple Contractors of the Project Schedule as determined pursuant to 109.06 and 109.05, respectively. If extending the time for Contract Completion is not possible, the Contractor shall price, and separately state, all costs of accelerated performance in the Contractor's Proposal. A Change Order granting a time extension may provide that the time for Contract Completion will be extended for only those specific elements actually delayed and that remaining milestone completion dates will not be altered and may further provide for adjustment of Liquidated Damages, to the fullest extent permitted by law. The Contractor shall not be entitled to any time extensions for delays caused by Contractor, its subcontractors, suppliers, normal weather conditions for the time of year and locality, or abnormal weather conditions that do not affect the critical path.

ITEM 118 DISPUTE RESOLUTION PROCEDURE

118.01 Notice and Claim Requirements
118.02 Filing of Notice
118.03 Filing of Claim
118.04 Claim Response
118.05 Claim Review and Decision
118.06 Appeal to Board of Review
118.07 Alternate Dispute Resolution
118.08 Delegation
118.09 Auditing of Claims
118.10 False Certification of Claims
118.11 Performance and Payment

118.01 Notice and Claim Requirements. Whenever the Contractor intends to seek additional time or compensation or mitigation of Liquidated Damages, whether due to delay, extra Work, additional time or Work, breach of Contract, or other causes arising out of or related to the Contract or the Project, the Contractor shall follow the procedures set forth in 118.01 through 118.11. The Contractor acknowledges and agrees that the Owner may delay, interfere with, and/or disrupt the Work of the Contractor, and such actions do not constitute a material breach of contract by the Owner, since the Contractor is entitled to additional compensation by properly submitting and pursuing a Claim as permitted by these Specifications. To the fullest extent permitted by law, failure by the Contractor to follow the procedures in 118.01 through 118.11 is a waiver of any claim for additional time or compensation or for mitigation of Liquidated Damages. Compliance with all applicable procedures in 118.01 through 118.11 is a condition precedent to the filing by the Contractor of any litigation related to the Contract or the Project.

118.02 Filing of Notice. Unless a shorter notice period is provided elsewhere in this Agreement, the Contractor shall file notice of any claim with the Engineer, in writing, no more than ten Days after the initial occurrence of the events, which are the basis of the claim. To the fullest extent permitted by law, failure of the Contractor to timely and completely provide such notice shall constitute a waiver by the Contractor of any claim for additional time or compensation or for mitigation of Liquidated Damages. Every such written notice shall provide the following information to permit timely and appropriate evaluation of the claim, determination of responsibility and opportunity for mitigation:

(a) Nature of claim and estimated amount of the claim, including all costs for interference, disruption, hindrance, delay and any impact, which amount shall be calculated in accordance with the pricing guidelines set forth in 117.10, shall be based upon the Contractor's experience and shall be a fair and reasonably accurate assessment of the damages suffered or anticipated by the Contractor, as applicable;

(b) Specific number of Days of extension requested and specific number of Days for remobilization requested;

(c) Identification of Persons and events responsible for causing the claim, including without limitation the date or anticipated date, as applicable of the commencement of any interference, disruption, hindrance, delay or impact;

(d) Identification of activities on the Construction Schedule and the Project Schedule, if applicable, which will or may be affected by the claim or new activities which will or may be created and the relationship with existing activities;

(e) Anticipated impacts and anticipated duration of any interference, disruption, hindrance, delay or impact and any remobilization period; and

(f) Recommended action to avoid or minimize any interference, disruption, hindrance, delay or impact.

118.03 Filing of Claim. With respect to every claim submitted, the Contractor shall file three copies of its claim with the Engineer not more than thirty Days after the notice required by 118.02 and, in all events prior to Contract Completion. The Contractor's claim shall detail the amounts claimed and provide the following information to permit timely and appropriate evaluation of the claim, determination of responsibility and any remaining opportunity for mitigation. If the Contractor is unable to calculate any amount claimed in detail, the Contractor shall use its best efforts to provide a reasonable estimate of such amount:

(a) A narrative of the event, or combination of events, claimed as resulting in interference, disruption, hindrance, delay or impact to the Contractor, including the start date of the event or events and the actual, or anticipated, finish date;

(b) A quantification of the planned Work items and the changed scope of Work items claimed as having been impacted;

(c) A time impact analysis, consistent with standard critical path methodology for scheduling, demonstrating the impact to the Contractor's scheduled activities;

(d) Copies of the Contractor's daily log for each Day of impact;

(e) Copies of relevant correspondence and other information regarding or supporting Contractor entitlement;

(f) Copies of Contractor payroll records for labor impacts claimed by Contractor and any Subcontractor affected by the event or events;

(g) Copies of invoices for material impacts claimed by the Contractor and any Subcontractor affected by the event or events;

(h) Copies of Equipment records, or rental invoices, for any Equipment impacts claimed by the Contractor or any Subcontractor affected by the event or events;

(i) Copies of the most recent Contractor's income statement, including segregated general and administrative expenses for the most recent reporting period, and for the period of the Contract, if available, and similar information for any Subcontractor claim included;

(j) A copy of Contractor's original coded bid takeoff and estimating records that formed the basis of Contractor's bid;

(k) Contractor's coded Job Cost Report with a key to the coding;

(l) A statement, signed by an authorized representative of the Contractor, certifying that the claims are made in good faith, the supporting data is accurate and complete to the best of the Contractor's knowledge and belief and the amount requested accurately reflects the Contract adjustment for which the Contractor believes the City is liable in accordance with the Contract Documents, in particular the pricing guidelines set forth 117.10.

The City may request documents and information from the Contractor in addition to those listed in this 118.03, as the City determines necessary to evaluate and comment upon the Claim. Upon receipt of such request from the Owner, the Contractor shall provide all requested documents and information within ten (10) days. The Contractor shall provide the requested documents in the formats requested, which include both paper and electronic copies. If requested by the City, the electronic copies shall be provided in native computer language. The Contractor's provision of the requested documents to the City in the format requested by the City shall be a condition precedent to any further proceeding under the Contract Documents. Failure to provide the requested documents shall be a material breach of the Contract, and the Contractor shall indemnify the City for all of the City's costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the Contractor's failure to comply with this provision. If the Contractor fails to provide the requested documents, the Contractor shall be deemed to have irrevocably waived its claim.

118.04 Claim Response. Immediately upon receipt of any claim submitted by the Contractor in accordance with 118.03, the Engineer shall deliver 2 copies to the Authorized Representative. Upon submission of the claim by the Contractor, the Engineer shall convene a meeting with the Contractor and any applicable Subcontractors and Material Suppliers to review and discuss the claim. The Engineer shall review the Contractor's claims with all attendees and discuss any questions regarding the nature or content of the required items. Any items deemed deficient shall be corrected by the Contractor before the Engineer will commence review in accordance with 118.05. The Engineer shall document the timeliness of notice provided under paragraph 118.02 and the actual date of corrected submission of the claim.

118.05 Claim Review and Decision. Upon corrected submission of the claim and all requested documentation by the Contractor, the Engineer shall review the claim and prepare a written analysis of its content. The analysis may include a narrative of the examination of the facts giving rise to the claim, relevant Contract Documents and language therein, an analysis of claimed additional labor, Materials and Equipment for the scope of the Work items described and an analysis of any time extension for any interference, disruption, hindrance, impact or delay claimed (including the calculation of any concurrent delays affecting entitlement) and shall include confirmation of the calculation of claimed labor, Materials and Equipment as conforming to the pricing guidelines set forth in 117.10 and a concluding recommendation regarding Contractor entitlement to, and the appropriateness and reasonableness of, all or any part of, the claimed costs and time extension. The Engineer may include copies of contemporaneous documentation supporting any recommendation regarding the sufficiency or inadequacy of the Contractor's claim, the Contractor's performance or the rebuttal of the claim. The Engineer shall prepare and submit the claim analysis to the Authorized Representative within thirty Days of the corrected

submission of the claim. The Authorized Representative shall examine the Contractor's claim, and the analysis of the claim submitted by the Engineer. The Authorized Representative shall approve or deny all or any part of, the Contractor's claim and forward a written decision to the Contractor and the Engineer within thirty Days after receipt of the Engineer's claim analysis. The decision of the Authorized Representative shall be final and conclusive, unless the Contractor appeals the decision to the Board of Review in accordance with 118.06. In the event either the Engineer or the Authorized Representative fail to act in accordance with the foregoing schedule, the claim shall be deemed denied.

118.06 Appeal to Board of Review. The Contractor may appeal the decision of the Authorized Representative to the Board of Review by written notice to the Authorized Representative within ten Days of receipt of the Authorized Representative's decision or, in the absence of a decision, within 10 days of the expiration of the time set forth in 118.05. Failure by the Contractor to provide notice of an appeal within the said 10-day period shall result in the Engineer's decision becoming final and binding upon the Contractor. The Board of Review shall meet within thirty Days of receipt of the notice by the Authorized Representative. The Contractor shall be given an opportunity to present the claim at the meeting. The purpose of the meeting shall be to settle the issues in dispute. The Board of Review shall render a decision on the claim within thirty Days of the meeting unless a mutual agreement is made between the Contractor and the Board of Review to extend the time for decision. The decision of the Board of Review shall be final and conclusive, unless the Contractor provides written notice to the Authorized Representative of the Contractor's intention to file litigation within ten Days of receipt of the decision. The filing of an appeal and the provision of notice of intention to file litigation are each a condition precedent to the filing of any litigation related to the Project or the Contract by the Contractor and any failure by the Contractor to timely fulfill them will preclude the Contractor from filing any such litigation.

118.07 Alternate Dispute Resolution. If, upon consideration of a claim, the Contractor and the City mutually agree in writing, the dispute resolution procedure may be waived, or the claim may be referred to a form of Alternative Dispute Resolution, including a procedure to equitably share the costs of the Alternative Dispute Resolution.

118.08 Delegation. No provision shall prevent the Board of Review or the Authorized Representative from delegating the duties or authorities of the Board of Review or the Authorized Representative to any third Person selected at the discretion of the Board of Review or Authorized Representative, as applicable.

118.09 Auditing of Claims. All claims by the Contractor shall be subject to audit at any time following the filing of such claim, whether or not such claim is part of litigation pending in the courts of this State. The audit may be performed by employees of the City or by a consultant engaged by the City. The audit may begin on ten Days' notice to the Contractor, Subcontractor or Material Supplier, as applicable. The Contractor, Subcontractor or Material Supplier shall use its best efforts to cooperate with the audit. Failure of the Contractor, Subcontractor or Material Supplier to maintain and retain sufficient records to allow the City to verify the claim shall constitute a waiver of any portion of such claim that cannot be verified. Without limiting the foregoing, and as a minimum, the Contractor, Subcontractor or Material Supplier shall make available to the City the following documents:

(a) Daily time sheets and foreperson's daily reports;

(b) Union agreements, if any and employer agreements;

(c) Insurance, welfare, fringes and benefits records;

(d) Payroll register;

(e) Earnings records;

(f) Payroll tax returns;

(g) Material invoices, purchase orders, Subcontractor Contracts and all material and supply acquisition Contracts;

(h) Material cost distribution worksheets;

(i) Equipment records (list of Contractor Equipment, rates, etc.);

(j) Vendor rental agreements, and Subcontractor invoices;

(k) Subcontractor payment certificates;

(l) Canceled checks (payroll and vendors);

(m) Job cost reports;

(n) Job payroll ledger;

(o) General ledger, general journal, (if used) and all subsidiary ledgers and journals together with all supporting documentation pertinent to entries made in these ledgers and journals;

(p) Cash disbursements journal;

(q) Financial statements for all years reflecting operations on the Project;

(r) Income tax returns for all years reflecting operations on the Project;

(s) Depreciation records on all Equipment utilized whether such records are maintained by the Contractor involved, its accountant, or others;

(t) If a source other than depreciation records is used to develop costs for the Contractor's internal purposes in establishing the actual cost of owning and operating Equipment, all such other source documents;

(u) All documents which reflect the Contractor's actual profit and overhead, or the calculation of overhead multipliers, during the years the Project was being performed and for each of the five years prior to the commencement of this Project;

(v) All documents related to the preparation of the Contractor's Bid, including the contemporaneous final calculations on which the Bid was based;

(w) All documents which relate to each and every claim together with all documents which support or negate the amount of damages as to each claim;

(x) Worksheets used to prepare the claim establishing the cost components for items of the claim including, but not limited to, labor, fringes, benefits and insurance, Materials, Equipment, Subcontractors, and all documents which establish the time periods, individuals involved, the hours and rate of pay for the individuals; and

(y) All other documents required by the City in its discretion to intelligently review the claim.

118.10 False Certification of Claims. The Contractor shall not knowingly present or cause to be presented to the Owner a false or fraudulent Claim. "Knowingly" shall have the same meaning as in Section 3729(b) USC of the Federal False Claims Act. If the Contractor knowingly presents or causes to be presented a false or fraudulent Claim, then the Contractor shall be liable to the Owner for the same civil penalty and damages as the United States Government would be entitled to recover under such Section 3729(a) USC and shall also indemnify and hold the City harmless from all costs and expenses, including the City's attorneys' and consultants' fees and expenses incurred in investigating and defending against such Claim and in pursuing the collection of such penalty, damages, and fees and expenses. If any Contractor falsely certifies all or any part of a claim, the portion of the claim so certified shall be denied. If any Contractor is found to have falsely certified all or any part of any claim, that fact may be used to support a finding of ineligibility in future Bids for the award of any City Contract.

118.11 Performance and Payment. The Contractor shall proceed with performance of the Work during any dispute resolution process, unless otherwise agreed by the Contractor and the Authorized Representative in writing. The City shall continue to make payment of any undisputed amounts in accordance with the Contract Documents pending final resolution of a claim, unless otherwise agreed by the Contractor and the Authorized Representative in writing. If the Contractor accepts the decision of the Authorized Representative or the City Commission and foregoes litigation of the claim, any payment to be made, credit to be provided or extension of time to be granted pursuant to the decision shall be evidenced by a Change Order package consisting of a completed Change Order form signed by the Contractor, the Engineer and the Authorized Representative, a copy of the approval of the City Commission and any necessary supporting documentation and any payment shall be made pursuant to a Payment Request in accordance with 114.02 and 114.03 or 114.10 through 114.13, as applicable.

118.12 Settlement Offers. If the Contractor initiates a Claim, the City may make settlement offers to settle the Claim at any time up to the date of the trial. Such settlement offers shall be subject to Rule 408 (Compromise and Offers of Compromise) of the Ohio Rules of Evidence. If at any stage of the litigation, including any appeals, the Contractor's Claim is dismissed or found to be without merit, or if the damages awarded to the Contractor on its Claim do not exceed the City's last settlement offer, the Contractor shall be liable to the City and shall reimburse the City for all of the City's attorneys' fees and expenses, and arising out of or related to such Claim since the date of such last settlement offer.

ITEM 119 CONTRACT TERMINATION

119.01 Notice to Surety
119.02 Suspension of Work
119.03 Termination for Convenience
119.04 Termination for Cause
119.05 Contractor Bankruptcy

119.01 Notice to Surety. The Authorized Representative shall provide notice to the Contractor's Surety of any Suspension or Termination pursuant to 119.01 through 119.05; provided, however, the failure to provide such notice shall not release the Surety from any of its obligations.

119.02 Suspension of Work. If, in the judgment of the Authorized Representative, the Contractor is causing undue risk of damage to any part of the Project or adjacent area, the Authorized Representative may suspend the Work temporarily, either wholly or in part, for such period until, in the judgment of the Authorized Representative, the safe and proper prosecution of the Work may be resumed. The Authorized Representative may also suspend the Work either in whole or in part for a specified number of Days on account of public necessity, adverse weather conditions, or other similar reasons which are beyond the control of the Contractor. In case of such a suspension, an extension of time, if appropriate, may be allowed as provided in the Contract Documents but no payment will be made to the Contractor for any expense or damages resulting therefrom, except where Contractor has established that a delay was proximately caused by an improper action or failure to act by the Owner, in which case Contractor may be entitled to additional compensation. Any failure of the Authorized Representative to suspend the Work shall not relieve the Contractor of the Contractor's responsibility to perform the Work safely and in accordance with the Contract Documents. The Contractor shall, upon receipt of notice of suspension, cease Work on the suspended activities and take all necessary or appropriate steps to limit disbursements and minimize costs with respect thereto. The Contractor shall furnish a report to the Authorized Representative, within five Days of receipt of the notice of suspension, describing the status of the Work, including without limitation, results accomplished, conclusions resulting therefrom, and such other information as the Authorized Representative may require. In the event of suspension, the Contractor shall be entitled to payment of compensation due under the Contract Documents, upon submission of a proper invoice, for the Work performed prior to receipt of notice of suspension, which shall be payable based upon the Contract Cost Breakdown.

119.03 Termination for Convenience. The City may, at any time upon seven Days written notice to the Contractor, terminate the Contract in whole or in part for the City's convenience and without cause. Upon receipt of the notice of termination for convenience, the Contractor shall immediately, in accordance with instructions from the Authorized Representative, proceed with performance of the following duties:

(a) Cease operation as specified in the notice;

(b) Place no further orders and enter into no further subcontracts for Materials, labor, services or facilities except as necessary to complete continued portions of the Project;

(c) Terminate all subcontracts and orders to the extent they relate to the Work terminated;

(d) Proceed to complete the performance of any Work not terminated; and

(e) Take actions that may be necessary, or that the Authorized Representative may require, for the protection and preservation of the terminated Work.

Upon termination for convenience, the Contractor shall be paid in accordance with the Contract Cost Breakdown for Work completed, including any amount retained, and the value of Materials ordered and delivered, less any salvage credit the Contractor may receive for them. All Materials, Equipment, facilities and supplies at the Project site, or stored off site, for which the Contractor has been compensated, shall become property of the City. The Contractor may submit evidence of any reasonable expenses directly attributable to the termination of the Work for consideration by the City. The Contractor shall not be entitled to any profit or overhead for Work not performed and in no event shall the Contractor's compensation exceed the total Contract price. Any dispute as to the sum then payable to the Contractor shall be resolved in accordance with the provisions of 118.01 through 118.11.

119.04 Termination for Cause. If the City determines that the Contractor has failed to prosecute the Work with the necessary force or in a timely manner; failed to make payments to Subcontractors or Suppliers pursuant to the agreements between the Contractor and Subcontractors or Suppliers; disregards any applicable laws, statutes, ordinances, codes, rules, regulations, or lawful orders of a public authority; has refused to remedy any Defective Work; or is otherwise in substantial breach of the Contract Documents, the Authorized Representative shall notify the Contractor and the Contractor's Surety of such failure or refusal. The Contractor shall begin to cure such failure or refusal within two Business Days of receipt of the notice. If the Contractor fails to continuously and diligently pursue and cure such failure or refusal within twenty Days of receipt of the notice, the City may, without prejudice to any of its other rights or remedies, terminate the Contract and employ upon the Work the additional force, or supply the Materials or such part of either as is appropriate, and may remove Defective Work. If the Contractor is so terminated, the Contractor's Surety may be given the option to engage another Contractor to perform the Contract, with the approval of the Authorized Representative. If the Contractor's Surety does not commence performance of the Contract within ten Days of the date on which the Contract was terminated, the City may complete the Work by such means as the Authorized Representative deems appropriate. The City may take possession of and use all Materials, facilities, and Equipment at the Project site or stored off site for which the City has paid. If the Contract is so terminated, the Contractor shall not be entitled to any further payment. If the City completes the Work and if the cost of completing the Work exceeds the balance of the Contract price, including compensation for all direct and consequential damages incurred by the Engineer and/or the City as a result of the termination, such excess shall be paid by the Contractor or the Contractor's Surety. If the Contractor's Surety performs the Work, the provisions of the Contract Documents shall govern the Surety's performance, with the Surety being substituted for the Contractor in all such provisions including, without limitation, provisions for payment for the Work and provisions about the right of the City to complete the Work. Upon a final determination, by a court of competent jurisdiction, that the termination pursuant to 119.04 was improper, the termination shall be deemed a termination for convenience pursuant to 119.03.

119.05 Contractor Bankruptcy. If the Contractor files a voluntary petition in bankruptcy or has an involuntary petition in bankruptcy filed against the Contractor, or if the Contractor makes

a general assignment for the benefit of creditors, or if a receiver is appointed for all or a substantial part of the Contractor's business or property, the Authorized Representative shall serve written notice on the Contractor and the Contractor's Surety stating that any failure of the Contractor to provide adequate assurances of continued performance will be considered a rejection of the Contract, which shall result in termination of the Contract for cause. In such event, Surety shall be immediately responsible for timely and property completion of the Work. Such termination of the Contract need not be evidenced by an order of any court rejecting the Contract. Upon a final determination, by a court having jurisdiction, that the termination was improper, the termination will be deemed to be a termination for convenience pursuant to 119.03.

ITEM 120 - AUDITS AND RECORDS

120.01 Examination
120.02 Termination and Disputes
120.03 Non-Disclosure by Contractor
120.04 Interest

120.01 Examination. The City shall have the right to examine all books, records, documents and other data of the Contractor and of the Contractor's Subcontractors and Material Suppliers related to the Bidding, pricing, or performance of the Work, including without limitation for the purpose of evaluating any Proposal or claim. Such Materials shall be made available at the office of the Contractor, Subcontractor, or Material Supplier, as applicable, at all reasonable times for inspection, audit and reproduction until the expiration of seven years after the date of Final Acceptance of the Project by the City. To the extent that the Contractor, Subcontractor, or Material Supplier, as applicable, informs the City in writing that any documents copied by the City are trade secrets, the City shall treat such documents as trade secrets of the Contractor, Subcontractor, or Material Supplier, as applicable. In the event, any dispute arises with any other Person about whether such other Person should be given access to the documents, the Contractor, Subcontractor, or Material Supplier, as applicable, agrees to indemnify the City against all costs, expenses and damages, including without limitation attorneys' fees, incurred or paid by reason of such dispute. The right of inspection, audit, and reproduction shall extend to all documents necessary to permit adequate evaluation of the cost of pricing data submitted along with the computations and Projections used therein.

120.02 Termination and Disputes. If the Contract has been terminated, in whole or in part, the records relating to the Work terminated shall be made available to the City for a period of seven years from the date of any applicable final settlement or payment, as applicable. Records which relate to disputes, litigation, or settlement of claims arising out of the performance of the Work shall be made available until such dispute, litigation or settlement has been finally decided or settled.

120.03 Non-Disclosure by Contractor. The Contractor shall not disclose, at any time during or after the Work, either directly or indirectly, any confidential records, knowledge or information which the Contractor may acquire about the Project or the City, except as may be required by law or order of a court of competent jurisdiction.

120.04 Interest. Moneys owed to the Contractor by the City pursuant to the terms of the Contract Documents, which are not paid when due shall accrue straight interest at the rate paid by the STAR Account, from the date the moneys become due until the moneys are paid. Any contrary provisions of 153.12, 153.13, 153.14 and 153.63, ORC, do not apply to this Contract.

CITY OF DAYTON CMS MODIFICATIONS FOR ONLINE BIDDING MODIFICATIONS

The City of Dayton Construction and Material Specifications Modifications for Online Bidding are hereby modified by this Contract as follows:

1. The definition of Authorized Representative contained in Section 102 shall be removed and replaced with the following:

   Authorized Representative: The Authorized Representative for the Contract is the Director of the City of Dayton, Department of Public Works, or duly authorized designee.

2. The definition of Engineer in Section 102 shall be removed and replaced with the following:

   Engineer: The Engineer for the Contract the Chief Engineer – Division of Civil Engineering, Department of Public Works or duly authorized designee.

3. Section 103.36 is hereby removed and replaced with the following:

   103.36 Bid Guaranty. The Bidder must file with the Bid a Bid guaranty, payable to the City of Dayton, in the form of the signed Bid guaranty and Contract Bond contained in the Contract Documents, for at least 10% of the full amount of the Base Bid plus any Alternates. The Bid guaranty shall be submitted through the Electronic Bidding Service. The Bid guaranty shall be in form and substance satisfactory to the City and shall serve as an assurance that the Bidder will, upon acceptance of the Bidder's Bid, comply with all conditions precedent for execution of the Contract Form and execute the Contract Form within the time specified by the City. ANY BID GUARANTY MUST BE PAYABLE TO THE CITY OF DAYTON. A Bid may be rejected if the Bid guaranty is payable to any other Person. IF THE BLANK LINES FOR THE AMOUNT ON THE BID GUARANTY AND CONTRACT BOND ARE NOT FILLED IN, THE PENAL SUM WILL AUTOMATICALLY BE THE FULL AMOUNT OF THE BASE BID PLUS ADD ALTERNATES. If those blank lines are filled in, the amount must not be less than the full amount of the Base Bid plus add Alternates, stated in dollars and cents. A PERCENTAGE IS NOT ACCEPTABLE. The Bid guaranty and Contract Bond must be signed by an authorized agent with Power of Attorney from a Surety. The Bid guaranty and Contract Bond must be issued by a Surety authorized by the Department of Insurance to transact business in Ohio. The requirements of Section 3905.41, ORC, may be applicable to require the Bid guaranty and Contract Bond be countersigned by an Ohio resident agent. The Bidder must determine whether this requirement is applicable to the Bidder's Surety. Bid guaranties will be returned to all unsuccessful Bidders seventy-five Days after the Bid Deadline or upon execution of the Contract Form by the apparently successful Bidder, whichever is earlier.

4. Section 106.13 is hereby removed and replaced with the following:

   106.13 Construction Schedule. If the Contractor fails to prosecute the Work in accordance with the Construction Schedule, the provisions of Section 105.02 may be invoked.

5. Section 107.19 is hereby removed.

6. Sections 109.05, 109.06, 109.07, 109.08, 109.09, 109.10, 109.11, and 109.12 are hereby removed and replaced with the following:

109.05 Construction Schedule. The Contractor shall prepare a preliminary Construction Schedule within 30-days of the issuance of a Notice to Proceed. The Contractor shall submit the preliminary Construction Schedule in the form of a Gantt Chart. A Gantt Chart consists of a table of project task information and a bar chart that graphically displays the project schedule, depicting progress in relation to time and often used in planning and tracking projects. The Engineer within seven Days of receipt of the preliminary Construction Schedule shall provide written comments to the Contractor. Within 5 days of receipt of the Engineer's comments, the Contractor shall incorporate the comments and submit a revised Construction Schedule to the Engineer. The Contractor shall update the Construction Schedule every thirty days. The table associated with the Gantt Chart shall be formatted in accordance with the following tables as a minimum:

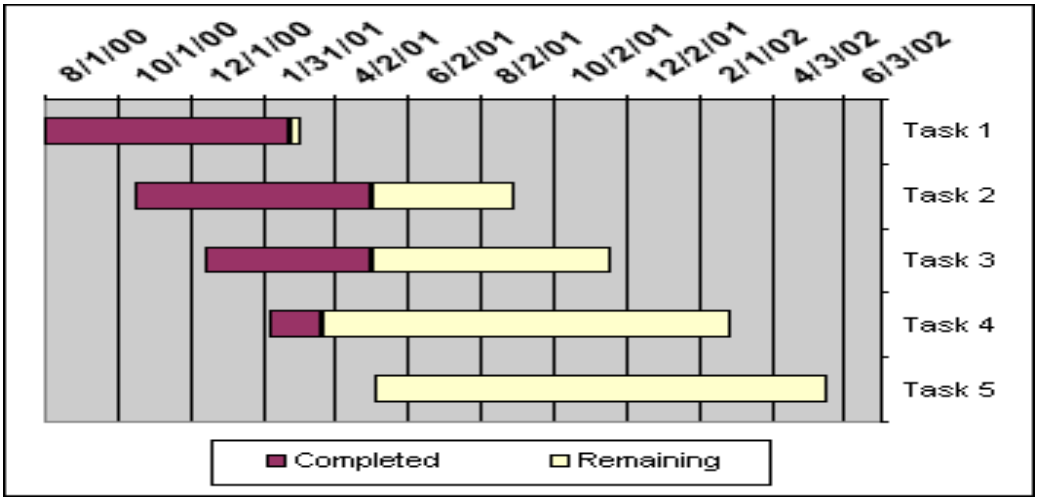
Sample Gantt Chart Table

Task ID	Task Description/ Name	Resource Performing Task	Duration of Task (days)	Start Date	Completion Date	Status
1	Submittals	GC	30	5/15	6/15	Done
2	Mobilize/Setup	GC	10	6/1	6/11	10%
3	Site Clearing	Subcontractor	15	6/12	6/27	0%
Etc.	Etc.	Etc.	Etc.	Etc.	Etc.	Etc.

Note: Table entries are for illustration purposes only.

1. Task ID: Sequential identifier for task (number, alphabetical, alpha-numeric).
2. Task Description/ Name: Brief description or name of major task items.
3. Resource Performing Task: Individuals or company responsible for completion of task and/or with the majority of the work in the task.
4. Duration of Task: Number of days estimated to complete task.
5. Start/Completion dates: Projected dates.
6. Status: Percent completed, description of status, etc.

Sample Graphical Representation of Gantt Chart



109.06 Approval and Acceptance of Contractor Schedule. The Contractor shall review and sign each updated Construction Schedule. The Contractor's signature on any base line or updated Construction Schedule shall serve as an affirmation of the Contractor's approval of and agreement to the Construction Schedule and a representation that the Contractor can meet the requirements of the Construction Schedule without additional compensation.

7. Sections 114.01, 114.02, 114.04, 114.05, and 114.07 are hereby removed and replaced by the following:

114.01 Contractor Payment Request. After confirming the quantities of work performed with the Engineer, the Contractor shall submit monthly to the Engineer an itemized Payment Request, showing the quantities of work performed. The Contractor shall sign the Payment Request thereby certifying that the quantities are correct and the work has been done in accordance with the Contract, and that it constitutes the total amount of work performed during the period. The Contractor shall supply any additional documentation the Engineer may request in connection with each payment to the Contractor. Certified payroll reports for the period of time indicated shall be attached to one copy of every Payment Request. The Contractor shall list on the Contractor Payment Request any approved Change Orders processed and performed during the time covered by the Payment Request.

114.02 Partial Payment. The City shall pay the Contractor an amount equivalent to 90% of the amount listed in each Payment Request within 30 days of the date each Payment Request is executed by the Contractor and approved by the Engineer. After the Contract is 50% complete, as determined by the Engineer, the retainage shall be reduced and the City shall pay 95% of the amount listed in each remaining Payment Request. The amount of Liquidated Damages to which the City is apparently entitled under the Contract Documents may be deducted from any Payment Request by the Engineer and Authorized Representative. Payments due and not paid within such thirty day period shall accrue interest from the date that payment is due under the Contract Documents at the rate paid by the STAR Account in accordance with 120.04.

8. Section 117.06 is hereby removed and replaced with the following:

117.06 Change Order Process. When a change to the Work is ordered, the Engineer shall:

1. Prepare a written request to the Contractor detailing the changes to be made.

2. Reach a written agreement with the Contractor concerning the cost of the Change Order using Unit Prices or the Pricing Guidelines set forth in Section 117.10, whichever the Engineer determines in his or her discretion is applicable.

3. If the cost of the agreed Change Order is less than the available Project Contingency Funds, the Change Order agreement need only be signed by the Engineer.

4. If the cost of the agreed Change Order exceeds the available Project Contingency Funds then the Change Order must be approved by the City Commission and signed by the City Manager. The Contractor may bill for Work covered by the Change Order only after the Change Order is properly executed in accordance with this Section.

9. Section 117.12 is hereby removed and replaced with the following:
117.12 Time Extension. Notwithstanding any other provision of the Contract Documents, time extensions for changes in the Work will depend upon the extent to which the change causes delay in Work on the Critical Path of the Construction Schedule. If extending the time for Contract Completion is not possible, the Contractor shall price, and separately state, all costs of accelerated performance in the Contractor's Proposal. A Change Order granting a time extension may provide that the time for Contract Completion will be extended for only those specific elements actually delayed and that remaining milestone completion dates will not be altered and may further provide for adjustment of Liquidated Damages, to the fullest extent permitted by law.

Fire Station 15 and Fire Station 16 Renovations					
ITEM CODE	**ITEM DESCRIPTION**	**UofM**	**QUANTITY**	**UNIT PRICE**	**EXTENSION**
Item 1	Fire Station 15 Renovations, Complete, As Per Plan	Lump	1		
Item 2	Fire Station 16 Renovations, Complete, As Per Plan	Lump	1		
Item 3	Fire Station 15 Building Permit Fee	EA	1	$11,477.23	$11,477.23
Item 4	Fire Station 16 Building Permit Fee	EA	1	$11,477.23	$11,477.23
Item 5	Fire Station 15 Hazardous Material Abatement Allowance	EA	1	$50,000.00	$50,000.00
Item 6	Fire Station 16 Hazardous Material Abatement Allowance	EA	1	$50,000.00	$50,000.00
Alternate No. 1					
Alt. 1	Fire Station 15 & 16 Contingency Allowance ($250,000.00)	Lump	1		

Project Manual

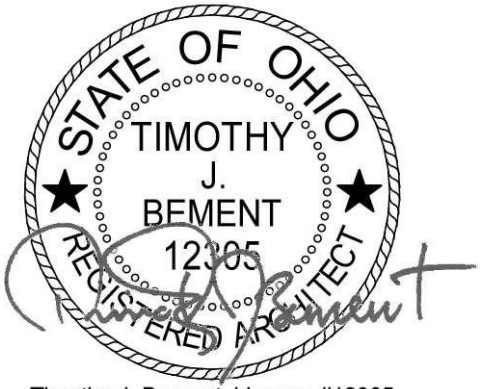
DATE: August 1, 2025

City of Dayton
Fire Stations #15 and #16 Renovations

Dayton, Ohio

Architect:

App Architecture
615 Woodside Drive
Englewood, OH 45322



Timothy J. Bement, License #12305
Expiration Date 12/31/2025

PROJECT NUMBER: 4284.00/01

PROJECT DIRECTORY

PART 1 GENERAL

SECTION INCLUDES

Identification of project team members and their contact information.

OWNER:

Name: City of Dayton
Address Line 1: 101 W 3rd Street.
City: Dayton.
State: Ohio.
Zip Code: 45402-1814.

CONSULTANTS:

Architect: Design Professional of Record. All correspondence from the Contractor regarding construction documents authored by Architect's consultants will be through this party, unless alternate arrangements are mutually agreed upon at preconstruction meeting.

Company Name: App Architecture, Inc.
Address Line 1: 615 Woodside Dr.
City: Englewood.
State: Ohio.
Zip Code: 45322.
Telephone: 937.836.8898.
Primary Contact:
Title: Principal-in-Charge.
Name: Timothy J. Bement, AIA.

Mechanical Engineering Consultant - Plumbing, Mechanical, Electrical:

Company Name: Nauman & Zelinski LLC.
Address Line 1: 204 South Ludlow Street, Suite 400.
City: Dayton.
State: Ohio.
Zip Code: 45402.
Telephone: 937.223.3821.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 00 0103

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23 3300 - Air Duct Accessories
23 3400 - Fans
23 3713 - Diffusers, Registers and Grilles
23 5000 Central Heating Equipment

23 5100 - Breechings, Chimneys, and Stacks
23 5523 - Gas-Fired Radiant Heaters
23 5533 - Fuel-Fired Unit Heaters
23 7000 Central HVAC Equipment
23 7413 - Packaged, Outdoor, Air Handling Units
23 8000 Decentralized HVAC Equipment
23 8101 - Terminal Heat Transfer Units
Division 26 -- Electrical
26 0000 General Requirements for Electrical Systems
26 0001 - Basic Electrical Requirements
26 0002 - Electrical Work in Existing Buildings
26 0004 - Firestopping for Electrical Systems
26 0005 - Excavation, Backfill and Surface Restoration
26 0500 Common Work Results for Electrical
26 0519 - Low-Voltage Electrical Power Conductors and Cables
26 0526 - Grounding and Bonding for Electrical Systems
26 0529 - Hangers and Supports for Electrical Systems
26 0533 - Raceway and Boxes for Electrical Systems
26 0537 - J-Hook Pathways For Electrical Systems
26 0543 - Underground Ducts and Raceways for Electrical Systems
26 0553 - Identification for Electrical Systems
26 0563 - Specific Wiring Applications
26 0590 - Electrical Specialties
26 0900 Instrumentation and Control for Electrical
26 0923 - Lighting Control Devices
26 2000 Low-Voltage Electrical Distribution
26 2416 - Panelboards
26 2726 - Wiring Devices
26 2813 - Fuses
26 2816 - Enclosed Switches and Circuit Breakers
26 3000 Facility Electrical Power Generating and Storing Equipment
26 3214 - Engine Generators (Station 16 ONLY- Alternate E1)
26 3623A - Automatic Transfer Switch and Portable Docking Station (Station 15 ONLY)
26 3623B - Automatic Transfer Switch and Portable Docking Station (Station 16 ONLY)
26 4000 Electrical Cathodic Protection
26 4313 - Surge Protective Devices (SPD) for Low-Voltage Electrical Power Circuits
26 5000 Lighting
26 5113 - Interior Lighting Fixtures
26 5200 - Exit and Emergency Lighting
26 5700 - Suspended Ceiling Mounted Circulation Fans
26 7000 Communications

26 7533 Raceway and Boxes for Communications Systems

Division 31 -- Earthwork

Division 32 -- Exterior Improvements

Division 33 -- Utilities

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SECTION 01 1000
SUMMARY

PART 1 GENERAL

1.01 PROJECT

A. Project Name: 4284.00 & 01 Dayton Fire Department Station 15 & 16 Renovation

B. Owner's Name: City of Dayton

C. Architect's Name: App Architecture, Inc.

D. Additional Project contact information is specified in Section 00 0103 - Project Directory.

E. The Project consists of the renovation/alteration of two existing fire stations.

1.02 CONTRACT DESCRIPTION

A. Contract Type: A single prime contract based on a Stipulated Price as described in Document 00 5200 - Agreement Form.

1.03 DESCRIPTION OF ALTERATIONS WORK

A. Scope of demolition and removal work is indicated on drawings and specified in Section 02 4100.

1.04 WORK BY OWNER

A. Items noted NIC (Not in Contract) will be supplied and installed by Owner before Date of Substantial Completion. Some items include:
   1. Furnishings.
   2. Small equipment, including but not limited to fitness equipment.
   3. Refer to construction documents for additional items.

B. Owner will supply and install the following:
   1. Refer to the matrices located on the drawings..

C. Owner will supply the following for installation by Contractor:
   1. Refer to the matrices located on the drawings.

1.05 OWNER OCCUPANCY

A. Owner intends to occupy the Project upon Substantial Completion.

B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.

C. Schedule the Work to accommodate Owner occupancy.

1.06 CONTRACTOR USE OF SITE AND PREMISES

A. Construction Operations: Limited to areas noted on Drawings.
   1. Locate and conduct construction activities in ways that will limit disturbance to site.

B. Arrange use of site and premises to allow:
   1. Work by Others.
   2. Work by Owner.

C. Provide access to and from site as required by law and by Owner:
   1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
   2. Do not obstruct roadways, sidewalks, or other public ways without permit.

D. Time Restrictions:

1. Limit conduct of the hours of 7:00 a.m. to 5:00 p.m.
2. Weekend Hours: As approved by Owner.
3. Early Morning Hours: As approved by Owner.

E. Utility Outages and Shutdown:
1. Prevent accidental disruption of utility services to other facilities.

1.07 WORK SEQUENCE

END OF SECTION 01 1000

SECTION 01 2000
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedures for preparation and submittal of applications for progress payments.

1.02 SCHEDULE OF VALUES

A. Use Schedule of Values Form: AIA G703, edition stipulated in the Agreement.

B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.

C. Forms filled out by hand will not be accepted.

1.03 APPLICATIONS FOR PROGRESS PAYMENTS

A. Payment Period: Submit at intervals stipulated in the Agreement.

B. Use Form AIA G702 and Form AIA G703, edition stipulated in the Agreement.

C. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.

D. Forms filled out by hand will not be accepted.

E. Execute certification by signature of authorized officer.

F. Submit one electronic copy of each Application for Payment as a 'pencil copy' for review by the architect. Once approved, submit one final signed and notarized electronic copy to the architect for processing by the architect and Owner.

END OF SECTION 01 2000

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SECTION 01 2100
ALLOWANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Contingency allowance.

1.02 RELATED REQUIREMENTS

1.03 CONTINGENCY ALLOWANCE

A. Contractor's costs for products, delivery, installation, labor, insurance, payroll, taxes, bonding, equipment rental, overhead and profit will be included in Change Orders authorizing expenditure of funds from this Contingency Allowance.

B. Funds will be drawn from the Contingency Allowance only by Change Order.

C. At closeout of Contract, funds remaining in Contingency Allowance will be credited to Owner by Change Order.

1.04 ALLOWANCES SCHEDULE

A. Owner Contingency Allowance: Include a stipulated sum / price of **$50,000** per Station for the Owner's use for potential additional scope items during construction.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 2100

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SECTION 01 2300
ALTERNATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Description of Alternates.

B. Procedures for pricing Alternates.

C. Documentation of changes to Contract Price and Contract Time.

1.02 RELATED REQUIREMENTS

A. Document 00 2113 - Instructions to Bidders: Instructions for preparation of pricing for Alternates.

1.03 ACCEPTANCE OF ALTERNATES

A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.

B. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

1.04 SCHEDULE OF ALTERNATES

A. As noted or shown in the Contract Documents and Bid Packages.
   1. Alternate No. E - 1: New Standy Natural Gas Generator for Station 16.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 2300

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SECTION 01 2500
SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedural requirements for proposed substitutions.

1.02 RELATED REQUIREMENTS

A. Section 00 2113 - Instructions to Bidders: Restrictions on timing of substitution requests.

B. Section 01 2100 - Allowances, for cash allowances affecting this section.

C. Section 01 2200 - Unit Prices, for additional unit price requirements.

D. Section 01 2300 - Alternates, for product alternatives affecting this section.

E. Section 01 3000 - Administrative Requirements: Submittal procedures, coordination.

F. Section 01 6000 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.

1.03 DEFINITIONS

A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
   1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
      a. Unavailability.
      b. Regulatory changes.
      c. Unavailability of required warranty terms.
   2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.
      a. Substitution requests offering advantages solely to the Contractor will not be considered.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
   2. Agrees to provide the same warranty for the substitution as for the specified product.
   3. Agrees to provide same or equivalent maintenance service and source of replacement parts, as applicable.
   4. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
   5. Waives claims for additional costs or time extension that may subsequently become apparent.
   6. Agrees to reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.

B. A Substitution Request for specified installer constitutes a representation that the submitter:
   1. Has acted in good faith to obtain services of specified installer, but was unable to come to commercial, or other terms.

C. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
   1. Note explicitly any non-compliant characteristics.

D. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
   1. No specific form is required. Contractor's Substitution Request documentation must include the following:
      a. Project Information:
         1) Official project name and number, and any additional required identifiers established in Contract Documents.
         2) Owner's, Architect's, and Contractor's names.
      b. Substitution Request Information:
         1) Discrete and consecutive Substitution Request number, and descriptive subject/title.
         2) Indication of whether the substitution is for cause or convenience.
         3) Issue date.
         4) Reference to particular Contract Document(s) specification section number, title, and article/paragraph(s).
         5) Description of Substitution.
         6) Reason why the specified item cannot be provided.
         7) Differences between proposed substitution and specified item.
      c. Attached Comparative Data: Provide point-by-point, side-by-side comparison addressing essential attributes specified, as appropriate and relevant for the item:
         1) Physical characteristics.
         2) In-service performance.
         3) Expected durability.
         4) Visual effect.
         5) Warranties.
         6) Other salient features and requirements.
         7) Include, as appropriate or requested, the following types of documentation:
            (a) Product Data:
            (b) Samples.
            (c) Certificates, test, reports or similar qualification data.
            (d) Drawings, when required to show impact on adjacent construction elements.
      d. Impact of Substitution:
         1) Savings to Owner for accepting substitution.
         2) Change to Contract Time due to accepting substitution.

E. Limit each request to a single proposed substitution item.
   1. Submit an electronic document, combining the request form with supporting data into single document.

3.02 SUBSTITUTION PROCEDURES DURING PROCUREMENT

A. Submittal Time Restrictions:
   1. Section 00 2113 - Instructions to Bidders specifies time restrictions and the documents required for submitting substitution requests during the bidding period.

3.03 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

A. Architect will consider requests for substitutions only within 15 days after date of Agreement.

B. Submit request for Substitution for Cause within 14 days of discovery of need for substitution, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.

C. Submit request for Substitution for Convenience within 14 days of discovery of its potential advantage to the project, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.

1. In addition to meeting general documentation requirements, document how the requested substitution benefits the Owner through cost savings, time savings, greater energy conservation, or in other specific ways.
2. Document means of coordinating of substitution item with other portions of the work, including work by affected subcontractors.
3. Bear the costs engendered by proposed substitution of:
   a. Owner's compensation to the Architect for any required redesign, time spent processing and evaluating the request.
   b. Other construction by Owner.
   c. Other unanticipated project considerations.

D. Substitutions will not be considered under one or more of the following circumstances:
1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
2. Without a separate written request.
3. When acceptance will require revisions to Contract Documents.

3.04 RESOLUTION

A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.

B. Architect will notify Contractor in writing of decision to accept or reject request.
1. Architect's decision following review of proposed substitution will be noted on the submitted form cover sheet.

3.05 ACCEPTANCE

A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

3.06 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

END OF SECTION 01 2500

App Architecture
creative focused design

615 Woodside Drive, Englewood, Ohio 45322
T 937.836.8898 F 937.832.3696
www.app-arch.com

SUBSTITUTION REQUEST FORM

DATE:

REQUEST NO.:

PROJECT: CITY OF DAYTON
FIRE STATIONS 15 & 16 RENOVATIONS

PROPOSED SUBSTITUTION: _____

_____

_____

_____

REQUEST AUTHOR: _____ **REQUIRED REPLY DATE:** _____

REPLY: _____

_____

_____

_____

REPLY AUTHOR: _____ **REPLY DATE:** _____

ATTACHMENTS:

ACTION REQUIRED:

DISTRIBUTION:

END OF SECTION 01 2500

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SECTION 01 3000
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General administrative requirements.

B. Web-based project software service.

C. Preconstruction meeting.

D. Progress meetings.

E. Construction progress schedule.

F. Contractor's daily reports.

G. Coordination drawings.

H. Submittals for review, information, and project closeout.

I. Number of copies of submittals.

J. Requests for Information (RFI) procedures.

K. Submittal procedures.

1.02 RELATED REQUIREMENTS

A. Section 01 6000 - Product Requirements: General product requirements.

B. Section 01 7000 - Execution and Closeout Requirements: Additional coordination requirements.

C. Section 01 7800 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

1.03 REFERENCE STANDARDS

1.04 PROJECT COORDINATOR

A. Project Coordinator: General Contractor.

B. Cooperate with the Project Coordinator in allocation of mobilization areas of site; for field offices and sheds, for access, traffic, and parking facilities.

C. During construction, coordinate use of site and facilities through the Project Coordinator.

D. Comply with Project Coordinator's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.

E. Comply with instructions of the Project Coordinator for use of temporary utilities and construction facilities. Responsibility for providing temporary utilities and construction facilities is identified in Section 01 1000 - Summary.

F. Coordinate field engineering and layout work under instructions of the Project Coordinator.

G. Make the following types of submittals to Architect through the Project Coordinator:
   1. Requests for Information.
   2. Requests for substitution.
   3. Shop drawings, product data, and samples.
   4. Test and inspection reports.
   5. Design data.
   6. Manufacturer's instructions and field reports.
   7. Applications for payment and change order requests.
   8. Progress schedules.

9. Coordination drawings.
10. Correction Punch List and Final Correction Punch List for Substantial Completion.
11. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 WEB-BASED PROJECT SOFTWARE SERVICE

A. Web-Based Project Software Service: General Contractor to provide, administer, and use web-based project software to host and manage project communication and documentation.
   1. Include, at minimum, the following features:
      a. Project directory, including Owner, Contractor, subcontractors, Architect, Architect's consultants, and other entities involved in the project. Include names of contact persons and contact information for each entity.
      b. Access control for each entity and for each workflow process to determine each entity's digital rights to create, modify, view, and print documents.
      c. Workflow planning, allowing customization of workflow for each project entity.
      d. Creation, logging, tracking, and notification for project communications required in other Specification Sections, including, but not limited to RFI's, submittals, Minor Changes in the Work, Construction Change Directives, and Change Orders.
      e. Tracking of project communication statuses in real time, including timestamped response log.
      f. Procedures for viewing PDFs or similar file formats, allowing markups by each entity. Provide security features to lock markups against changes once submitted.
      g. Processing and tracking of payment applications.
      h. Processing and tracking of contract modifications.
      i. Creation and distribution of meeting minutes.
      j. Document management for drawings, specifications, and coordination drawings, including revision control.
      k. Management of construction progress photographs.
      l. Mobile device compatibility.
      m. Creation of data analytics reports.
      n. Creation and export of editable logs for software functions. Provide Owner, Architect, and Architect's consultants with rights and ability to download logs when requested.
   2. Provide up to 20 user licenses for use by Owner, Architect, Architect's consultants, and other entities involved in the project.
   3. Comply with the software service's current published licensing agreements.
   4. Training: Provide one-hour, web-based training session for users of software service. Further training is the responsibility of the user.
      a. Representatives of Owner are scheduled and included in this training.
   5. Project Closeout: Provide digital archive in format that is readable by common desktop software applications in format acceptable to Architect. Provide data in locked format to prohibit further changes after completion of the project.
   6. Web-Based Project Software Services: Subject to compliance with the requirements use one of the following:
      a. Procore Technologies.
      b. Autodesk Build.

3.02 PRECONSTRUCTION MEETING

A. Project Coordinator will schedule a meeting no later than 10 days after the execution of the Agreement.

B. Attendance Required:
   1. Owner.

2. Architect.
3. Construction Manager.

C. Agenda:
1. Execution of Owner-Contractor Agreement.
2. Submission of executed bonds and insurance certificates.
3. Distribution of Contract Documents.
4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
5. Submission of initial Submittal schedule.
6. Designation of personnel representing the parties to Contract, Construction Manager and Architect.
7. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
8. Scheduling.
9. Scheduling activities of the Special Inspector.

D. Record minutes and distribute copies within two days after meeting to participants, and those affected by decisions made.

3.03 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the work at maximum bi-weekly intervals.

B. Project Coordinator will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

C. Attendance Required:
1. Construction Manager.
2. Owner.
3. Architect.
4. Contractor's superintendent.
5. Major subcontractors.

D. Agenda:
1. Review minutes of previous meetings.
2. Review of work progress.
3. Field observations, problems, and decisions.
4. Identification of problems that impede, or will impede, planned progress.
5. Review of submittals schedule and status of submittals.
6. Review of RFIs log and status of responses.
7. Maintenance of progress schedule.
8. Corrective measures to regain projected schedules.
9. Planned progress during succeeding work period.
10. Maintenance of quality and work standards.
11. Effect of proposed changes on progress schedule and coordination.
12. Other business relating to work.

E. Record minutes and distribute copies within two days after meeting to participants, and those affected by decisions made.

3.04 CONSTRUCTION PROGRESS SCHEDULE

A. Within 10 days after date of the Agreement, submit preliminary schedule defining planned operations for the first 60 days of work, with a general outline for remainder of work.

B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.

1. Include written certification that major contractors have reviewed and accepted proposed schedule.

D. Within 10 days after joint review, submit complete schedule.

E. Submit updated schedule with each Application for Payment.

3.05 DAILY CONSTRUCTION REPORTS

A. Include only factual information. Do not include personal remarks or opinions regarding operations and/or personnel.

B. Prepare a daily construction report recording the following information concerning events at Project site and project progress:
1. Date.
2. High and low temperatures, and general weather conditions.
3. List of subcontractors at Project site.
4. List of separate contractors at Project site.
5. Approximate count of personnel at Project site.
6. Major equipment at Project site.
7. Material deliveries.
8. Safety, environmental, or industrial relations incidents.
9. Meetings and significant decisions.
10. Unusual events (submit a separate special report).
11. Stoppages, delays, shortages, and losses. Include comparison between scheduled work activities (in Contractor's most recently updated and published schedule) and actual activities. Explain differences, if any. Note days or periods when no work was in progress and explain the reasons why.
12. Testing and/or inspections performed.
13. Signature of Contractor's authorized representative.

3.06 COORDINATION DRAWINGS

A. Provide information required by Project Coordinator for preparation of coordination drawings.

B. Review drawings prior to submission to Architect.

C. Architect and consultants will provide CAD or REVIT files as requested for use in producing coordination drawings. Waiver forms are provided at the end of this section and must be completed and signed as part of any request for digital files.

3.07 REQUESTS FOR INFORMATION (RFI)

A. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
1. Prepare a separate RFI for each specific item.
a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
b. Do not forward requests which solely require internal coordination between subcontractors.
2. Prepare in a format and with content acceptable to Architect.

B. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
1. Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.
2. Unacceptable Uses for RFIs: Do not use RFIs to request the following::
a. Approval of submittals (use procedures specified elsewhere in this section).
b. Approval of substitutions (see Section - 01 6000 - Product Requirements)
c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).

d. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).

3. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response, with an explanatory notation.
4. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, Contract Documents, with no additional input required to clarify the question. They will be returned without a response, with an explanatory notation.
   a. The Owner reserves the right to assess the Contractor for the costs (on time-and-materials basis) incurred by the Architect, and any of its consultants, due to processing of such RFIs.

C. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
1. Official Project name and number, and any additional required identifiers established in Contract Documents.
2. Owner's, Architect's, and Construction Manager's names.
3. Discrete and consecutive RFI number, and descriptive subject/title.
4. Issue date, and requested reply date.
5. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
6. Annotations: Field dimensions and/or description of conditions which have engendered the request.
7. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.

D. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.

E. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
1. Indicate current status of every RFI. Update log promptly and on a regular basis.
2. Note dates of when each request is made, and when a response is received.
3. Highlight items requiring priority or expedited response.
4. Highlight items for which a timely response has not been received to date.

F. Review Time: Architect will respond and return RFIs to Contractor within seven calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.
1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.

G. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.
1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.
2. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.
3. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.
4. Notify Architect within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

3.08 SUBMITTAL SCHEDULE

A. Submit to Architect for review a schedule for submittals in tabular format.
   1. Submit at the same time as the preliminary schedule specified in Section - 01 3216 - Construction Progress Schedule.
   2. Coordinate with Contractor's construction schedule and schedule of values.
   3. Arrange information to include scheduled date for initial submittal, specification number and title, submittal category (for review or for information), description of item of work covered, and role and name of subcontractor.
   4. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.
      a. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.

3.09 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:
   1. Product data.
   2. Shop drawings.
   3. Samples for selection.
   4. Samples for verification.

B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.

C. Samples will be reviewed for aesthetic, color, or finish selection.

D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 7800 - Closeout Submittals.

3.10 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:
   1. Design data.
   2. Certificates.
   3. Test reports.
   4. Inspection reports.
   5. Manufacturer's instructions.
   6. Manufacturer's field reports.
   7. Other types indicated.

B. Submit for Architect's knowledge as contract administrator or for Owner.

3.11 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit Correction Punch List for Substantial Completion.

B. Submit Final Correction Punch List for Substantial Completion.

C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 7800 - Closeout Submittals:
   1. Project record documents.
   2. Operation and maintenance data.
   3. Warranties.
   4. Bonds.
   5. Other types as indicated.

D. Submit for Owner's benefit during and after project completion.

3.12 NUMBER OF COPIES OF SUBMITTALS

A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.

B. Extra Copies at Project Closeout: See Section 01 7800.

C. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
   1. After review, produce duplicates.
   2. Retained samples will not be returned to Contractor unless specifically so stated.

3.13 SUBMITTAL PROCEDURES

A. General Requirements:
   1. Use a separate Project Submittal Cover Sheet for each item. Form included at end of this specification section.
   2. Submit separate packages of submittals for review and submittals for information, when included in the same specification section.
   3. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
   4. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
   5. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
      a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
   6. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
      a. Upload submittals in electronic form to Electronic Document Submittal Service website.
   7. Schedule submittals to expedite the Project, and coordinate submission of related items.
      a. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
      b. For sequential reviews involving Architect's consultants, Owner, or another affected party, allow an additional 15 days.
   8. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
   9. When revised for resubmission, identify all changes made since previous submission.
   10. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
   11. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.

B. Product Data Procedures:
   1. Submit only information required by individual specification sections.
   2. Collect required information into a single submittal.
   3. Submit concurrently with related shop drawing submittal.
   4. Do not submit (Material) Safety Data Sheets for materials or products.

C. Shop Drawing Procedures:
   1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
   2. Do not reproduce Contract Documents to create shop drawings.
   3. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.

D. Samples Procedures:
   1. Transmit related items together as single package.

2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.

3.14 SUBMITTAL REVIEW

A. Submittals for Review: Architect and Cons will review each submittal, and approve, or take other appropriate action.

B. Submittals for Information: Architect will acknowledge receipt and review. See below for actions to be taken.

C. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
   1. Notations may be made directly on submitted items and/or listed on appended Submittal Review cover sheet.

D. Architect's and consultants' actions on items submitted for review:
   1. Authorizing purchasing, fabrication, delivery, and installation:
      a. "Reviewed", or language with same legal meaning.
      b. "Reviewed as Noted, Resubmission not required", or language with same legal meaning.
         1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
      c. "Reviewed as Noted, Resubmit for Record", or language with same legal meaning.
   2. Not Authorizing fabrication, delivery, and installation:

E. Architect's and consultants' actions on items submitted for information:
   1. Items for which no action was taken:
      a. "Received" - to notify the Contractor that the submittal has been received for record only.
   2. Items for which action was taken:
      a. "Reviewed" - no further action is required from Contractor.

END OF SECTION 01 3000

Agreement & Waiver
For Transfer and Use of
Architectural Electronic Files

App Architecture
creative focused design

615 Woodside Drive, Englewood, Ohio 45322
T 937.836.8898 F 937.832.3696
www.app-arch.com

PROJECT: _____

OWNER: _____

You (hereinafter "User") have requested App Architecture (hereinafter "AA") provide electronic files, which may include BIM files, (hereinafter "Electronic Files) for User's convenience and use in the preparation of shop drawings/coordination drawings related to this project only. AA is willing to accommodate this request subject to the following terms and conditions:

AA and User fully understand that the data contained in these Electronic Files are part of AA's Instruments of Service, AA shall be deemed the author of the drawings and data, and shall retain all common law, statutory law, and other rights. Modifications to the Electronic Files are to be made only by AA or its Subconsultants through the RFI process. User shall not transfer the Electronic Files to any other party without the express written authorization of AA. These files are not a product and shall not be used by User or anyone else receiving this data through or from User for any other purpose other than as a convenience as described above. AA makes no warranties, either express or implied, of merchantability and fitness for any particular purpose. Furthermore, any description of said Electronic Files shall not be deemed to create an implied or express warranty that such Electronic Files shall conform to said description.

User understands and accepts that Electronic Files deteriorate or can be modified inadvertently or otherwise without authorization by AA. Therefore, AA may remove all indication of its ownership or involvement from these Electronic Files. Furthermore, AA makes no representations as to compatibility, usability or readability of the files resulting from the use of software, application packages, operating systems, or computer hardware differing from those of AA. Nor does AA make any representation that these Electronic Files will have any particular durability or that they will not damage or impair the User's computer or software.

The User acknowledges that the furnishing of these files in no way relieves the User from the responsibility for the preparation of shop drawings or other schedules as required by the Contract between the Contractor and the Owner including the need to check, confirm and coordinate the work with that of other contractors for this project.

User understands that these Electronic Files are not contract documents, they do not contain all the information of the contract documents. Significant differences may exist between these Electronic Files and corresponding hard copy documents due to addenda, change orders, revisions, layer visibility or other reasons. AA makes no representations as to the accuracy or completeness of these Electronic Files. User understands and agrees that in the event of a conflict, printed hard copy drawings and specifications issued by AA shall take precedence over Electronic Files. User understands and agrees that User alone is completely responsible, without limitation, to check and otherwise confirm the accuracy of all data on these Electronic Files. The User recognizes that the

AA does not have, and will not have, any duty or obligation to advise or give notice to the User of any future revisions or modifications to the originating Electronic Files.

The User acknowledges that the Electronic Files provided by AA are a graphical representation of the building in order to generate two-dimensional industry standard drawings. A Revit model will contain both 2D and 3D components. The data contained in the Electronic Files may not be 100% accurate and should not be used for dimensional control, building layout or similar purposes. Additionally, the User acknowledges that the information in the Electronic Files should be use for comparative purposes only and shall not be relied upon for accurate quantity estimates.

The User shall assume all risks and liabilities resulting from use of these Electronic Files. User agrees to make no claims and hereby waives, to the fullest extent permitted by law, any claims or causes of action of any nature whatsoever, including claims for consequential damages, against AA, its officers, directors, employees, agents, or sub-consultants which may arise out of or in connection with the use of the Electronic Files. Furthermore, User shall, to the fullest extent permitted by law, indemnify, defend, and hold harmless AA, its officers, directors, employees, agents, or sub-consultants from and against all claims, damages, losses, and expenses, including attorney fees, arising out of, or related to User's, or anyone else receiving this data through or from User, use of the Electronic Files. If User reproduces the Electronic Files or creates a derivative work based upon them, User shall remove or completely obliterate any professional seals, logos, and other indications on the documents of the identity of AA, its officers, directors, employees, agents, or sub-consultants.

Neither this Agreement nor use of these files shall alter the contractor's Contract for Construction in any way.

ELECTRONIC FILE FORMAT (SELECT ONE):

☐ .DWG Format – List drawing sheets requested:

_____

_____

☐ Revit Project Model (Model only, no Views included, no specific LOD):

The User agrees that the AA shall have no responsibility whatsoever for problems of any nature arising from transmitting and storing electronic files at a User requested FTP site or project management site or the conversion of the Electronic Files by the User or others for use in non-native applications. AA will not provide Electronic Files in compressed formats. The User agrees to accept the files in the format provided by AA, and that the User's conversion or electronic file storage at the User's at the User's requested site, shall be at the User's sole risk.

AA, at its sole discretion, may modify the Electronic Files before they are provided to the User. Such modifications may include, but are not limited to, removal of certain information. AA, at its sole discretion, may refuse to provide some or all Electronic Files requested by the User.

The availability of Electronic Files that were not prepared by AA is subject to the consent of the Owner and/or consultant that prepared those Electronic Files. AA will not negotiate with the Owner or consultant or repeatedly solicit the Owner or consultant to obtain consent. Neither this

Agreement and Waiver for Transfer and Use of Electronic Files nor any such separate Consultant's consent may be assigned or transferred by the User to any other person or entity.

USER (FIRM NAME): _____ **DATE:** _____

ADDRESS: _____

CITY: _____ **STATE:** _____ **ZIP:** _____

PHONE NO.: _____

SIGNED: _____ **EMAIL:** _____

NAME/TITLE (PRINTED): _____

Nauman & Zelinski LLC

204 South Ludlow Street, Suite 400
Dayton, Ohio 45402
P: 937.223-3821
F: 937.223-3849

AGREEMENT AND WAIVER FOR USE OF ENGINEERING COMPUTER AIDED DESIGN FILES

PROJECT:

OWNER:

CONTRACTOR:

The undersigned acknowledges the receipt of electronic CAD files, which may include BIM files, (hereinafter "Electronic Files") in AutoCad format for the above referenced project. These electronic files are provided as a convenience to the User, for use in preparing shop drawings and or coordination drawings related to the construction of this project only. These electronic files and the information contained within are part of the engineer's instruments of service and remain the property of Nauman & Zelinski LLC. The electronic files shall not be reproduced or used in any form except in conjunction with this project.

The User acknowledges that the information provided in these electronic files is not a substitute or replacement for the Contract Documents. The User acknowledges that neither Nauman & Zelinski, the Consultants, the Client, nor the Owner make any warranty or representation that the information contained in these electronic files reflects the hard-copy Contract Documents in their entirety. The User assumes full responsibility in the use of these electronic files, including the responsibility to see that all manual modifications, addenda, bulletins, clarifications and Change Orders to the drawings executed as part of the Contract Documents have been incorporated.

The User acknowledges that the furnishing of these electronic files in no way relieves the User from the responsibility for the preparation of shop drawings or other schedules as required by the Contract between the Contractor and the Owner including the need to check, confirm and coordinate the work with that of other contractors for this project.

The User agrees to make no claim and hereby waive, to the fullest extent permitted by law, any claim or cause of action of any nature against Nauman & Zelinski LLC, the Consultants, the Client, the Owner and any of their agents that may arise out of or in connection with the use of these electronic files.

Furthermore, the User shall, to the fullest extent permitted by law, indemnify and hold harmless against Nauman & Zelinski LLC, the Consultants, the Client, the Owner and any of their agents against all damages, liabilities or costs, including reasonable attorney's fees and defense costs, arising out of or resulting from the use of these electronic files.

Under no circumstances shall the delivery of these electronic files be deemed a sale by Nauman & Zelinski LLC, and no warranties, either express or implied, of merchantability and fitness for any particular purpose is made. In no event shall Nauman & Zelinski LLC be liable for any loss of profit or any consequential damages as a result of the use or reuse of these electronic files.

ELECTRONIC FILE FORMAT (Select One):

AutoCAD: ____ (Only Floor Plan Drawings will be issued in electronic format)

LIST OF DRAWINGS REQUESTED

_____

_____

FILE FORMAT: Revit: ____ (Model only, no views will be included, no specific LOD.)

The following costs are applicable to delivery of these files by e-mail.

COST OF PREPARATION OF REVIT MODEL: $0
COST OF PREPARATION OF CAD FILES: $0

USER (CONTRACTOR NAME):_____

DATE:_____

ADDRESS:_____

_____

CITY:_____ **STATE:**_____ **ZIP:**_____

PHONE NO.:_____

SIGNED:_____ **TITLE:**_____

NAME (PRINTED):_____

SECTION 01 4000
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Submittals.
B. Quality assurance.
C. References and standards.
D. Testing and inspection agencies and services.
E. Contractor's design-related professional design services.
F. Control of installation.
G. Mock-ups.
H. Tolerances.
I. Manufacturers' field services.
J. Defect Assessment.

1.02 RELATED REQUIREMENTS

A. Document 00 3100 - Available Project Information: Soil investigation data.
B. Section 01 3000 - Administrative Requirements: Submittal procedures.
C. Section 01 6000 - Product Requirements: Requirements for material and product quality.

1.03 REFERENCE STANDARDS

A. IAS AC89 - Accreditation Criteria for Testing Laboratories; 2021.

1.04 DEFINITIONS

A. Contractor's Professional Design Services / Delegated Design: Design of some aspect or portion of the project by party other than the design professional of record. Provide these services as part of the Contract for Construction.
    1. Design Services Types Required:
        a. Design-Related: Design services explicitly required to be performed by another design professional due to highly-technical and/or specialized nature of a portion of the project. Services primarily involve engineering analysis, calculations, and design, and are not intended to alter the aesthetic aspects of the design.
B. Design Data: Design-related, signed and sealed drawings, calculations, specifications, certifications, shop drawings and other submittals provided by Contractor, and prepared directly by, or under direct supervision of, appropriately licensed design professional.

1.05 CONTRACTOR'S DESIGN-RELATED PROFESSIONAL DESIGN SERVICES

A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.
B. Base design on performance and/or design criteria indicated in individual specification sections.
    1. Submit a Request for Interpretation to Architect if the criteria indicated are not sufficient to perform required design services.
C. Scope of Contractor's Professional Design Services: Provide for the following items of work:

1.06 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Designer's Qualification Statement: Submit for Architect's knowledge as contract administrator, or for Owner's information.
   1. Include information for each individual professional responsible for producing, or supervising production of, design-related professional services provided by Contractor.
      a. Full name.
      b. Professional licensure information.
      c. Statement addressing extent and depth of experience specifically relevant to design of items assigned to Contractor.

C. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
   1. Include calculations that have been used to demonstrate compliance to performance and regulatory criteria provided, and to determine design solutions.
   2. Include required product data and shop drawings.
   3. Include a statement or certification attesting that design data complies with criteria indicated, such as building codes, loads, functional, and similar engineering requirements.
   4. Include signature and seal of design professional responsible for allocated design services on calculations and drawings.

D. Test Reports: After each test/inspection, promptly submit copies of report to Architect and to Contractor.
   1. Include:
      a. Date issued.
      b. Project title and number.
      c. Name of inspector.
      d. Date and time of sampling or inspection.
      e. Identification of product and specifications section.
      f. Location in the Project.
      g. Type of test/inspection.
      h. Date of test/inspection.
      i. Results of test/inspection.
      j. Compliance with Contract Documents.
      k. When requested by Architect, provide interpretation of results.
   2. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.

E. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
   1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

F. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
   1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.

1.07 QUALITY ASSURANCE

A. Testing Agency Qualifications:
   1. Prior to start of work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
   2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.

3. Qualification Statement: Provide documentation showing testing laboratory is accredited under IAS AC89.

B. Designer Qualifications: Where professional engineering design services and design data submittals are specifically required of Contractor by Contract Documents, provide services of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.08 REFERENCES AND STANDARDS

A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

C. Obtain copies of standards where required by product specification sections.

D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.

E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from Contract Documents by mention or inference otherwise in any reference document.

1.09 TESTING AND INSPECTION AGENCIES AND SERVICES

A. Owner will employ and pay for services of an independent testing agency to perform special tests and inspections required by authorities having jurisdiction as the responsibility of the Owner, as indicated in the Statement of Special Inspections included at the end of this Section and as follows: .
   1. Notifying Architect and Contractor promptly of any irregularities and deficiences observed in the Work during performance of its services.
   2. Submitting a certified written report of each test, inspection, and similar quality control services to Architect with a copy to Contractor and to authorities having jurisdiction.
   3. Retesting and reinspecting corrected Work.

B. Contractor shall employ and pay for services of an independent testing agency to perform other specified testing.

C. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 MOCK-UPS

A. Before installing portions of the Work where mock-ups are required, construct mock-ups in location and size indicated for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.

B. Accepted mock-ups establish the standard of quality the Architect will use to judge the Work.

C. Notify Architect fifteen (15) working days in advance of dates and times when mock-ups will be constructed.

D. Provide supervisory personnel who will oversee mock-up construction. Provide workers that will be employed during the construction at Project.

E. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.

F. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

G. Obtain Architect's approval of mock-ups before starting work, fabrication, or construction.
   1. Architect will issue written comments within seven (7) working days of initial review and each subsequent follow up review of each mock-up.
   2. Make corrections as necessary until Architect's approval is issued.

H. Architect will use accepted mock-ups as a comparison standard for the remaining Work.

I. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Architect.

3.03 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

3.04 TESTING AND INSPECTION

A. See individual specification sections for testing and inspection required.

B. Testing Agency Duties:
   1. Provide qualified personnel at site. Cooperate with Architect and Construction Manager in performance of services.
   2. Perform specified sampling and testing of products in accordance with specified standards.
   3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
   4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
   5. Perform additional tests and inspections required by Architect.
   6. Submit reports of all tests/inspections specified.

C. Limits on Testing/Inspection Agency Authority:
   1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.

2. Agency may not approve or accept any portion of the Work.
3. Agency may not assume any duties of Contractor.
4. Agency has no authority to stop the Work.

D. Contractor Responsibilities:
1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
3. Provide incidental labor and facilities:
a. To provide access to Work to be tested/inspected.
b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
c. To facilitate tests/inspections.
d. To provide storage and curing of test samples.
4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

E. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.

F. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.05 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance equipment as applicable, and to initiate instructions when necessary.

B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.06 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not complying with specified requirements.

B. If, in the opinion of Architect, it is not practical to remove and replace the work, Architect will direct an appropriate remedy or adjust payment.

END OF SECTION 01 4000

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SECTION 01 5000
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary utilities.

B. Temporary telecommunications services.

C. Temporary sanitary facilities.

D. Security requirements.

E. Vehicular access and parking.

F. Waste removal facilities and services.

G. Project identification sign.

H. Field offices.

1.02 TEMPORARY UTILITIES

A. Owner will provide the following:
   1. Electrical power and metering, consisting of connection to existing facilities.
   2. Water supply, consisting of connection to existing facilities.

B. New permanent facilities may be used.

1.03 ELECTRONIC COMMUNICATION SERVICES

A. Provide, maintain, and pay for a secure WiFi wireless connection to internet services to field office at time of project mobilization. Include provisions for access to relevant parties including but not limited to, Owner's construction forces, Architect, testing agencies, and authorities having jurisdiction.

1.04 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

B. Maintain daily in clean and sanitary condition.

1.05 SECURITY

A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.

1.06 VEHICULAR ACCESS AND PARKING

A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.

B. Coordinate access and haul routes with governing authorities and Owner.

C. Provide and maintain access to fire hydrants, free of obstructions.

D. Provide means of removing mud from vehicle wheels before entering streets.

E. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

1.07 WASTE REMOVAL

A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

B. Provide containers with lids. Remove trash from site periodically.

C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.08 PROJECT IDENTIFICATION

A. Provide project construction sign of design and construction indicated on drawings.

B. Erect on site at location indicated.

C. No other signs are allowed without Owner permission except those required by law.
   1. Provide other temporary signs as indicated and as required to inform public and individuals seeking entrance to Project.
   2. Maintain and touch up signs, so they are legible at all times.

1.09 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.

B. Remove underground installations to a minimum depth of 2 feet (600 mm). Grade site as indicated.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore new permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 5000

SECTION 01 6000
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General product requirements.

B. Transportation, handling, storage and protection.

C. Product option requirements.

D. Substitution limitations.

E. Procedures for Owner-supplied products.

F. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

A. Section 01 1000 - Summary: Identification of Owner-supplied products.

B. Section 01 2500 - Substitution Procedures: Substitutions made during procurement and/or construction phases.

C. Section 01 4000 - Quality Requirements: Product quality monitoring.

D. Section 01 7419 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.

1.03 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purschased for Project or taken from previously purchased stock. The term "product: includes the terms "material," "equipment," "system," and terms of similar intent.

B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accomplanited by the words "basis-of-design product," including make or model number or other designation. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.

1.04 SUBMITTALS

A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
   1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS

2.01 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by Contract Documents.

B. See Section 01 4000 - Quality Requirements, for additional source quality control requirements.

C. Use of products having any of the following characteristics is not permitted:
   1. Made using or containing CFC's or HCFC's.

D. Where other criteria are met, Contractor shall give preference to products that:
   1. If used on interior, have lower emissions.
   2. If wet-applied, have lower VOC content.

2.02 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.03 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

A. See Section 01 2500 - Substitution Procedures.

3.02 OWNER-SUPPLIED PRODUCTS

A. See Section 01 1000 - Summary for identification of Owner-supplied products.

B. Owner's Responsibilities:
   1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
   2. Arrange and pay for product delivery to site.
   3. On delivery, inspect products jointly with Contractor.
   4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
   5. Arrange for manufacturers' warranties, inspections, and service.

C. Contractor's Responsibilities:
   1. Review Owner reviewed shop drawings, product data, and samples.
   2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
   3. Handle, store, install and finish products.
   4. Repair or replace items damaged after receipt.

3.03 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

D. Transport and handle products in accordance with manufacturer's instructions.

E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.04 STORAGE AND PROTECTION

A. Provide protection of stored materials and products against theft, casualty, or deterioration.

B. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 7419.
   1. Structural Loading Limitations: Handle and store products and materials so as not to exceed static and dynamic load-bearing capacities of project floor and roof areas.

C. Store and protect products in accordance with manufacturers' instructions.

D. Store with seals and labels intact and legible.

E. Arrange storage of materials and products to allow for visual inspection for the purpose of determination of quantities, amounts, and unit counts.

F. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.

G. For exterior storage of fabricated products, place on sloped supports above ground.

H. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

I. Comply with manufacturer's warranty conditions, if any.

J. Do not store products directly on the ground.

K. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

L. Prevent contact with material that may cause corrosion, discoloration, or staining.

M. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

N. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION 01 6000

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SECTION 01 7000
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Pre-installation meetings.

C. Cutting and patching.

D. Surveying for laying out the work.

E. Cleaning and protection.

F. Starting of systems and equipment.

G. Demonstration and instruction of Owner personnel.

H. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittals procedures.

B. Section 01 4000 - Quality Requirements: Testing and inspection procedures.

C. Section 01 5000 - Temporary Facilities and Controls: Temporary exterior enclosures.

D. Section 01 7800 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.

E. Section 01 7900 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections

F. Section 07 8400 - Firestopping.

1.03 REFERENCE STANDARDS

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2022, with Errata (2021).

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
   1. On request, submit documentation verifying accuracy of survey work.
   2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in compliance with Contract Documents.
   3. Submit surveys and survey logs for the project record.

C. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
   1. Structural integrity of any element of Project.
   2. Integrity of weather exposed or moisture resistant element.
   3. Efficiency, maintenance, or safety of any operational element.
   4. Visual qualities of sight exposed elements.
   5. Work of Owner or separate Contractor.

1.05 QUALIFICATIONS

A. For surveying work, employ a land surveyor registered in the State in which the Project is located and acceptable to Architect. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities,

1.06 PROJECT CONDITIONS

A. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

B. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.

1.07 COORDINATION

A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Notify affected utility companies and comply with their requirements.

C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

F. Coordinate completion and clean-up of work of separate sections.

G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, work of the specific section.

C. Notify Architect four days in advance of meeting date.

D. Prepare agenda and preside at meeting:
   1. Review conditions of examination, preparation and installation procedures.
   2. Review coordination with related work.

E. Record minutes and distribute copies within two days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

3.04 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Architect of any discrepancies discovered.

C. Contractor shall locate and protect survey control and reference points.

D. Control datum for survey is that indicated on drawings.

E. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

F. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

G. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.

H. Utilize recognized engineering survey practices.

I. Establish a minimum of two permanent bench marks on site, referenced to established control points. Record locations, with horizontal and vertical data, on project record documents.

J. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
   1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
   2. Grid or axis for structures.
   3. Building foundation, column locations, ground floor elevations.
   4. Controlling lines and levels required for mechanical and electrical trades.

K. Periodically verify layouts by same means.

L. Maintain a complete and accurate log of control and survey work as it progresses.

M. On completion of foundation walls and major site improvements, prepare a certified survey illustrating dimensions, locations, angles, and elevations of construction and site work.

3.05 GENERAL INSTALLATION REQUIREMENTS

A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.06 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. Perform whatever cutting and patching is necessary to:
1. Complete the work.
2. Fit products together to integrate with other work.
3. Provide openings for penetration of mechanical, electrical, and other services.
4. Match work that has been cut to adjacent work.
5. Repair areas adjacent to cuts to required condition.
6. Repair new work damaged by subsequent work.
7. Remove samples of installed work for testing when requested.
8. Remove and replace defective and non-complying work.

C. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

D. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

E. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

F. Restore work with new products in accordance with requirements of Contract Documents.

G. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

H. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 8400, to full thickness of the penetrated element.

I. Patching:
1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
2. Match color, texture, and appearance.
3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.07 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.08 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

F. Protect work from spilled liquids. If work is exposed to spilled liquids, immediately remove protective coverings, dry out work, and replace protective coverings.

G. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

H. Prohibit traffic from landscaped areas.

I. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

J. Comply with manufacturer's written instructions for temperature and relative humidity.

3.09 SYSTEM STARTUP

A. Coordinate schedule for start-up of various equipment and systems.

B. Notify Architect and Owner seven days prior to start-up of each item.

C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.

D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

E. Verify that wiring and support components for equipment are complete and tested.

F. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.

G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

H. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.10 DEMONSTRATION AND INSTRUCTION

A. See Section 01 7900 - Demonstration and Training.

3.11 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

B. Testing, adjusting, and balancing HVAC systems: See Section 23 0593 - Testing, Adjusting, and Balancing.

3.12 FINAL CLEANING

A. Execute final cleaning prior to Substantial Completion.

B. Use cleaning materials that are nonhazardous. Use materials recommended by manufacturer or fabricator of the surface to be cleaned.

C. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

D. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

E. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

F. Clean filters of operating equipment.

G. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, and drainage systems.

H. Clean site; sweep paved areas, rake clean landscaped surfaces.

I. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.13 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.
   1. Provide copies to Architect.

B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.

C. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.

D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.

E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.

F. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.

G. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.

H. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

END OF SECTION 01 7000

SECTION 01 7419
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

A. Owner requires that this project generate the least amount of trash and waste possible.

B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.

C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.

D. Contractor Reporting Responsibilities: Submit periodic Waste Disposal Reports; report landfill disposal, incineration, recycling, salvage, and reuse regardless of to whom the cost or savings accrues; use the same units of measure on required reports.

E. Methods of trash/waste disposal that are not acceptable are:
   1. Burning on the project site.
   2. Burying on the project site.
   3. Dumping or burying on other property, public or private.
   4. Other illegal dumping or burying.

F. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.

B. Section 01 5000 - Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.

C. Section 01 6000 - Product Requirements: Waste prevention requirements related to delivery, storage, and handling.

D. Section 01 7000 - Execution and Closeout Requirements: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

1.03 DEFINITIONS

A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.

B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.

C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.

D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.

E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.

F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

I. Return: To give back reusable items or unused products to vendors for credit.

J. Reuse: To reuse a construction waste material in some manner on the project site.

K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.

L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.

M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

N. Toxic: Poisonous to humans either immediately or after a long period of exposure.

O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

PART 3 EXECUTION

2.01 WASTE MANAGEMENT PROCEDURES

A. See Section 01 3000 for additional requirements for project meetings, reports, submittal procedures, and project documentation.

B. See Section 01 5000 for additional requirements related to trash/waste collection and removal facilities and services.

C. See Section 01 6000 for waste prevention requirements related to delivery, storage, and handling.

D. See Section 01 7000 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

2.02 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.

B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect.

C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

D. Meetings: Discuss trash/waste management goals and issues at project meetings.
   1. Prebid meeting.
   2. Preconstruction meeting.
   3. Regular job-site meetings.

E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
   1. Provide containers as required.
   2. Provide adequate space for pick-up and delivery and convenience to subcontractors.
   3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.

I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION 01 7419

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SECTION 01 7800
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project record documents.

B. Operation and maintenance data.

C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

B. Section 01 7000 - Execution and Closeout Requirements: Contract closeout procedures.

C. Individual Product Sections: Specific requirements for operation and maintenance data.

D. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.

B. Operation and Maintenance Data:
   1. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
   2. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
   3. Submit two sets along with digital version of revised final documents in final form within 10 days after final inspection.

C. Warranties and Bonds:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
   2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
   3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Specifications.
   3. Addenda.
   4. Change Orders and other modifications to the Contract.
   5. Reviewed shop drawings, product data, and samples.
   6. Manufacturer's instruction for assembly, installation, and adjusting.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress.

E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
   1. Manufacturer's name and product model and number.
   2. Product substitutions or alternates utilized.
   3. Changes made by Addenda and modifications.

F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
   1. Measured depths of foundations in relation to finish first floor datum.
   2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
   3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
   4. Field changes of dimension and detail.
   5. Details not on original Contract drawings.

G. Submit PDF electronic files of scanned record prints, specifications and product data, including addenda and contract modifications.

3.02 OPERATION AND MAINTENANCE DATA

A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:
   1. Product data, with catalog number, size, composition, and color and texture designations.
   2. Information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

C. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.

D. Additional information as specified in individual product specification sections.

E. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:
   1. Description of unit or system, and component parts.
   2. Identify function, normal operating characteristics, and limiting conditions.
   3. Include performance curves, with engineering data and tests.
   4. Complete nomenclature and model number of replaceable parts.

B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.

D. Include color coded wiring diagrams as installed.

E. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

F. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
   1. Include HVAC outdoor and exhaust air damper calibration strategy.
      a. Include provisions which ensure that full closure of dampers can be achieved.
   2. Include Carbon Dioxide Monitoring Protocol.
   3. Include Carbon Monoxide Monitoring Protocol.
   4. Include Frost Mitigation Strategy for ventilation heat-recovery system.

G. Provide servicing and lubrication schedule, and list of lubricants required.

H. Include manufacturer's printed operation and maintenance instructions.

I. Include sequence of operation by controls manufacturer.

J. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

K. Provide control diagrams by controls manufacturer as installed.

L. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.

M. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

N. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

O. Include test and balancing reports.

P. Additional Requirements: As specified in individual product specification sections.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.

B. Where systems involve more than one specification section, provide separate tabbed divider for each system.

C. Binders: Commercial quality, 8-1/2 by 11 inch (216 by 280 mm) three D side ring binders with durable plastic covers; 2 inch (50 mm) maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Construction Manager, Architect, Consultants, Contractor and subcontractors, with names of responsible parties.

F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.

G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.

H. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.

I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

J. Arrangement of Contents: Organize each volume in parts as follows:
   1. Project Directory.
   2. Table of Contents, of all volumes, and of this volume.
   3. Operation and Maintenance Data: Arranged by system, then by product category.
      a. Source data.
      b. Operation and maintenance data.
      c. Field quality control data.
      d. Photocopies of warranties and bonds.

K. Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
   1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimium readable file size.
   2. File Names and Bookmarks: Bookmark individual documents base on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into indiviudual composite bookdmarked files, then create compostie manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

3.06 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

E. Manual: Bind in commercial quality 8-1/2 by 11 inch (216 by 279 mm) three D side ring binders with durable plastic covers.

F. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.

G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.

H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

I. Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at the beginning of each document.

END OF SECTION 01 7800

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SECTION 01 7900
DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.01 SUMMARY

A. Demonstration of products and systems where indicated in specific specification sections.

1.02 RELATED REQUIREMENTS

A. Section 01 7800 - Closeout Submittals: Operation and maintenance manuals.

B. Other Specification Sections: Additional requirements for demonstration and training.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Training Plan: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
   1. Submit to Architect for transmittal to Owner.
   2. Submit not less than four weeks prior to start of training.
   3. Revise and resubmit until acceptable.
   4. Provide an overall schedule showing all training sessions.
   5. Include at least the following for each training session:
      a. Identification, date, time, and duration.
      b. Description of products and/or systems to be covered.
      c. Name of firm and person conducting training; include qualifications.
      d. Intended audience, such as job description.
      e. Objectives of training and suggested methods of ensuring adequate training.
      f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
      g. Media to be used, such a slides, hand-outs, etc.
      h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.

C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
   1. Include applicable portion of O&M manuals.
   2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
   3. Provide one extra copy of each training manual to be included with operation and maintenance data.

D. Training Reports:
   1. Identification of each training session, date, time, and duration.
   2. Sign-in sheet showing names and job titles of attendees.
   3. List of attendee questions and written answers given, including copies of and references to supporting documentation required for clarification; include answers to questions that could not be answered in original training session.

E. Video Recordings: Submit digital video recording of each demonstration and training session for Owner's subsequent use.
   1. Format: Digital
   2. Label each digital file with session identification and date.

1.04 QUALITY ASSURANCE

A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.

1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 DEMONSTRATION - GENERAL

A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner.

B. Demonstration may be combined with Owner personnel training if applicable.

C. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
   1. Perform demonstrations not less than two weeks prior to Substantial Completion.
   2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

D. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
   1. Perform demonstrations not less than two weeks prior to Substantial Completion.

3.02 TRAINING - GENERAL

A. Conduct training on-site unless otherwise indicated.

B. Owner will provide classroom and seating at no cost to Contractor.

C. Provide training in minimum two hour segments.

D. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time.

E. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
   1. The location of the O&M manuals and procedures for use and preservation; backup copies.
   2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
   3. Typical uses of the O&M manuals.

F. Product- and System-Specific Training:
   1. Review the applicable O&M manuals.
   2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
   3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
   4. Provide hands-on training on all operational modes possible and preventive maintenance.
   5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
   6. Discuss common troubleshooting problems and solutions.
   7. Discuss any peculiarities of equipment installation or operation.
   8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
   9. Review recommended tools and spare parts inventory suggestions of manufacturers.
   10. Review spare parts and tools required to be furnished by Contractor.

11. Review spare parts suppliers and sources and procurement procedures.

G. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

END OF SECTION 01 7900

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SECTION 02 4100
DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Selective demolition of building elements for alteration purposes.

1.02 RELATED REQUIREMENTS

A. Section 01 1000 - Summary: Limitations on Contractor's use of site and premises.

B. Section 01 1000 - Summary: Sequencing and staging requirements.

C. Section 01 1000 - Summary: Description of items to be removed by Owner.

D. Section 01 1000 - Summary: Description of items to be salvaged or removed for re-use by Contractor.

E. Section 01 5000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

F. Section 01 7000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.

1.03 DEFINITIONS

A. Remove: Detach or dismantle items from existing construction and dispose of them off site, unless items are indicated to be salvaged or reinstalled.

B. Remove and Salvage: Detach or dismantle items from existing construction in a manner to prevent damage. Clean, package, label and deliver salvaged items to Owner in ready-for-reuse condition.

C. Remove and Reinstall: Detach or dismantle items from existing construction in a manner to prevent damage. Clean and prepare for reuse and reinstall where indicated.

D. Existing to Remain: Designation for existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

PART 3 EXECUTION

2.01 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with requirements in Section 01 7000.

B. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
   3. Provide, erect, and maintain temporary barriers and security devices.
   4. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
   5. Do not close or obstruct roadways or sidewalks without permits from authority having jurisdiction.
   6. Conduct operations to minimize obstruction of public and private entrances and exits. Do not obstruct required exits at any time. Protect persons using entrances and exits from removal operations.

7. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon, or limit access to their property.

C. Do not begin removal until receipt of notification to proceed from Owner.

D. Protect existing structures and other elements to remain in place and not removed.
   1. Provide bracing and shoring.
   2. Prevent movement or settlement of adjacent structures.
   3. Stop work immediately if adjacent structures appear to be in danger.

2.02 EXISTING UTILITIES

A. Coordinate work with utility companies. Notify utilities before starting work, comply with their requirements, and obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.

E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

2.03 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Existing construction and utilities indicated on drawings are based on casual field observation and existing record documents only.
   1. Verify construction and utility arrangements are as indicated.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.

B. Separate areas in which demolition is being conducted from areas that remain occupied.
   1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 01 5000 in locations indicated on drawings.

C. Remove existing work as indicated and required to accomplish new work.
   1. Remove items indicated on drawings.

D. Services including, but not limited to, HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications: Remove existing systems and equipment as indicated.
   1. Maintain existing active systems to remain in operation, and maintain access to equipment and operational components.
   2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
   3. See Section 01 1000 - Summary for limitations on outages and required notifications.
   4. Verify that abandoned services serve only abandoned facilities before removal.
   5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings. Remove back to source of supply where possible, otherwise cap stub and tag with identification.

E. Protect existing work to remain.
   1. Prevent movement of structure. Provide shoring and bracing as required.
   2. Perform cutting to accomplish removal work neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.

4. Patch to match new work.

2.04 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION 02 4100

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SECTION 03 3000
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete formwork.

B. Floors and slabs on grade.

C. Concrete reinforcement.

D. Joint devices associated with concrete work.

E. Miscellaneous concrete elements, including equipment pads and fence post piers.

F. Concrete curing.

1.02 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants: Products and installation for sealants and joint fillers for saw cut joints and isolation joints in slabs.

1.03 REFERENCE STANDARDS

A. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary; 2019 (Reapproved 2022).

B. ACI PRC-211.1 - Selecting Proportions for Normal-Density and High Density-Concrete - Guide; 2022.

C. ACI PRC-302.1 - Guide to Concrete Floor and Slab Construction; 2015.

D. ACI PRC-304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).

E. ACI PRC-308 - Guide to External Curing of Concrete; 2016.

F. ACI SPEC-301 - Specifications for Concrete Construction; 2020.

G. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2022.

H. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2022.

I. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2023.

J. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2023.

K. ASTM C150/C150M - Standard Specification for Portland Cement; 2022.

L. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2023.

M. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a (Reapproved 2016).

N. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2019.

O. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2019, with Editorial Revision (2022).

P. ASTM C618 - Standard Specification for Coal Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2023, with Editorial Revision.

Q. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 2017.

R. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 2020a.

S. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures; 2020.

T. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete; 2019.

U. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2022.

V. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Asphalt Types); 2023.

W. ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2018a.

X. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2017 (Reapproved 2023).

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.

C. Mix Design: Submit proposed concrete mix design.
   1. Indicate proposed mix design complies with requirements of ACI SPEC-301, Section 4 - Concrete Mixtures.

D. Samples: Submit samples of underslab vapor retarder to be used.

E. Sustainable Design Submittal: If any fly ash, ground granulated blast furnace slag, silica fume, rice hull ash, or other waste material is used in mix designs to replace Portland cement, submit the total volume of concrete cast in place, mix design(s) used showing the quantity of portland cement replaced, reports showing successful cylinder testing, and temperature on day of pour if cold weather mix is used.

1.05 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI SPEC-301 and ACI CODE-318.

PART 2 PRODUCTS

2.01 FORMWORK

A. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
   1. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.

2.02 REINFORCEMENT MATERIALS

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi) (420 MPa).
   1. Type: Deformed billet-steel bars.
   2. Finish: Unfinished, unless otherwise indicated.

B. Steel Welded Wire Reinforcement (WWR): Galvanized, plain type, ASTM A1064/A1064M.
   1. Form: Flat Sheets.
   2. WWR Style: 4 x 8-W6 x W10 (102 x 203-MW39 x MW65).

C. Reinforcement Accessories:
   1. Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch (1.29 mm).

2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.

2.03 CONCRETE MATERIALS

A. Cement: ASTM C150/C150M, Type I - Normal Portland type.
   1. Acquire cement for entire project from same source.

B. Fine and Coarse Aggregates: ASTM C33/C33M.
   1. Acquire aggregates for entire project from same source.

C. Fly Ash: ASTM C618, Class C or F.

D. Silica Fume: ASTM C1240, proportioned in accordance with ACI PRC-211.1.

E. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

2.04 ADMIXTURES

A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

B. Air Entrainment Admixture: ASTM C260/C260M.

C. Water Reducing and Retarding Admixture: ASTM C494/C494M Type D.

D. Water Reducing Admixture: ASTM C494/C494M Type A.

2.05 ACCESSORY MATERIALS

A. Underslab Vapor Retarder:
   1. Sheet Material: ASTM E1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. Single-ply polyethylene is prohibited.
   2. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.

2.06 BONDING AND JOINTING PRODUCTS

A. Epoxy Bonding System:
   1. Complying with ASTM C881/C881M and of Type required for specific application.

B. Slab Isolation Joint Filler: 1/2-inch (13 mm) thick, height equal to slab thickness, with removable top section forming 1/2-inch (13 mm) deep sealant pocket after removal.
   1. Material: ASTM D1751, cellulose fiber.

2.07 CURING MATERIALS

A. Curing and Sealing Compound, Moisture Emission-Reducing, Membrane-Forming: Clear, liquid sealer for application to newly-placed concrete; capable of providing adequate bond for flooring adhesives, initially and over the long term; with sufficient moisture vapor impermeability to prevent deterioration of flooring adhesives due to moisture emission.
   1. Use this product to cure and seal all slabs to receive adhesively applied flooring or roofing.
   2. Comply with ASTM C309 and ASTM C1315 Type I Class A.
   3. VOC Content: Less than 100 g/L.

B. Water: Potable, not detrimental to concrete.

2.08 CONCRETE MIX DESIGN

A. Proportioning Normal Weight Concrete: Comply with ACI PRC-211.1 recommendations.
   1. Replace as much Portland cement as possible with fly ash, ground granulated blast furnace slag, silica fume, or rice hull ash as is consistent with ACI recommendations.

B. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI SPEC-301.

1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.

C. Admixtures: Add acceptable admixtures as recommended in ACI PRC-211.1 and at rates recommended or required by manufacturer.

D. Normal Weight Concrete:
1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 3,000 pounds per square inch (20.7 MPa).
2. Fly Ash Content: Maximum 15 percent of cementitious materials by weight.
3. Silica Fume Content: Maximum 5 percent of cementitious materials by weight.
4. Water-Cement Ratio: Maximum percent per concrete types schedule by weight.
5. Total Air Content: Per concrete types schedule, determined in accordance with ASTM C173/C173M.
6. Maximum Slump: Maximum 5" for all members. If a superplasticizer is used, initial slump to be 3", increased to 8" maximum after addition (at the job site) of the superplasticizer.
7. Maximum Aggregate Size: 5/8 inch (16 mm).

2.09 MIXING

A. On Project Site: Mix in drum type batch mixer, complying with ASTM C685/C685M. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.

B. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.02 PREPARATION

A. Formwork: Comply with requirements of ACI SPEC-301. Design and fabricate forms to support all applied loads until concrete is cured and for easy removal without damage to concrete.

B. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in according to bonding agent manufacturer's instructions.
1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.

C. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

D. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Comply with ASTM E1643. Lap joints minimum 6 inches (150 mm). Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.
1. Vapor Retarder Over Granular Fill: Install compactible granular fill before placing vapor retarder as indicated on drawings. Do not use sand.

3.03 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

A. Comply with requirements of ACI SPEC-301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.

B. Install welded wire reinforcement in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.

3.04 PLACING CONCRETE

A. Place concrete in accordance with ACI PRC-304.

B. Place concrete for floor slabs in accordance with ACI PRC-302.1.

C. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

D. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.

E. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.

F. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

3.05 SLAB JOINTING

A. Locate joints as indicated on drawings.

B. Anchor joint fillers and devices to prevent movement during concrete placement.

C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.

3.06 FLOOR FLATNESS AND LEVELNESS TOLERANCES

A. Minimum F(F) Floor Flatness and F(L) Floor Levelness Values:
   1. Exposed to View and Foot Traffic: F(F) of 20; F(L) of 15, on-grade only.
   2. Under Carpeting: F(F) of 25; F(L) of 20, on-grade only.
   3. Under Thin Resilient Flooring and Thinset Tile: F(F) of 35; F(L) of 25, on-grade only.

B. F(F) Floor Flatness and F(L) Floor Levelness shall be in accordance with ASTM E1155.

C. Correct the slab surface if composite overall value is less than specified and if local value is less than two-thirds of specified value or less than F(F) 13/F(L) 10.

D. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.07 CONCRETE FINISHING

A. Concrete Slabs: Finish to requirements of ACI PRC-302.1 and as follows:
   1. Other Surfaces to Be Left Exposed: Trowel as described in ACI PRC-302.1, minimizing burnish marks and other appearance defects.

3.08 CURING AND PROTECTION

A. Comply with requirements of ACI PRC-308. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

C. Surfaces Not in Contact with Forms:
   1. Slabs and Floors To Receive Adhesive-Applied Flooring: Curing compounds and other surface coatings are usually considered unacceptable by flooring and adhesive manufacturers. If such materials must be used, either obtain the approval of the flooring and adhesive manufacturers prior to use or remove the surface coating after curing to flooring manufacturer's satisfaction.
   2. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
   3. Final Curing: Begin after initial curing but before surface is dry.

3.09 DEFECTIVE CONCRETE

A. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.

3.10 PROTECTION

A. Do not permit traffic over unprotected concrete floor surface until fully cured.

3.11 SCHEDULE - CONCRETE TYPES AND FINISHES

A. Interior Slabs on Grade, 4,000 PSI, Exposure Class: F0, Max Water Cement Ratio: 0.50, Air Content: Optional

B. Exterior, Unreinforced Slabs on Grade and Exterior Concrete Not Otherwise Identified, 4,500 PSI, Exposure Class: F2,C1, Max Water Cement Ratio: 0.45, Air Content: 5%-7%

END OF SECTION 03 3000

SECTION 04 2000
UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete block.
B. Clay facing brick.
C. Mortar and grout.
D. Reinforcement and anchorage.
E. Flashings.
F. Lintels.
G. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 07 2100 - Thermal Insulation: Insulation for cavity spaces.
B. Section 07 2500 - Weather Barriers: Water-resistive barriers applied to exterior face of backing sheathing or unit masonry substrate.
C. Section 07 6200 - Sheet Metal Flashing and Trim: Through-wall masonry flashings.
D. Section 07 9200 - Joint Sealants: Sealing control and expansion joints.

1.03 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
B. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2022.
C. ASTM C67/C67M - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile; 2023.
D. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2023.
E. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2023.
F. ASTM C140/C140M - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units; 2023a.
G. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2018.
H. ASTM C150/C150M - Standard Specification for Portland Cement; 2022.
I. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2018.
J. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale); 2023.
K. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019a, with Editorial Revision.
L. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2024.
M. ASTM C476 - Standard Specification for Grout for Masonry; 2023.
N. ASTM C780 - Standard Test Methods for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2023.
O. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2016.

P. ASTM C1714/C1714M - Standard Specification for Preblended Dry Mortar Mix for Unit Masonry; 2019a.

Q. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing; 2017.

R. BIA Technical Notes No. 13 - Ceramic Glazed Brick Exterior Walls; 2017.

S. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2022, with Errata (2024).

T. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all relevant installers.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.

C. Shop Drawings: Indicate pertinent dimensions, materials, anchorage, size and type of fasteners, and accessories for brickwork support system.

QUALITY ASSURANCE

2.01 FIRE RATED ASSEMBLIES: COMPLY WITH APPLICABLE CODE FOR UL ASSEMBLIES AS LISTED ON THE DRAWINGS.

2.02 MOCK-UPS

A. Construct a masonry wall as a mock-up panel sized 4 feet (1.219 m) long by 3 feet (.914 m) high; include mortar, accessories, structural backup, and flashings (with lap joint, corner, and end dam) in mock-up.

B. Locate where directed.

2.03 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

PART 2 PRODUCTS

3.01 CONCRETE MASONRY UNITS

A. Concrete Block: Comply with referenced standards and as follows:
   1. Size: Standard units with nominal face dimensions of 16 by 8 inches (400 by 200 mm) and nominal depths as indicated on drawings for specific locations.
   2. Special Shapes: Provide nonstandard blocks configured for corners.
      a. Provide bullnose units for outside corners.
      b. Provide U-shape units for bond beam lintels.
   3. Load-Bearing Units: ASTM C90, normal weight.
      a. Hollow block, as indicated.
   4. Nonloadbearing Units: ASTM C129.
      a. Hollow block, as indicated.
      b. Normal weight.

3.02 BRICK UNITS

A. Manufacturers:

B. Facing Brick: ASTM C216, Type FBS Smooth, Grade SW.
   1. Color and texture: Architect shall select a brick for each building based upon a $1,225/thousand cost range.
   2. Nominal size: As indicated on drawings.
   3. Special shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.

3.03 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I; color as required to produce approved color sample.
   1. Not more than 0.60 percent alkali.

B. Hydrated Lime: ASTM C207, Type S.

C. Mortar Aggregate: ASTM C144.

D. Grout Aggregate: ASTM C404.

E. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979/C979M.
   1. Color(s): As selected by Architect from manufacturer's full range.

F. Water: Clean and potable.

G. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C1714/C1714M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
   1. Type: Type S.
   2. Color: Standard gray.

H. Packaged Dry Material for Grout for Masonry: Premixed cementitious materials and dried aggregates; capable of producing grout of the specified strength in accordance with ASTM C476 with the addition of water only.
   1. Type: Fine.

3.04 REINFORCEMENT AND ANCHORAGE

A. Manufacturers:
   1. Hohmann & Barnard, Inc: www.h-b.com/#sle.
   2. WIRE-BOND; 2401 RJ-711 Adjustable Veneer Anchor: www.wirebond.com/#sle.

B. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi) (420 MPa), deformed billet bars; galvanized.

C. Joint Reinforcement: Use ladder type joint reinforcement where vertical reinforcement is involved and truss type elsewhere, unless otherwise indicated.

D. Flexible Anchors: 2-piece anchors that permit differential movement between masonry and building frame, sized to provide not less than 5/8 inch (16 mm) of mortar coverage from masonry face.

E. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A 153/A 153M, Class B.
   1. Anchor plates: Not less than 0.075 inch (1.91 mm) thick, designed for fastening to structural backup through sheathing by two fasteners; provide design with legs that penetrate sheathing and insulation to provide positive anchorage.
   2. Wire ties: Manufacturer's standard shape, 0.1875 inch (4.75 mm) thick.
   3. Vertical adjustment: Not less than 3-1/2 inches (89 mm).

F. Metal-to-Metal Fasteners: Self-drilling, self-tapping screws; corrosion resistant finish or hot dip galvanized to ASTM A153/A153M.

3.05 FLASHINGS

A. Combination Asphaltic Flashing Materials - Copper:
   1. Copper/Asphalt Flashing: 5 oz/sq ft (1.52 kg/sq m) copper sheet coated with elastic asphalt compound on both sides.
      a. Manufacturers:
         1) WIRE-BOND: www.wirebond.com/#sle.

B. Termination Bars: Aluminum; compatible with membrane and adhesives.

C. Lap Sealants and Tapes: As recommended by flashing manufacturer; compatible with membrane and adhesives.

3.06 ACCESSORIES

A. Preformed Control Joints: Polyvinyl chloride material. Provide with corner and tee accessories, fused joints.

B. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.

C. Weeps:
   1. Type: Extruded propylene with honeycomb design.
   2. Color(s): As selected by Architect from manufacturer's full range.

D. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

3.07 LINTELS

A. Concrete Masonry Unit Lintels: As indicated on the structural drawings.

B. Steel Lintels for Brick Veneer: As indicated on the structural drawings.

3.08 MORTAR AND GROUT MIXING

A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.
   1. Masonry below grade and in contact with earth: Type S.
   2. Exterior, loadbearing masonry: Type S.
   3. Exterior, non-loadbearing masonry: Type N.
   4. Interior, loadbearing masonry: Type S.
   5. Interior, non-loadbearing masonry: Type N.

B. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches (50 mm) or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches (50 mm).

C. Admixtures: Add to mixture at manufacturer's recommended rate and in accordance with manufacturer's instructions; mix uniformly.

PART 3 EXECUTION

4.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive masonry.

B. Verify that related items provided under other sections are properly sized and located.

C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

4.02 PREPARATION

A. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

4.03 COLD AND HOT WEATHER REQUIREMENTS

A. Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

4.04 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Concrete Masonry Units:
   1. Bond: Running.
   2. Coursing: One unit and one mortar joint to equal 8 inches (200 mm).
   3. Mortar Joints: Concave.

D. Brick Units:
   1. Bond: Running.
   2. Coursing: Three units and three mortar joints to equal 8 inches (200 mm).
   3. Mortar Joints: Concave.

4.05 PLACING AND BONDING

A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

B. Lay hollow masonry units with face shell bedding on head and bed joints.

C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.

D. Remove excess mortar and mortar smears as work progresses.

E. Interlock intersections and external corners, except for units laid in stack bond.

F. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

G. Cut mortar joints flush where wall tile is scheduled or resilient base is scheduled.

H. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

4.06 WEEPS/CAVITY VENTS

A. Install weeps in veneer and cavity walls at 24 inches (600 mm) on center horizontally on top of through-wall flashing above shelf angles and lintels and at bottom of walls.

4.07 CAVITY MORTAR CONTROL

A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.

B. For cavity walls, build inner wythe ahead of outer wythe to accommodate accessories.

4.08 REINFORCEMENT AND ANCHORAGE - GENERAL AND CAVITY WALL MASONRY

A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches (400 mm) on center.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches (400 mm) each side of opening.

C. Place continuous joint reinforcement in first and second joint below top of walls.

D. Embed longitudinal wires of joint reinforcement in mortar joint with at least 5/8 inch (16 mm) mortar cover on each side.

E. Lap joint reinforcement ends minimum 6 inches (150 mm).

F. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 36 inches (900 mm) horizontally and 24 inches (600 mm) vertically.

G. Embed ties and anchors in mortar joint and extend into masonry unit a minimum of 1-1/2 inches (38 mm) with at least 5/8 inch (16 mm) mortar cover to the outside face of the anchor.

4.09 MASONRY FLASHINGS

A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
   1. Extend flashings full width at such interruptions and at least 6 inches (152 mm), minimum, into adjacent masonry or turn up flashing ends at least 2 inches (50.8 mm), minimum, to form watertight pan at nonmasonry construction.
   2. Seal lapped ends and penetrations of flashing before covering with mortar.

B. Terminate flashing up 8 inches (203 mm) minimum on vertical surface of backing:
   1. Install vertical leg of flashing over fluid-applied or self-adhered air/vapor barriers over backing or per manufacturer’s directions.

C. Extend metal flashings to within 1/2 inch (12 mm) of exterior face of masonry and adhere to top of stainless steel angled drip with hemmed edge.

4.10 LINTELS

A. Install precast concrete lintels over brick veneer openings.

B. Install reinforced unit masonry lintels over openings where steel or precast concrete lintels are not scheduled. Reinforcing as indicated on the structural drawings.
   1. Do not splice reinforcing bars.
   2. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch (13 mm) of dimensioned position.
   3. Place and consolidate grout fill without displacing reinforcing.
   4. Allow masonry lintels to attain specified strength before removing temporary supports.

C. Maintain minimum 16 inch (200 mm) bearing on each side of opening.

4.11 GROUTED COMPONENTS

A. Reinforce bond beams as indicated on the structural drawings. Continue bond beam reinforcing and grout through control joints.

B. Lap splices as indicated on the strucutral drawings.

C. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch (13 mm) of dimensioned position.

D. Place and consolidate grout fill without displacing reinforcing.

E. At bearing locations, fill masonry cores with grout for a minimum 12 inches (300 mm) either side of opening.

4.12 CONTROL AND EXPANSION JOINTS

A. Do not continue horizontal joint reinforcement through control or expansion joints.

B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

C. Size control joints as indicated on drawings; if not indicated, 3/4 inch (19 mm) wide and deep.

D. Form expansion joint as detailed on drawings.

4.13 BUILT-IN WORK

A. As work progresses, install built-in metal door frames and glazed frames and other items to be built into the work and furnished under other sections.

B. Install built-in items plumb, level, and true to line.

C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.
   1. Fill adjacent masonry cores with grout minimum 12 inches (300 mm) from framed openings.

4.14 TOLERANCES

A. Install masonry within the site tolerances found in TMS 402/602.

B. Maximum Variation from Alignment of Columns: 1/4 inch (6 mm).

C. Maximum Variation From Unit to Adjacent Unit: 1/16 inch (1.6 mm).

D. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft (6 mm/3 m) and 1/2 inch in 20 ft (13 mm/6 m) or more.

E. Maximum Variation from Plumb: 1/4 inch (6 mm) per story non-cumulative; 1/2 inch (13 mm) in two stories or more.

F. Maximum Variation from Level Coursing: 1/8 inch in 3 ft (3 mm/m) and 1/4 inch in 10 ft (6 mm/3 m); 1/2 inch in 30 ft (13 mm/9 m).

G. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch (minus 6.4 mm, plus 9.5 mm).

H. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch (6 mm).

4.15 CUTTING AND FITTING

A. Cut and fit for pipes and conduit. Coordinate with other sections of work to provide correct size, shape, and location.

B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

4.16 PARGING

A. Dampen masonry walls prior to parging.

B. Scarify each parging coat to ensure full bond to subsequent coat.

C. Parge masonry walls in two uniform coats of mortar to a total thickness of 3/4 inch (19 mm).

D. Steel trowel surface smooth and flat with a maximum surface variation of 1/8 inch per foot (1 mm/m).

E. Strike top edge of parging at 45 degrees.

4.17 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.

B. Clay Masonry Unit Tests: Test each variety of clay masonry in accordance with ASTM C67/C67M requirements, sampling 5 randomly chosen units for each 50,000 installed.

C. Concrete Masonry Unit Tests: Test each variety of concrete unit masonry in accordance with ASTM C140/C140M for compliance with requirements of this specification.

D. Mortar Tests: Test each type of mortar in accordance with ASTM C780, testing with same frequency as masonry samples.

4.18 CLEANING

A. Remove excess mortar and mortar droppings.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.

D. Use non-metallic tools in cleaning operations.

4.19 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION 04 2000

SECTION 05 5305
METAL GRATINGS AND FLOOR PLATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Formed metal floor, mezzanine, and stair tread gratings.

B. Flat surface floor and stair tread plating.

1.02 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

C. ASTM A786/A786M - Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates; 2015 (Reapproved 2021).

D. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.

E. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021.

F. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

G. NAAMM MBG 531 - Metal Bar Grating Manual; 2017.

H. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate details of component supports, openings, perimeter construction details, and tolerances.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

C. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated within the previous 12 months.

1.04 QUALITY ASSURANCE

A. Designer Qualifications: Design gratings and plates under direct supervision of a licensed Professional Engineer experienced in design of this type of work.

B. Welder Qualifications: Welding processes and welding operators qualified within previous 12 months in accordance with AWS D1.1/D1.1M.

PART 2 PRODUCTS

2.01 MATERIALS

A. Steel Floor Plate: ASTM A786/A786M; manufacturer's standard pattern.

B. Steel For Welding or Riveting: ASTM A36/A36M unfinished, of shapes indicated.

C. Steel Framing: ASTM A36/A36M shapes, unfinished.

D. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

E. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

A. Grating Type: NAAMM MBG 531, Pressure Locked Type.

B. Fabricate support framing for openings.

C. Top Surface: Serrated.

2.03 FINISHES

A. Galvanizing for Steel Shapes: ASTM A123/A123M.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated on drawings.

B. Verify that opening sizes and dimensional tolerances are acceptable.

C. Verify that supports are correctly positioned.

3.02 INSTALLATION

A. Install components in accordance with manufacturer's instructions.

B. Place frames in correct position, plumb and level.

C. Mechanically cut galvanized finish surfaces. Do not flame cut.

D. Anchor by welding.

E. Set perimeter closure flush with top of grating and surrounding construction.

F. Secure to prevent movement.

3.03 SCHEDULES

A. Mezzanine: Manufactured die stamped type, serrations facing upward, galvanized steel, 200 lb/sq ft (976 kg/sq m) live load.

SECTION 06 1000
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preservative treated wood materials.

B. Fire retardant treated wood materials.

C. Communications and electrical room mounting boards.

D. Concealed wood blocking, nailers, and supports.

E. Wall sheathing with factory applied water-resistive and air barrier sheet.

1.02 RELATED REQUIREMENTS

A. Section 07 6200 - Sheet Metal Flashing and Trim: Sill flashings.

1.03 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

B. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing; 2003 (Reapproved 2017).

C. ASTM D2898 - Standard Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing; 2010 (Reapproved 2017).

D. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

F. AWPA U1 - Use Category System: User Specification for Treated Wood; 2023.

G. PS 20 - American Softwood Lumber Standard; 2021.

H. SPIB (GR) - Standard Grading Rules; 2021.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide technical data on wood preservative materials.

C. ABAA Field Quality Control Submittals: Submit third-party reports of testing and inspection required by ABAA QAP.

D. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.

E. ABAA Installer Qualification: Submit documentation of current contractor accreditation and current installer certification. Keep copies of all contractor accreditation and installer certification on site during and after installation. Present on-site documentation upon request.

1.05 QUALITY ASSURANCE

A. Air Barrier Association of America (ABAA) Quality Assurance Program (QAP); www.airbarrier.org/#sle:
   1. Installer Qualification: Use accredited contractor, certified installers, evaluated materials, and third-party field quality control audit.

2. Manufacturer Qualification: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture. Use secondary materials approved in writing by primary material manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, and installation.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
1. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
2. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Grading Agency: Southern Pine Inspection Bureau, Inc; SPIB (GR).

B. Sizes: Nominal sizes as indicated on drawings, .

C. Moisture Content: S-dry or MC19.

2.03 CONSTRUCTION PANELS

A. Wall Sheathing: Glass mat faced gypsum with integral water-resistive and air barrier, ASTM C1177/C1177M, 5/8 inch (15.9 mm) thick.
1. Edges: Square.
2. Water Vapor Permeance: 30 perms (1723.5 ng/(Pa s sq m)), minimum, when tested in accordance with ASTM E96/E96M.
3. Air Permeance, Sheathing: 0.001 cfm/sq ft (0.005 L/s per sq m), maximum, when tested in accordance with ASTM E2178.
4. Fluid-Applied Flashing: Approved by sheathing manufacturer.
5. Warranty:
a. Exposure: Manufacturer's standard; 12 months, against exposure damage, and dated from installation of product.
b. Defect: Manufacturer's standard; 5 years, against manufacturing defects, and dated from purchase of product.
c. Material: Manufacturer's standard; 5 years, dated from Date of Substantial Completion.
6. Products:
a. Georgia-Pacific LLC; DensElement Barrier System: www.DensElement.com/#sle. (Basis-of-Design)

2.04 ACCESSORIES

A. Fasteners and Anchors:
1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.

B. General Purpose Construction Adhesives: Comply with ASTM C557.

2.05 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
   1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
   2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

B. Fire Retardant Treatment:
   1. Exterior Type: AWPA U1, Category UCFB, Commodity Specification H, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes both before and after accelerated weathering test performed in accordance with ASTM D2898.
      a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
      b. Treat exterior rough carpentry items.
      c. Do not use treated wood in direct contact with the ground.
   2. Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
      a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
      b. Treat rough carpentry items as indicated .
      c. Do not use treated wood in applications exposed to weather or where the wood may become wet.

C. Preservative Treatment:
   1. Preservative Pressure Treatment of Plywood Above Grade: AWPA U1, Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative.
      a. Kiln dry plywood after treatment to maximum moisture content of 19 percent.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.02 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.

C. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

D. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

3.03 ROOF-RELATED CARPENTRY

A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

3.04 INSTALLATION OF CONSTRUCTION PANELS

A. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches (610 mm) on center on all edges and into studs in field of board.
   1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
   2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
   3. Install adjacent boards without gaps.
   4. Size and Location: As indicated on drawings.

B. Wall Sheathing with Water-Resistive Barrier and Air Barrier: Secure to studs in accordance with manufacturer's installation instructions.
   1. Install with laminated water-resistive and air barrier on exterior side of sheathing.
   2. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
   3. Use only mechanically attached and drainable EIFS and exterior insulation with wall sheathing with laminated water-resistive and air barrier.
   4. Apply manufacturer's standard seam tape to joints between sheathing panels; use tape gun or hard rubber roller in accordance with manufacturer's installation instructions.

3.05 TOLERANCES

A. Framing Members: 1/4 inch (6 mm) from true position, maximum.

B. Variation from Plane, Other than Floors: 1/4 inch in 10 feet (2 mm/m) maximum, and 1/4 inch in 30 feet (7 mm in 10 m) maximum.

3.06 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Coordination of ABAA Tests and Inspections:
   1. Provide testing and inspection required by ABAA QAP.
   2. Notify in ABAA writing of schedule for air barrier work. Allow adequate time for testing and inspection.
   3. Cooperate with ABAA testing agency.
   4. Allow access to air barrier work areas and staging.
   5. Do not cover air barrier work until tested, inspected, and accepted.

END OF SECTION 06 1000

SECTION 06 4100
ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Specially fabricated cabinet units.

B. Hardware.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Support framing, grounds, and concealed blocking.

B. Section 12 3600 - Countertops.

1.03 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 2022.

B. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications; 2022.

C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

D. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

E. BHMA A156.9 - Cabinet Hardware; 2020.

F. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting not less than one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
   1. Scale of Drawings: 1-1/2 inch to 1 foot (125 mm to 1 m), minimum.

C. Product Data: Provide data for hardware accessories.

D. Samples for Verification: Provide the following.
   1. Plastice Laminates, 8 x 10 inch for each type, color, pattern and surface finish.
   2. Lumber products with Shop-Applied Opaque Finish: 5 x 12 inch.

1.06 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
   1. Single Source Responsibility: Provide and install this work from single fabricator.

1.07 MOCK-UPS

A. Provide mock-up of typical base cabinet, wall cabinet, and countertop, including hardware, finishes, and plumbing accessories.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Protect units from moisture damage.

1.09 FIELD CONDITIONS

A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 PRODUCTS

2.01 CABINETS

A. Quality Standard: Premium Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Plastic Laminate Faced Cabinets:

C. Cabinets:
   1. Finish - Exposed Exterior Surfaces: Decorative laminate.
   2. Finish - Semi-Exposed Surfaces: Decorative laminate
   3. Finish - Concealed Surfaces: Manufacturer's option.
   4. Door and Drawer Front Edge Profiles: Square edge with inset band.
   5. Door and Drawer Front Retention Profiles: Fixed panel.
   6. Casework Construction Type: Type A - Frameless.
   7. Interface Style for Cabinet and Door: Style 1 - Overlay; reveal overlay.
   8. Adjustable Shelf Loading: 40 psf (19.5 gm/sq cm).
   9. Cabinet Style: Flush overlay.
   10. Cabinet Doors and Drawer Fronts: Flush style.
   11. Drawer Construction Technique: Dovetail joints.

2.02 WOOD-BASED COMPONENTS

A. Wood fabricated from old growth timber is not permitted.

2.03 PANEL CORE MATERIALS

A. Particleboard: Composite panel composed of cellulosic particles, additives, and bonding system; comply with ANSI A208.1.
   1. Grade: M-2; moisture resistance: MR10.
   2. Panel Thickness: 3/4 inch (19.1 mm).

B. Medium Density Fiberboard (MDF): Composite panel composed of cellulosic fibers, additives, and bonding system; cured under heat and pressure; comply with ANSI A208.2.
   1. Grade: 115; moisture resistance: MR10.
   2. Panel Thickness: 3/4 inch (19.1 mm).

2.04 THERMALLY FUSED LAMINATE PANELS

A. Thermally Fused Laminate (TFL): Melamine- or polyester-resin-saturated decorative papers; for fusion to composite wood substrates under heat and pressure.
   1. Test in accordance with NEMA LD 3 Section 3.
   2. Panel Core Substrate: Particleboard.
   3. Color: White.

2.05 LAMINATE MATERIALS

A. Manufacturers:
   1. As indicated on the drawings..
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.

C. Provide specific types as indicated.

1. Horizontal Surfaces: HGS, 0.048 inch (1.22 mm) nominal thickness, colors as indicated, finish as indicated.
2. Vertical Surfaces: VGS, 0.028 inch (0.71 mm) nominal thickness, colors as indicated, finish as indicated.
3. Laminate Backer: BKL, 0.020 inch (0.51 mm) nominal thickness, undecorated; for application to concealed backside of panels faced with high pressure decorative laminate.

2.06 COUNTERTOPS

A. Countertops: Refer to Section 12 3600.

2.07 ACCESSORIES

A. Adhesive: Type recommended by fabricator to suit application.

B. Plastic Edge Banding: Extruded ABS or PVC, convex shaped; smooth finish; self locking serrated tongue; of width to match component thickness.
1. Color: As indicated on drawings- match countertop color.

C. Fasteners: Size and type to suit application.

D. Drawer Organization Systems:
1. File Folder Frames: Pendaflex adjustable 14 gauge steel devices to accomodate hanging file folders: Provide at all file drawer locations.
2. Trash Can Pullout Drawer: Bottom mount trash pull out with soft-close feature and two 27 quart white plastic bins.
a. Products:
1) Rev-A-Shelf 5349 Series

E. Grommets: Standard plastic grommets for cut-outs, 3 inch OD, with matching plastic caps with slot for wire passage. .
1. Product: Doug Mockett & Company, Inc., "SG Series".
a. Color: To be selected by the Architect.

F. Glass Shelving and doors:
1. Provide door hardware, shelf supports and glass doors/shelves as indicated on the drawings.

G. Slatwall Panels:
1. Product: Anchor Core, 4 x 8 foot panels, 3/4 inch thick, 15 channels per board, spaced 3 inch on center with aluminum inserts.
2. Finish: Plastic laminate as selected by the Architect from standard finishes.
3. Accessories: Owner provided, owner installed.

2.08 HARDWARE

A. Hardware: BHMA A156.9, types as indicated for quality grade specified.

B. Adjustable Cabinet Shelf Supports: Standard side-mounted system using recessed metal shelf standards or multiple holes for pin supports and coordinated self rests, polished chrome finish, for nominal 1 inch (25 mm) spacing adjustments.

C. Adjustable Shelf Standards and Supports: Standard back-mounted system using surface mounted metal shelf standards and coordinated cantilevered shelf brackets, satin chrome finish, for nominal 1 inch (25 mm) spacing adjustments.
1. Products:
a. Knape and Vogt; #255 Steel Standards and #256 Steel Shelf Supports.
b. Location: Dorm Room Lockers and Kitchen Pantry Cabinets.

D. Adjustable Shelf Standards and Supports: Standard back-mounted system using surface mounted metal shelf standards and coordinated cantilevered shelf brackets, satin chrome finish, for nominal 1 inch (25 mm) spacing adjustments.
1. Products:

a. Knape and Vogt; KV185 Heavy Duty Double Slotted Shelf Brackets and KV85 Heavy Duty Double Slotted Shelf Standards.

E. Closet Rod:
1. Products:
a. Knape and Vogt; 660 Series Heavy Duty Round Closet Rod and 735 CHR wall-mount flanges.
2. Location: Dorm Room (DL) Lockers.

F. Closet Rod/Shelf Bracket:
1. Products:
a. Knape and Vogt; 1198 Series Extra Duty Rod and Shelf Brackets
2. Location: Crew Laundry Room.

G. Shelf Support Brackets: Fixed, L-shaped, corner reinforced, concealed mounting.
1. Materials: Formed steel shapes.
a. Finish: Manufacturer's standard, factory-applied, textured powder coat.
b. Color: Black.
2. Height: 5 inches (130 mm).
3. Support Length: 8 inches (200 mm).
4. Products:
a. A&M Hardware, Inc; Standard Brackets: www.aandmhardware.com/#sle.
b. Substitutions: See Section 01 6000 - Product Requirements.

H. Sliding Clothing Carrier:
1. Products:
a. Knape and Vogt; KV1, 12 inch deep.
2. Location: Typical Locker (LKR)
3. Workstation Brackets: Fixed, L-shaped, face-of-stud mounting.
a. Materials: Steel; L-shape cross-section.
1) Finish: Manufacturer's standard, factory-applied, powder coat.
2) Color: Almond.
3) Height: 15 inches (380 mm).
4) Support Length: 21 inches (530 mm).
5) Width: 1-1/2 inches (38 mm).
b. Products:
1) A&M Hardware, Inc; Standard Brackets: www.aandmhardware.com/#sle.
4. Drawer and Door Pulls: Provide Amerock Riva pull in polished nickel, BP55367PN, 5 inch centers..
5. Built-In Combination Cabinet Locks: Where indicated on the drawings.
a. Manufacturers:
1) Olympus Lock; Combi-Cam Ultra Series:7440, Brushed Alum Finish.
6. Cabinet Catches:
a. Manufacturers:
b. Location: Decon Room No. 145 and Shop Room 149.
7. Drawer Slides: General purpose cabinet drawers and specialty purpose drawers including but not limited to keyboard trays, pencil drawers and file drawers.
a. Type: Full extension with overtravel.
b. Static Load Capacity: Heavy Duty grade (HD-100).
1) File drawers: Provide Heavy Duty grade (HD-200)
c. Mounting: Side mounted.
d. Stops: Integral type.
e. Features: Provide self closing/stay closed type.
8. Drawer Slides: General purpose cabinet drawers in the Kitchen only.
a. Type: Full extension with overtravel.
b. Static Load Capacity: Heavy Duty grade (HD-100)
c. Mounting: Bottom mounted.

d. Stops: Integral type.

9. Hinges: European style concealed self-closing type, 125 degrees of opening , steel with nickel-plated finish (building standard).
   a. Manufacturers:
      1) Blum, Inc; CLIP top BLUMOTION: www.blum.com/#sle. 71B7550D
10. Hinges: 2 1/2 inch, 5-knuckle hinges made from 0.093 inch thick netak as follows:
   a. Manufacturers:
      1) Rockford Process Control (RPC) Model No. 376 26D with hospital tip non-removable pin.
   b. Location: Decon Room and Shop Maintenance Room.
11. Garment Hooks: Surface-mounted; Chrome.
   a. Manufacturers:
      1) Knape and Vogt; KV 2038 Series Commercial Garment Hook.

2.09 FABRICATION

A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.

B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.

D. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify location and sizes of utility rough-in associated with work of this section.

3.02 INSTALLATION

A. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.

B. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.

C. Use concealed joint fasteners to align and secure adjoining cabinet units.

D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch (0.79 mm). Do not use additional overlay trim for this purpose.

E. Secure cabinets to floor using appropriate angles and anchorages.

3.03 ADJUSTING

A. Adjust installed work.

B. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION 06 4100

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SECTION 07 2100
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Board insulation and integral vapor retarder at cavity wall construction and over metal studs in exterior veneer wall applications.

B. Batt insulation and vapor retarder in exterior wall construction.

C. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

1.02 RELATED REQUIREMENTS

A. Section 07 2700 - Air Barriers: Separate air barrier materials.

1.03 REFERENCE STANDARDS

A. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2023.

B. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2023.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

D. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 Degrees C; 2024.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

1.05 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Insulation Inside Masonry Cavity Walls: Extruded polystyrene (XPS) carbon black board.

B. Insulation Over Metal Stud Framed Walls with Metal Siding: Extruded polystyrene (XPS).

C. Insulation in Metal Framed Walls: Batt insulation with separate vapor retarder.

2.02 FOAM BOARD INSULATION MATERIALS

A. Extruded Polystyrene (XPS) Continuous Insulation (CI) Board: Comply with ASTM C578, and manufactured using carbon black technology.
   1. Type and Compressive Resistance: Type IV, 25 psi (173 kPa), minimum.
   2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
   3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   4. Type and Thermal Resistance, R-value (RSI-value): Type IV, 5.6 (0.98), minimum, per 1 inch (25.4 mm) thickness at 75 degrees F (24 degrees C) mean temperature.
   5. Board Size: 48 inch by 96 inch (1220 mm by 2440 mm).

6. Board Thickness: 2 inch (50.8 mm).
7. Board Edges: Shiplap, at long edges.
8. Products:
   a. DuPont de Nemours, Inc; Styrofoam Brand Ultra SL (Shiplap): building.dupont.com/#sle.
   b. Note: Use LiquidArmor Flashing and Sealan in conjunction with this system..
   c. Substitutions: See Section 01 6000 - Product Requirements.

B. Extruded Polystyrene (XPS) Cavity Wall Insulation Board: Comply with ASTM C578, and manufactured using carbon black technology.
1. Type and Compressive Resistance: Type IV, 25 psi (173 kPa), minimum.
2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
4. Type and Thermal Resistance, R-value (RSI-value): Type IV, 5.6 (0.98), minimum, per 1 inch (25.4 mm) thickness at 75 degrees F (24 degrees C) mean temperature.
5. Board Size: 15-3/4 inch by 96 inch (400 mm by 2440 mm).
6. Board Thickness: 1-3/4 inch (44.5 mm).
7. Board Edges: Square.
8. Products:
   a. DuPont de Nemours, Inc; Styrofoam Brand Cavitymate Ultra: building.dupont.com/#sle.
   b. Or approved equal.
   c. Substitutions: See Section 01 6000 - Product Requirements.

2.03 MINERAL FIBER BLANKET INSULATION MATERIALS

A. Flexible Glass Fiber Blanket Thermal Insulation: Preformed insulation, complying with ASTM C665; friction fit.
1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
2. Smoke Developed Index: 50 or less, when tested in accordance with ASTM E84.
3. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
4. Thermal Resistance: R-value (RSI-value) as indicated on the drawings.
5. Thickness: as indicated on the drawings.
6. Facing: Unfaced.
7. Products:
   a. CertainTeed Corporation: www.certainteed.com/#sle.
   b. Johns Manville: www.jm.com/#sle.
   c. Owens Corning Corporation; EcoTouch PINK FIBERGLAS Insulation: www.ocbuildingspec.com/#sle.

2.04 ACCESSORIES

A. Sheet Vapor Retarder: Black polyethylene film for above grade application, 10 mil, 0.010 inch (0.25 mm) thick.

B. Tape: Reinforced polyethylene film with acrylic pressure sensitive adhesive.
1. Application: Sealing of interior circular penetrations, such as pipes or cables.
2. Width: Are required for application.

C. Sill Plate Sealer: Closed-cell foam tape with rubberized adhesive membrane; bridges gap between foundation structure and sill plate or skirt board.
1. Width: 3-1/2 inches (89 mm).
2. Ultraviolet (UV) and Weathering Resistance: Approved in writing by manufacturer for up to 30 days of weather exposure.
3. Products:
   a. Dupont Styrofoam Brand Sill Seal Foam Gasket.

D. Liquid Flashing: Single-component, nonsag flashing and weather barrier sealant.

1. Products:

E. Air and Moisture Sealing Insulation Fasteners: Preassembled fastener units consisting of sealing washer, screw, and gasketing tube.
   1. Length as required for thickness of insulation material and penetration of deck substrate.
   2. Products:
      a. TruFast Walls, a Division of Altenloh, Brinck & Co. US, Inc; Grip-Deck Self Drilling Ceramic Coated Screws: www.trufastwalls.com/#sle.

F. Adhesive: Type recommended by insulation manufacturer for application.

G. Roof Ventilation Baffles: Prefabricated ventilation channels for placement under roof sheathing with baffles to prevent wind-washing.
   1. Material: Polyvinyl Chloride (PVC)
   2. Roof Joist/Truss Spacing: 16 inch (406 mm) on center nominal.
   3. Manufacturers:
      a. Brentwood Industries, Inc.; AccuVent Original.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation and adhesive.

B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 BOARD INSTALLATION AT CAVITY WALLS

A. Apply adhesive to back of boards:
   1. Three continuous beads per board length.
   2. Full bed 1/8 inch (3.2 mm) thick.

B. Install boards to fit snugly between wall ties.
   1. Place membrane surface against adhesive.
   2. Place membrane surface facing out, and tape seal board joints.

C. Install boards horizontally on walls.
   1. Place boards to maximize adhesive contact.
   2. Butt edges and ends tightly to adjacent boards and protrusions.

D. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane. Use tape manufacturer approved spray foam insulation at all joints to achieve an air-tight installation.

3.03 BOARD INSTALLATION USING CLADDING AND CONTINUOUS INSULATION SUPPORTS

A. Install supports in accordance with manufacturer's installation instructions.

B. Install supports in compliance with system orientation, sizes, and locations as indicated on drawings and in accordance with approved shop drawings.

C. Install supports to fill in exterior wall spaces without gaps or voids in insulation.

D. Trim insulation neatly to fit spaces and provide a continuous thermal layer.

3.04 BOARD INSTALLATION UNDER CONCRETE SLABS

A. Place insulation under slabs on grade after base for slab has been compacted.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

C. Prevent insulation from being displaced or damaged while placing vapor retarder and placing slab.

3.05 BATT INSTALLATION

A. Install insulation and vapor retarder in accordance with manufacturer's instructions.

B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

E. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically.

F. At metal framing, place vapor retarder on warm side of insulation; lap and seal sheet retarder joints over face of member

G. Tape seal tears or cuts in vapor retarder.

H. Extend vapor retarder tightly to full perimeter of adjacent window and door frames and other items interrupting the plane of the membrane; tape seal in place.

I. Place insulation against baffles, and do not impede natural attic ventilation to soffit.

3.06 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION 07 2100

SECTION 07 8400
FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Firestopping systems.

B. Firestopping of joints and penetrations in fire-resistance-rated and smoke-resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.02 RELATED REQUIREMENTS

A. Section 09 2116 - Gypsum Board Assemblies: Gypsum wallboard fireproofing.

1.03 REFERENCE STANDARDS

A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2022.

B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2023a.

C. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems; 2015 (Reapproved 2019).

D. ASTM E2174 - Standard Practice for On-Site Inspection of Installed Firestop Systems; 2020a.

E. ASTM E2393 - Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers; 2020a.

F. ASTM E2307 - Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus; 2023b.

G. ASTM E2837 - Standard Test Method for Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed between Rated Wall Assemblies and Nonrated Horizontal Assemblies; 2023a.

H. ITS (DIR) - Directory of Listed Products; Current Edition.

I. FM (AG) - FM Approval Guide; Current Edition.

J. UL 1479 - Standard for Fire Tests of Penetration Firestops; Current Edition, Including All Revisions.

K. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems; Current Edition, Including All Revisions.

L. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.

C. Product Data: Provide data on product characteristics, performance ratings, and limitations.

D. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Installer's qualification statement.

1.05 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.

1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.

B. Installer Qualifications: Company specializing in performing the work of this section and:
1. Verification of minimum three years documented experience installing work of this type.

1.06 FIELD CONDITIONS

A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Firestopping Manufacturers:
1. 3M Fire Protection Products: www.3m.com/firestop/#sle.
2. Hilti, Inc: www.hilti.com/#sle.
3. Specified Technologies Inc: www.stifirestop.com/#sle.
4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Firestopping Materials: Any materials meeting requirements.

B. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

C. Fire Ratings: Refer to drawings for required systems and ratings.

2.03 FIRESTOPPING ASSEMBLY REQUIREMENTS

A. Perimeter Fire Containment Firestopping: Use system that has been tested according to ASTM E2307 to have fire resistance F Rating equal to required fire rating of floor assembly.

B. Head-of-Wall (HW) Joint System Firestopping at Joints Between Fire-Rated Wall Assemblies and Non-Rated Horizontal Assemblies: Use system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of wall assembly.

C. Floor-to-Floor (FF), Floor-to-Wall (FW), Head-of-Wall (HW), and Wall-to-Wall (WW) Joints, Except Perimeter, Where Both Are Fire-Rated: Use system that has been tested according to ASTM E1966 or UL 2079 to have fire resistance F Rating equal to required fire rating of the assembly in which the joint occurs.

D. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.

2.04 FIRESTOPPING SYSTEMS

A. Firestopping: Any material meeting requirements.
1. Fire Ratings: Use system that is listed by FM (AG), ITS (DIR), or UL (FRD) and tested in accordance with ASTM E814, ASTM E119, or UL 1479 with F Rating equal to fire rating of penetrated assembly and minimum T Rating Equal to F Rating and in compliance with other specified requirements.
2. Fire Ratings: See drawings for required systems and ratings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

3.03 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

B. Do not cover installed firestopping until inspected by authorities having jurisdiction.

C. Install labeling required by code.

3.04 FIELD QUALITY CONTROL

A. Independent Testing Agency: Inspection agency employed and paid by Owner, will examine penetration firestopping in accordance with ASTM E2174 and ASTM E2393.

B. Repair or replace penetration firestopping and joints at locations where inspection results indicate firestopping or joints do not meet specified requirements.

3.05 CLEANING

A. Clean adjacent surfaces of firestopping materials.

3.06 PROTECTION

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION 07 8400

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SECTION 07 9200
JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Self-leveling pourable joint sealants.

C. Joint backings and accessories.

1.02 RELATED REQUIREMENTS

A. Section 09 2116 - Gypsum Board Assemblies: Sealing acoustical and sound-rated walls and ceilings.

B. Section 09 3000 - Tiling: Sealant between tile and plumbing fixtures and at junctions with other materials and changes in plane.

1.03 REFERENCE STANDARDS

A. ASTM C794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants; 2018 (Reapproved 2022).

B. ASTM C834 - Standard Specification for Latex Sealants; 2017 (Reapproved 2023).

C. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2022.

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

E. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems; 2023.

F. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016 (Reapproved 2023).

G. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2022.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Submit manufacturer's technical datasheets for each product to be used; include the following:
   1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
   2. List of backing materials approved for use with the specific product.
   3. Backing material recommended by sealant manufacturer.
   4. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
   5. Substrates the product should not be used on.
   6. Substrates for which use of primer is required.
   7. Installation instructions, including precautions, limitations, and recommended backing materials and tools.
   8. Sample product warranty.
   9. Certification by manufacturer indicating that product complies with specification requirements.

C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.

D. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

E. Preconstruction Laboratory Test Reports: Submit at least four weeks prior to start of installation.

F. Executed warranty.

1.05 QUALITY ASSURANCE

A. Maintain one copy of each referenced document covering installation requirements on site.

B. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.

C. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.
   1. Adhesion Testing: In accordance with ASTM C794.
   2. Compatibility Testing: In accordance with ASTM C1087.
   3. Stain Testing: In accordance with ASTM C1248; required only for stone substrates.
   4. Allow sufficient time for testing to avoid delaying the work.
   5. Deliver sufficient samples to manufacturer for testing.
   6. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.
   7. Testing is not required if sealant manufacturer provides data showing previous testing, not older than 24 months, that shows satisfactory adhesion, lack of staining, and compatibility.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 2-year manufacturer warranty for installed sealants and accessories that fail to achieve a watertight seal, exhibit loss of adhesion or cohesion, or do not cure. Complete forms in Owner's name and register with manufacturer.

C. Extended Correction Period: Correct defective work within 2-year period commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Nonsag Sealants:
   1. Bostik Inc: www.bostik-us.com/#sle.
   2. Dow: www.dow.com/#sle.
   3. Pecora Corporation: www.pecora.com/#sle.
   4. Sika Corporation: www.usa.sika.com/#sle.
   5. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
   6. W. R. Meadows, Inc: www.wrmeadows.com/#sle.
   7. Substitutions: See Section 01 6000 - Product Requirements.

B. Self-Leveling Sealants:
   1. Bostik Inc: www.bostik-us.com/#sle.
   2. Dow: www.dow.com/#sle.
   3. Pecora Corporation: www.pecora.com/#sle.
   4. Sika Corporation: www.usa.sika.com/#sle.
   5. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
   6. W. R. Meadows, Inc: www.wrmeadows.com/#sle.
   7. Substitutions: See Section 01 6000 - Product Requirements.

2.02 JOINT SEALANT APPLICATIONS

A. Scope:

1. Exterior Joints:
   a. Seal the following joints:
      1) Wall expansion and control joints.
      2) Joints between doors, windows, and other frames or adjacent construction.
      3) Joints between different exposed materials. (Horizonal and vertical joints)
2. Interior Joints:
   a. Seal the following joints:
      1) Joints between door frames and window frames and adjacent construction.
      2) In sound-rated wall and ceiling assemblies, gaps at electrical outlets, wiring devices, and piping penetrations.
      3) In sound-rated wall and ceiling assemblies, seal joints between wall assemblies and ceiling assemblies; between wall assemblies and other construction; between ceiling assemblies and other construction.
3. Do Not Seal:
   a. Intentional weep holes in masonry.
   b. Joints indicated to be covered with expansion joint cover assemblies.
   c. Joints where sealant installation is specified in other sections.
   d. Joints between suspended ceilings and walls.

B. Exterior Joints: Use nonsag nonstaining silicone sealant, unless otherwise indicated.
   1. Control and Expansion Joints in Concrete Paving: Self-leveling polyurethane traffic-grade sealant.

C. Interior Joints: Use nonsag polyurethane sealant, unless otherwise indicated.
   1. Wall and Ceiling Joints in Nonwet Areas: Acrylic emulsion latex sealant.
   2. Joints between Tile in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant; white.

D. Interior Wet Areas: Bathrooms, restrooms, and kitchens; fixtures in wet areas include plumbing fixtures, food service equipment, countertops, cabinets, and other similar items.

E. Sound-Rated Assemblies: Walls and ceilings identified as STC-rated, sound-rated, or acoustical.

2.03 JOINT SEALANTS - GENERAL

A. Colors: As selected by Architect from manufacturer's standard colors.

2.04 NONSAG JOINT SEALANTS

A. Nonstaining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus 50 percent, minimum.
   2. Nonstaining to Porous Stone: Nonstaining to light-colored natural stone when tested in accordance with ASTM C1248.
   3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
   4. Products:
      a. Pecora Corporation: www.pecora.com/#sle.
      b. Sika Corporation: www.usa.sika.com/#sle.
      c. Tremco Commercial Sealants & Waterproofing; Spectrem 2 (Basis-of-Design): www.tremcosealants.com/#sle.

B. Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
   1. Color: _____ Architect to select from manufacturer's full range.
   2. Products:
      a. Pecora Corporation: www.pecora.com/#sle.
      b. Sika Corporation: www.usa.sika.com/#sle.

C. Hybrid Silane Polyether Sealant: ASTM C920, Grade NS, Uses NT, M, G, A, and O; single component; not expected to withstand continuous water immersion.

1. Movement Capability: Plus and minus 35 percent.
2. Color: To be selected by Architect from manufacturer's standard range.
3. Products:
   a. Tremco Incorporated, Dynomic FC, (Basis of Design).
   b. Master Builders Solutions.

D. Acrylic Emulsion Latex: Water-based; ASTM C834, single component, nonstaining, nonbleeding, nonsagging; not intended for exterior use.
1. Color: To be selected by Architect from manufacturer's standard range.
2. Grade: ASTM C834; Grade 0 Degrees F (Minus 18 Degrees C).
3. Products:
   a. Pecora Corporation: www.pecora.com/#sle.
   b. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
   c. Tremco Commercial Sealants & Waterproofing; Tremflex 834: (Basis-of-Design) www.tremcosealants.com/#sle.

E. Noncuring Butyl Sealant: Solvent-based, single component, nonsag, nonskinning, nonhardening, nonbleeding; nonvapor permeable; intended for fully concealed applications. For use if metal roof bid alternate is accepted.

2.05 SELF-LEVELING JOINT SEALANTS

A. Self-Leveling Polyurethane Sealant: ASTM C920, Grade P, Uses M and A; single or multicomponent; explicitly approved by manufacturer for traffic exposure; not expected to withstand continuous water immersion .
1. Movement Capability: Plus and minus 25 percent, minimum.
2. Products:
   a. Pecora Corporation: www.pecora.com/#sle.
   b. Sika Corporation; Sikaflex-1c SL: www.usa.sika.com/#sle.

2.06 ACCESSORIES

A. Sealant Backing Materials, General: Materials placed in joint before applying sealants; assists sealant performance and service life by developing optimum sealant profile and preventing three-sided adhesion; type and size recommended by sealant manufacturer for compatibility with sealant, substrate, and application.

B. Joint Cleaner: Noncorrosive and nonstaining type, type recommended by sealant manufacturer; compatible with joint forming materials.

C. Primers: Type recommended by sealant manufacturer to suit application; nonstaining.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

E. Concrete Floor Joints That Will Be Exposed in Completed Work: Test joint filler in an inconspicuous area to verify that it does not stain or discolor slab.

3.03 INSTALLATION

A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Provide joint sealant installations complying with ASTM C1193.

C. Install acoustical sealant application work in accordance with ASTM C919.

D. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.

E. Install bond breaker backing tape where backer rod cannot be used.

F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

G. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

H. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

END OF SECTION 07 9200

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SECTION 08 0671
DOOR HARDWARE SCHEDULE

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2022.

D. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2022.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.03 SUMMARY

A. This Section references specification sections relating to commercial door hardware for the following:
   1. Swinging doors.
   2. Sliding Doors.
   3. Other doors to the extent indicated.

B. Commercial door hardware includes, but is not necessarily limited to, the following:
   1. Mechanical door hardware.
   2. Electromechanical and access control door hardware.
   3. Electromechanical and access control door hardware power supplies, back-ups and surge protection.
   4. Automatic operators.
   5. Cylinders specified for doors in other sections.

C. Related Sections:
   1. Division 08 Section “Door Hardware”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
   1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
   2. ICC (IBC) International Building Code.
   3. NFPA 70 - National Electrical Code.
   4. NFPA 80 - Fire Doors and Windows.
   5. NFPA 101 - Life Safety Code.
   6. NFPA 105 - Installation of Smoke Door Assemblies.
   7. State Building Codes, Local Amendments.

E. Standards: Reference Related Sections for requirements regarding compliance with applicable industry standards.

1.04 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
   1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
   2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
   3. Content: Include the following information:
      a. Type, style, function, size, label, hand, and finish of each door hardware item.
      b. Manufacturer of each item.
      c. Fastenings and other pertinent information.
      d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
      e. Explanation of abbreviations, symbols, and codes contained in schedule.
      f. Mounting locations for door hardware.
      g. Door and frame sizes and materials.
   4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Keying Schedule: Prepared under the supervision of the Owner, separate schedule detailing final keying instructions for locksets and cylinders in writing. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner to approve submitted keying schedule prior to the ordering of permanent cylinders.

D. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and contact information of the manufacturers providing the hardware and their nearest service representatives. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.

F. Warranties and Maintenance: Special warranties and maintenance agreements specified in the Related Sections.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.06 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

1.07 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 PRODUCTS

2.01 SCHEDULED DOOR HARDWARE

A. Refer to “PART 3 – EXECUTION” for required specification sections.

PART 3 EXECUTION

3.01 DOOR HARDWARE SETS

A. The door hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
   1. Quantities listed are for each pair of doors, or for each single door.
   2. The supplier is responsible for handing and sizing all products.
   3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
   4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

B. Products listed in the hardware sets shall be supplied by and in accordance with the requirements described in the specification section as noted for each item.
   1. Section 08 71 00 – Door Hardware.

C. Manufacturer’s Abbreviations:
   1. MK - McKinney
   2. RO - Rockwood
   3. SA - SARGENT
   4. HS - HES
   5. RF - Rixson
   6. NO - Norton
   7. PE - Pemko
   8. OT - Other
   9. SU - Securitron
   10. LU - Lund Equipment Co

3.02 HARDWARE SETS

A. Set: 1.0
   1. Doors: 116A, 119

3	Hinge, Full Mortise, Hvy Wt	T4A3386	US10BE(SS)	MK
1	Rim Exit Device, Storeroom	DG164 16 PE8804 Less Pull	US10BE	SA

1	Core	DG1 6300 GMK	US4	SA
1	SMART Pac Bridge Rectifier	2005M3		HS
1	Electric Strike	9600	613E	HS
1	Door Pull	BF157	10BE	RO
1	Conc Overhead Stop	6-X36	613E	RF
1	Surface Closer	J7500 x mounting plate to suit application	613E	NO
1	Weatherstrip	- Integral to door and frame assembly		OT
1	Sweep	29326DNB		PE
1	Threshold	2705DT		PE
1	ElectroLynx Harness	QC-C1500P (power transfer or electric strike to junction box above)		MK
1	Card Reader	- Provided by Security Contractor		OT
1	Motion Sensor	XMS		SU
1	Position Switch	DPS-M-BK		SU
1	Power Supply	AQL4-R8E1		SU
1	Wiring Diagram	- Elevation and Point to Point as Specified		OT

2. Notes:
   a. Door normally closed and locked.
   b. Presentation of valid credential at card reader unlocks electric strike allowing ingress.
   c. Door position switch to monitor / report open closed status of opening to security system.
   d. Motion sensor to shunt door monitoring at egress.Free egress at all times.
   e. Fail-secure.

B. Set: 1.1
   1. Doors: 101A

3	Hinge, Full Mortise, Hvy Wt	T4A3386	US10BE(SS)	MK
1	Rim Exit Device, Storeroom	DG164 16 PE8804 Less Pull	US10BE	SA
1	Core	DG1 6300 GMK	US4	SA
1	SMART Pac Bridge Rectifier	2005M3		HS
1	Electric Strike	9600	613E	HS
1	Door Pull	BF157	10BE	RO
1	Conc Overhead Stop	6-X36	613E	RF
1	Surface Closer	J7500 x mounting plate to suit application	613E	NO
1	Weatherstrip	- Integral to door and frame assembly		OT
1	Sweep	29326DNB		PE
1	Threshold	2705DT		PE
1	ElectroLynx Harness	QC-C1500P (power transfer or electric strike to junction box above)		MK
1	Motion Sensor	XMS		SU
1	Remote Push Button	- Provided by Security Contractor		OT

1	Position Switch	DPS-M-BK		SU
1	Power Supply	AQL4-R8E1		SU
1	Wiring Diagram	- Elevation and Point to Point as Specified		OT

2. Notes
   a. Door normally open.
   b. Depressing remote pushbutton in vestibule locks electric strike.
   c. Door position switch to monitor / report open closed status of opening to security system.
   d. Motion sensor to shunt door monitoring at egress.Free egress at all times.
   e. Fail-secure.

END OF SECTION 08 0671

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SECTION 08 1113
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2022.

B. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames; 2020.

C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2023.

D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2020.

E. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames; 2022.

F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

G. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2023, with Editorial Revision.

H. ASTM C1363 - Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus; 2019.

I. BHMA A156.115 - Hardware Preparation in Steel Doors and Frames; 2016.

J. ICC 500 - ICC/NSSA Standard for the Design and Construction of Storm Shelters; 2020.

K. NAAMM HMMA 867 - Guide Specifications for Laminated Core Hollow Metal Doors and Frames; 2016.

L. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2022.

M. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2022.

N. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.

O. NFPA 257 - Standard on Fire Test for Window and Glass Block Assemblies; 2022.

P. NFRC 102 - Procedure for Measuring the Steady-State Thermal Transmittance of Fenestration Systems; 2023.

Q. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2023.

R. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

S. UL 1784 - Standard for Air Leakage Tests of Door Assemblies; Current Edition, Including All Revisions.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.03 SUMMARY

A. Section Includes:
   1. Standard and custom hollow metal doors and frames.
   2. Steel sidelight, borrowed lite and transom frames.
   3. Louvers installed in hollow metal doors.
   4. Light frames and glazing installed in hollow metal doors.

B. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
   1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
   2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
   3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
   4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
   5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
   6. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
   7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   8. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
   9. ASTM C1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
   10. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.
   11. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
   12. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
   13. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
   14. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
   15. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
   16. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, and finishes.

B. Maintenance manual must be provided for tornado storm shelter impact protective systems.

C. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.

D. Shop Drawings: Include the following:
   1. Elevations of each door design.
   2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
   3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
   4. Locations of reinforcement and preparations for hardware.
   5. Details of anchorages, joints, field splices, and connections.
   6. Details of accessories.
   7. Details of moldings, removable stops, and glazing.
   8. Details of conduit and preparations for power, signal, and control systems.

E. Samples for Verification:
   1. Samples are only required by request of the architect and for manufacturers that are not current members of the Steel Door Institute.

1.05 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.

B. Quality Standard: In addition to requirements specified, furnish SDI-Certified manufacturer products that comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".

C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to UL 10C (neutral pressure at 40” above sill) or UL 10C.
   1. Oversize Fire-Rated Door Assemblies Construction: For units exceeding sizes of tested assemblies, attach construction label certifying doors are built to standard construction requirements for tested and labeled fire rated door assemblies except for size.
   2. Temperature-Rise Limit: Where indicated and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.
   3. Smoke Control Door Assemblies: Comply with NFPA 105.
      a. Smoke "S" Label: Doors to bear “S” label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.

D. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257. Provide labeled glazing material.

E. Storm Shelter Openings: Provide complete door systems for tornado storm shelters, and other areas of refuge, complying and tested according to ICC 500 (2014/2020), ICC/NSSA Standard for the Design and Construction of Storm Shelters.
   1. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.

F. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.
   1. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.07 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.08 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

B. Building Information Modeling (BIM) Support: Utilize designated BIM software tools and obtain training needed to successfully participate in the Project BIM processes. All technical disciplines are responsible for the product data integration and data reliability of their Work into the coordinated BIM applications.

1.09 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide steel doors and frames from a SDI Certified manufacturer:
   1. CECO Door Products (C).
   2. Curries Company (CU).

2.02 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

C. Frame Anchors: ASTM A653/A653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

2.03 HOLLOW METAL DOORS

A. General: Provide 1-3/4 inch (44 mm) doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8 and ANSI/NAAMM HMMA 867.

B. Exterior Doors: Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A653/A653M, Coating Designation A60. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
   1. Design: Flush panel.
   2. Core Construction: Manufacturer’s thermally enhanced QMax core. Where indicated provide doors fabricated as thermal-rated assemblies with a minimum thermal rating of 0.41 (0.41) /hr-ft2-F.
   3. Level/Model: Level 3 and Physical Performance Level A (Extra Heavy Duty), Minimum 16 gauge (0.053-inch - 1.3-mm) thick steel, Model 2.
   4. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
   5. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
   6. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

C. Interior Doors: Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A1008/A1008M. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
   1. Design: Flush panel.
   2. Core Construction: Manufacturer's standard kraft-paper honeycomb, or one-piece polystyrene core, securely bonded to both faces.
      a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
   3. Level/Model: Level 2 and Physical Performance Level B (Heavy Duty), Minimum 18 gauge (0.042-inch - 1.0-mm) thick steel, Model 2.
   4. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet.
   5. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
   6. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

D. Manufacturers Basis of Design:
   1. Curries Company (CU) - Polystyrene Core - 707 Series.
   2. Curries Company (CU) - QMax Core - 707 Series.

2.04 HOLLOW METAL DOOR AND SHUTTER ASSEMBLIES FOR STORM SHELTERS

A. General: Provide complete tornado storm shelter resistant assemblies constructed, test, and listed/labeled to resist the design pressures for components and cladding and missile impact resistance as described in ICC 500 (2014), ICC/NSSA Standard for the Design and Construction of Storm Shelters.
   1. Door and shutter systems, tested and complying with ICC 500 (2014) and supported by third party test results.
   2. Sheets fabricated on exterior openings from commercial quality hot dipped zinc coated steel complying with ASTM A924 A60. Gauges to be in accordance with manufacturers tested assemblies.
   3. Vertical Edges: Vertical edges to have the face sheets joined by a continuous weld extending the full height of the door. Welds are to be ground, filled and dressed smooth. Beveled Lock Edge, 1/8 inch (3.18 mm) in 2 inches (50.8 mm).
   4. Top Edge: Reinforce top of doors with a continuous steel channel extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached and welded in place with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
   5. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9".
   6. Replaceable Glass System: Provide a field replaceable glass system certified to UL 10C and ICC 500 2014 and 2020. Glass shall be Vetrotech Ultimax 90, 2-3/16” thick available in 10” x 10” or 4” x 25” sizes fire rated up to 90-minutes with a 284 psf design pressure for tornado openings and a 15 lb. 2 x 4 at 100mph impact resistance.

B. Manufacturers Basis of Design:
   1. CECO Door Products (C) - StormPro Series.
   2. Curries Company (CU) - StormPro Series.

2.05 HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Thermal Break Frames: Subject to the same compliance standards and requirements as standard hollow metal frames. Tested for thermal performance in accordance with NFRC 102, and resistance to air infiltration in accordance with NFRC 400. Where indicated provide thermally broken frame profiles available for use in both masonry and drywall construction. Fabricate with 1/16" positive thermal break and integral vinyl weatherstripping.

C. Exterior Frames: Fabricated of hot-dipped zinc coated steel that complies with ASTM A653/A653M, Coating Designation A60.
   1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
   2. Frames: Minimum 14 gauge (0.067-inch -1.7-mm) thick steel sheet.
   3. Manufacturers Basis of Design:
      a. Curries Company (CU) – Thermal Break TQ Series.

D. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A1008/A1008M.
   1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
   2. Frames: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.
   3. Manufacturers Basis of Design:
      a. Curries Company (CU) - CM Series.
      b. Curries Company (CU) - M Series.

E. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.

F. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.06 FRAME ANCHORS

A. Jamb Anchors:
   1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, not less than 0.042 inch (1.07 mm) thick, with corrugated or perforated straps not less than 2 inches (50.8 mm) wide by 10 inches (254 mm) long; or wire anchors not less than 0.177 inch (4.5 mm) thick.
   2. Stud Wall Type: Designed to engage stud and not less than 0.042 inch (1.07 mm) thick.

B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches (1.07 mm) thick.

C. Mortar Guards: Formed from same material as frames, not less than 0.016 inches (0.41 mm) thick.

2.07 LIGHT OPENINGS AND GLAZING

A. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricator's shop. Fixed and removable stops to allow multiple glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.

B. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Minimum 20 gauge thick, fabricated from same material as door face sheet in which they are installed.

C. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (15.88 mm) high unless otherwise indicated. Provide fixed frame moldings and stops on outside of exterior and on secure side of interior doors and frames.

D. Preformed Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated. Match pre-finished door paint color where applicable.

2.08 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inches (0.41 mm) thick.

2.09 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.

C. Hollow Metal Doors:
   1. Exterior Doors: Provide optional weep-hole openings in bottom of exterior doors to permit moisture to escape where specified.
   2. Glazed Lites: Factory cut openings in doors with applied trim or kits to fit. Factory install glazing where indicated.
   3. Astragals: Provide overlapping astragals as noted in door hardware sets in Division 08 Section"Door Hardware" on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch (19.05 mm) beyond edge of door on which astragal is mounted.
   4. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge strap for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".

D. Hollow Metal Frames:
   1. Shipping Limitations: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
   2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
      a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.
   3. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
   4. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.
   5. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge straps for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
   6. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
   7. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
   8. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
   9. Jamb Anchors: Provide number and spacing of anchors as follows:
      a. Masonry Type: Locate anchors not more than 18 inches (457.2 mm) from top and bottom of frame. Space anchors not more than 32 inches (812.8 mm) on-center and as follows:
         1) Two anchors per jamb up to 60 inches (1524 mm) high.
         2) Three anchors per jamb from 60 to 90 inches (2286 mm) high.
         3) Four anchors per jamb from 90 to 120 inches (3048 mm) high.
         4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches (609.6 mm) or fraction thereof above 120 inches (3048 mm) high.

b. Stud Wall Type: Locate anchors not more than 18 inches (457.2 mm) from top and bottom of frame. Space anchors not more than 32 inches (812.8 mm) o.c. and as follows:
   1) Three anchors per jamb up to 60 inches (1524 mm) high.
   2) Four anchors per jamb from 60 to 90 inches (2286 mm) high.
   3) Five anchors per jamb from 90 to 96 inches (2438.4 mm) high.
   4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches (609.6 mm) or fraction thereof above 96 inches (2438.4 mm) high.
   5) Two anchors per head for frames above 42 inches (1066.8 mm) wide and mounted in metal stud partitions.

10. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".
11. Bituminous Coating: Where frames are fully grouted with an approved Portland Cement based grout or mortar, coat inside of frame throat with a water based bituminous or asphaltic emulsion coating to a minimum thickness of 3 mils (0.0762 mm) DFT, tested in accordance with UL 10C and applied to the frame under a 3rd party independent follow-up service procedure.

E. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
   1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
   2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
   3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
   4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.10 STEEL FINISHES

A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.
   1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for square, level, twist, and plumb condition.

C. Tolerances shall comply with SDI 117 "Manufacturing Tolerances Standard Steel Doors and Frames."

D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

E. Verify tolerances against manufacturers installations instructions for tornado storm shelter openings.

3.03 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.
   1. Set frames accurately in position, plumbed, leveled, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
   2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
   3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
   4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
   1. Non-Fire-Rated Standard Steel Doors:
      a. Jambs and Head: 1/8 inch (3.18 mm) plus or minus 1/16 inch (1.59 mm).
      b. Between Edges of Pairs of Doors: 1/8 inch (3.18 mm) plus or minus 1/16 inch (1.59 mm).
      c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch (9.52 mm).
      d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch (19.05 mm).
   2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

D. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

3.04 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

3.05 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

END OF SECTION 08 1113

SECTION 08 1416
FLUSH WOOD DOORS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 2022.

B. AWI/AWMAC/WI - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

C. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2022.

D. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2022.

F. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.

G. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

H. WDMA I.S. 1A - Interior Architectural Wood Flush Doors; 2021, with Errata (2022).

1.02 SUMMARY

A. Section Includes:
   1. Five-ply flush wood veneer-faced doors for transparent finish.
   2. Factory finishing flush wood doors.
   3. Factory fitting flush wood doors to frames and factory machining for hardware.

B. Related Requirements:
   1. Section 08 1113 "Hollow Metal Doors and Frames" for wood doors in metal frames.
   2. Section 08 7100 "Door Hardware" for door hardware for flush wood doors.
   3. Section 08 8000 "Glazing" for glass view panels in flush wood doors.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, profiles, fire-resistance ratings, and finishes.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each type of door; construction details not covered in Product Data; and the following:
   1. Door schedule indicating door location, type, size, fire protection rating, and swing.
   2. Door elevations, dimension and locations of hardware, lite and louver cutouts, and glazing thicknesses.
   3. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
   4. Dimensions and locations of blocking for hardware attachment.
   5. Dimensions and locations of mortises and holes for hardware.
   6. Clearances and undercuts.
   7. Requirements for veneer matching.
   8. Doors to be factory finished and application requirements.

C. Samples for Verification:
   1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches (254 mm), for each material and finish.

1.04 CLOSEOUT SUBMITTALS

A. Special warranties.

1.05 QUALITY ASSURANCE

A. Fire-Rated Door Inspector Qualifications: Inspector for field quality-control inspections of fire-rated door assemblies complies with qualifications set forth in NFPA 80, Section 5.2.3.1 and the following:
   1. DHI's Fire and Egress Door Assembly Inspector (FDAI) certification.

B. Egress Door Inspector Qualifications: Inspector for field quality-control inspections of egress door assemblies complies with qualifications set forth in NFPA 101, Section 7.2.1.15.4 and the following:
   1. DHI's Fire and Egress Door Assembly Inspector (FDAI) certification.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in cardboard cartons and wrap bundles of doors in plastic sheeting.

C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.07 FIELD CONDITIONS

A. Environmental Limitations:
   1. Do not deliver or install doors until building is enclosed and weathertight, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during remainder of construction period.

1.08 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Delamination of veneer.
      b. Warping (bow, cup, or twist) more than 1/4 inch (6.35 mm) in a 42-by-84-inch section.
      c. Telegraphing of core construction in face veneers exceeding 0.01 inch (0.25 mm) in a 3-inch span.
   2. Warranty also includes installation and finishing that may be required due to repair or replacement of defective doors.
   3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 PRODUCTS

2.01 SOURCE LIMITATIONS

A. Obtain flush wood doors from single manufacturer.

2.02 PERFORMANCE REQUIREMENTS

A. Fire-Rated Wood Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated on Drawings, based on testing at positive pressure in accordance with UL 10C, or NFPA 252.

2.03 FLUSH WOOD DOORS, GENERAL

A. Quality Standard: In addition to requirements specified, comply with AWI/AWMAC/WI's "Architectural Woodwork Standards."
   1. Provide labels from AWI certification program indicating that doors comply with requirements of grades specified.

2.04 SOLID-CORE FIVE-PLY FLUSH WOOD VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Doors, Solid-Core Five-Ply Veneer-Faced Insert drawing designation:
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Masonite Architectural - Aspiro
      b. Oshkosh Door Company
      c. VT Industries, Inc.
   2. Performance Grade: ANSI/WDMA I.S. 1A Extra Heavy Duty.
   3. Architectural Woodwork Standards Grade: Premium.
   4. Faces: Single-plywood veneer not less than 1/50 inch (0.51 mm) thick.
      a. Species: Red Oak.
      b. Cut: Plain sliced.
      c. Match between Veneer Leaves: Book match.
      d. Assembly of Veneer Leaves on Door Faces: Running match.
   5. Exposed Vertical Edges: Same species as faces - Architectural Woodwork Standards edge Type A.
      a. Fire-Rated Single Doors: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed vertical edges.
      b. Mineral-Core Doors: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.
   6. Core for Non-Fire-Rated Doors:
      a. ANSI A208.1, Grade LD-2 particleboard.
         1) Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.
            (a) 5-inch top-rail blocking, in doors indicated to have closers.
            (b) 5-inch bottom-rail blocking, in exterior doors and doors indicated to have kick, mop, or armor plates.
         2) Provide doors with glued-wood-stave, or WDMA I.S. 10 structural-composite-lumber cores instead of particleboard cores for doors scheduled to receive exit devices in Section 087100 "Door Hardware."
   7. Core for Fire-Rated Doors: As required to achieve fire-protection rating indicated on Drawings.
      a. Blocking for Mineral-Core Doors: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated on Drawings as needed to eliminate through-bolting hardware.
   8. Construction: Five plies, hot-pressed bonded (vertical and horizontal edging is bonded to core), with entire unit abrasive planed before veneering.

2.05 LIGHT FRAMES AND LOUVERS

A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.
   1. Wood Species: Same species as door faces.
   2. Profile: Manufacturer's standard shape.

2.06 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated.
   1. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
   2. Comply with NFPA 80 requirements for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied.
   1. Locate hardware to comply with DHI-WDHS-3.
   2. Comply with final hardware schedules, door frame Shop Drawings, ANSI/BHMA-156.115-W, and hardware templates.

3. Coordinate with hardware mortises in metal frames, to verify dimensions and alignment before factory machining.
4. For doors scheduled to receive electrified locksets, provide factory-installed raceway and wiring to accommodate specified hardware.

C. Openings: Factory cut and trim openings through doors.
1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 08 8000 "Glazing."

2.07 FACTORY FINISHING

A. Comply with referenced quality standard for factory finishing.
1. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
2. Finish faces, all four edges, edges of cutouts, and mortises.
3. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

B. Factory finish doors.

C. Transparent Finish:
1. Architectural Woodwork Standards Grade: Premium.
2. Architectural Woodwork Standards System-5, Varnish, Conversion.
3. Staining: As selected by Architect from manufacturer's full range.
4. Sheen: Satin.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine doors and installed door frames, with Installer present, before hanging doors.
1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Hardware: For installation, see Section 08 7100 "Door Hardware."

B. Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.

C. Install frames level, plumb, true, and straight.
1. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch (3.18 mm) in 96 inches (2438.4 mm).
2. Anchor frames to anchors or blocking built in or directly attached to substrates.
a. Secure with countersunk, concealed fasteners and blind nailing.
b. Use fine finishing nails for exposed fastening, countersunk and filled flush with woodwork.
1) For factory-finished items, use filler matching finish of items being installed.
3. Install fire-rated doors and frames in accordance with NFPA 80.
4. Install smoke- and draft-control doors in accordance with NFPA 105.

D. Job-Fitted Doors:
1. Align and fit doors in frames with uniform clearances and bevels as indicated below.
a. Do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors.
2. Machine doors for hardware.
3. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.

4. Clearances:
   a. Provide 1/8 inch (3.18 mm) at heads, jambs, and between pairs of doors.
   b. Provide 1/8 inch (3.18 mm) from bottom of door to top of decorative floor finish or covering unless otherwise indicated on Drawings.
   c. Where threshold is shown or scheduled, provide 1/4 inch (6.35 mm) from bottom of door to top of threshold unless otherwise indicated.
   d. Comply with NFPA 80 for fire-rated doors.
5. Bevel non-fire-rated doors 1/8 inch (3.18 mm) in 2 inches (50.8 mm) at lock and hinge edges.
6. Bevel fire-rated doors 1/8 inch (3.18 mm) in 2 inches (50.8 mm) at lock edge; trim stiles and rails only to extent permitted by labeling agency.

E. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

F. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.03 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 08 1416

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SECTION 08 4313
ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed storefront, with vision glass.

B. Aluminum doors and frames.

C. Weatherstripping.

D. Door hardware.

1.02 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.

B. Section 08 7100 - Door Hardware: Hardware items other than specified in this section.

C. Section 08 8000 - Glazing: Glass and glazing accessories.

1.03 REFERENCE STANDARDS

A. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site; 2015.

B. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document); 2015.

C. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.

D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

E. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

F. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.

G. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, and internal drainage details.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.

D. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.

E. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.

F. Manufacturer's qualification statement.

G. Installer's qualification statement.

H. Specimen warranty.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.
   1. Provide certified glass products through ANSI accredited certifications that include plant audits and independent laboratory performance testing.
      a. Insulating Glass Certification Council (IGCC).
      b. Safety Glazing Certification Council (SGCC).

B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.08 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F (5 degrees C). Maintain this minimum temperature during and 48 hours after installation.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

C. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Aluminum-Framed Storefronts:
   1. Kawneer North America; Trifab VersaGlaze 451T Framing System: (450 for interior units) www.kawneer.com/#sle. (Basis-of-Design)
   2. Oldcastle BuildingEnvelope: www.oldcastlebe.com/#sle.
   3. YKK AP America, Inc: www.ykkap.com/commercial/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 BASIS OF DESIGN -- FRAMING FOR INSULATING GLAZING

A. Center-Set Style, Thermally-Broken:
   1. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep (51 mm wide by 114 mm deep).

2.03 BASIS OF DESIGN -- SWINGING DOORS

A. Wide Stile, Insulating Glazing, Thermally-Broken:
   1. Thickness: 1-3/4 inches (43 mm).

2.04 ALUMINUM-FRAMED STOREFRONT

A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
   1. Glazing Rabbet: For 1 inch (25 mm) insulating glazing.
   2. Finish: Superior performing organic coatings.
      a. Factory finish all surfaces that will be exposed in completed assemblies.
      b. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.
   3. Finish Color: As selected by Architect from manufacturer's standard line.
   4. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
   5. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
   6. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
   7. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F (95 degrees C) over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
   8. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
   9. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.

B. Performance Requirements
   1. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
      a. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
   2. Air Leakage: 0.06 cfm/sq ft (0.3 L/sec sq m) maximum leakage of storefront wall area when tested in accordance with ASTM E283/E283M at 1.57 psf (75 Pa) pressure difference.
   3. Condensation Resistance Factor of Framing: 50, minimum, measured in accordance with AAMA 1503.
   4. Overall U-value Including Glazing: 0.45 Btu/(hr sq ft deg F) (_____ W/(sq m K)), maximum.

2.05 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
   1. Glazing Stops: Flush.

B. Glazing: See Section 08 8000.

C. Swing Doors: Glazed aluminum.
   1. Thickness: 1-3/4 inches (43 mm).
   2. Top Rail: 4 inches (100 mm) wide.
   3. Vertical Stiles: 4-1/2 inches (115 mm) wide.
   4. Bottom Rail: 10 inches (254 mm) wide.
   5. Glazing Stops: Square.
   6. Finish: Same as storefront.

D. Operable Sash: Aluminum project-out awning; finished to match storefront; turn handle latch with manufacturer's standard insect screen.

2.06 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Fasteners: Stainless steel.

C. Sill Flashing Sealant: Elastomeric, silicone or polyurethane, compatible with flashing material.

D. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

2.07 FINISHES

A. High-Performance Organic Finish, Two-Coat PVDF: Fluoropolymer finish complying with AAMA 2604 or AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat.

B. Color: As selected by Architect from manufacturer's standard range.

C. Touch-Up Materials: As recommended by coating manufacturer for field application.

2.08 HARDWARE

A. For each door, include weatherstripping, sill sweep strip, and threshold.

B. Other Door Hardware: See Section 08 7100.

C. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.

D. Sill Sweep Strips: Resilient seal type, retracting, of neoprene; provide on all doors.

E. Threshold: Extruded aluminum, one piece per door opening, ribbed surface; provide on all doors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that storefront wall openings and adjoining water-resistive and/or air barrier seal materials are ready to receive work of this section.

3.02 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.

H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

I. Install operating sash.

J. Set thresholds in bed of sealant and secure.

K. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inch per 3 feet (1.5 mm per m) non-cumulative or 0.06 inch per 10 feet (1.5 mm per 3 m), whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch (0.8 mm).

3.04 ADJUSTING

A. Adjust operating hardware and sash for smooth operation.

3.05 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, and take care to remove dirt from corners and to wipe surfaces clean.

C. Upon completion of installation, thoroughly clean aluminum surfaces in accordance with AAMA 609 & 610.

3.06 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION 08 4313

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SECTION 08 7100
– DOOR HARDWARE

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames; 2020.

B. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2023.

C. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus; 2019.

D. BHMA A156.1 - Standard for Butts and Hinges; 2021.

E. BHMA A156.2 - Bored and Preassembled Locks and Latches; 2022.

F. BHMA A156.3 - Exit Devices; 2020.

G. BHMA A156.4 - Door Controls - Closers; 2019.

H. BHMA A156.5 - Cylinders and Input Devices for Locks; 2020.

I. BHMA A156.26 - Standard for Continuous Hinges; 2021.

J. BHMA A156.28 - Standard for Recommended Practices for Mechanical Keying Systems; 2023.

K. BHMA A156.31 - Electric Strikes and Frame Mounted Actuators; 2024.

L. ISO 9000 - Quality Management Systems -- Fundamentals and Vocabulary; 2015.

M. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

N. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2022.

O. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

P. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2022.

Q. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.

R. UL 10B - Standard for Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

S. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

T. UL 305 - Standard for Panic Hardware; Current Edition, Including All Revisions.

U. UL 1784 - Standard for Air Leakage Tests of Door Assemblies; Current Edition, Including All Revisions.

1.02 SUMMARY

A. Section includes:
   1. Mechanical and electrified door hardware for swinging doors
   2. Electronic access control system components

B. Section excludes:
   1. Windows
   2. Cabinets (casework), including locks in cabinets
   3. Signage
   4. Toilet accessories
   5. Overhead doors

C. Related Sections:
   1. Division 01 Section “Alternates” for alternates affecting this section.
   2. Division 06 Section “Rough Carpentry”

3. Division 06 Section "Finish Carpentry”
4. Division 07 Section “Joint Sealants” for sealant requirements applicable to threshold installation specified in this section.
5. Division 08 Sections:
    a. “Metal Doors and Frames”
    b. “Flush Wood Doors”
    c. “Stile and Rail Wood Doors”
    d. “Interior Aluminum Doors and Frames”
    e. "Aluminum-Framed Entrances and Storefronts"
    f. “Stainless Steel Doors and Frames”
    g. “Special Function Doors”
    h. "Entrances”
6. Division 09 sections for touchup, finishing or refinishing of existing openings modified by this section.
7. Division 26 “Electrical” sections for connections to electrical power system and for low-voltage wiring.
8. Division 28 “Electronic Safety and Security” sections for coordination with other components of electronic access control system and fire alarm system.

1.03 REFERENCES

A. UL - Underwriters Laboratories
    1. UL 10B - Fire Test of Door Assemblies
    2. UL 10C - Positive Pressure Test of Fire Door Assemblies
    3. UL 1784 - Air Leakage Tests of Door Assemblies
    4. UL 305 - Panic Hardware

B. DHI - Door and Hardware Institute
    1. Sequence and Format for the Hardware Schedule
    2. Recommended Locations for Builders Hardware
    3. Keying Systems and Nomenclature

C. NFPA – National Fire Protection Association
    1. NFPA 70 – National Electric Code
    2. NFPA 80 – 2016 Edition – Standard for Fire Doors and Other Opening Protectives
    3. NFPA 101 – Life Safety Code
    4. NFPA 105 – Smoke and Draft Control Door Assemblies
    5. NFPA 252 – Fire Tests of Door Assemblies

D. ANSI - American National Standards Institute
    1. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties
    2. ANSI/BHMA A156.28 - Recommended Practices for Keying Systems

1.04 SUBMITTALS

A. General:
    1. Submit in accordance with Conditions of Contract and Division 01 Submittal Procedures.
    2. Prior to forwarding submittal:
        a. Comply with procedures for verifying existing door and frame compatibility for new hardware, as specified in PART 3, “EXAMINATION” article, herein.
        b. Review drawings and Sections from related trades to verify compatibility with specified hardware.
        c. Highlight, encircle, or otherwise specifically identify on submittals: deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.

B. Action Submittals:

1. Product Data: Submit technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:
    a. Wiring Diagrams: For power, signal, and control wiring and including:
        1) Details of interface of electrified door hardware and building safety and security systems.
        2) Schematic diagram of systems that interface with electrified door hardware.
        3) Point-to-point wiring.
        4) Risers.
3. Samples for Verification: If requested by Architect, submit production sample of requested door hardware unit in finish indicated and tagged with full description for coordination with schedule.
    a. Samples will be returned to supplier. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.
4. Door Hardware Schedule:
    a. Submit concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work critical in Project construction schedule.
    b. Submit under direct supervision of a Door Hardware Institute (DHI) certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule published by DHI.
    c. Indicate complete designations of each item required for each opening, include:
        1) Door Index: door number, heading number, and Architect’s hardware set number.
        2) Quantity, type, style, function, size, and finish of each hardware item.
        3) Name and manufacturer of each item.
        4) Fastenings and other pertinent information.
        5) Location of each hardware set cross-referenced to indications on Drawings.
        6) Explanation of all abbreviations, symbols, and codes contained in schedule.
        7) Mounting locations for hardware.
        8) Door and frame sizes and materials.
        9) Degree of door swing and handing.
        10) Operational Description of openings with electrified hardware covering egress, ingress (access), and fire/smoke alarm connections.
5. Key Schedule:
    a. After Keying Conference, provide keying schedule that includes levels of keying, explanations of key system's function, key symbols used, and door numbers controlled.
    b. Use ANSI/BHMA A156.28 “Recommended Practices for Keying Systems” as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
    c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
    d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
    e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion. Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
    f. Prepare key schedule by or under supervision of supplier, detailing Owner’s final keying instructions for locks.
6. Templates: After final approval of hardware schedule, provide templates for doors, frames and other work specified to be factory or shop prepared for door hardware installation.

C. Informational Submittals:
   1. Provide Qualification Data for Supplier, Installer and Architectural Hardware Consultant.
   2. Provide Product Data:
      a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
      b. Include warranties for specified door hardware.

D. Closeout Submittals:
   1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:
      a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
      b. Catalog pages for each product.
      c. Factory order acknowledgement numbers (for warranty and service)
      d. Name, address, and phone number of local representative for each manufacturer.
      e. Parts list for each product.
      f. Final approved hardware schedule edited to reflect conditions as-installed.
      g. Final keying schedule
      h. Copies of floor plans with keying nomenclature
      i. Copy of warranties including appropriate reference numbers for manufacturers to identify project.
      j. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.

E. Inspection and Testing:
   1. Submit a written report of the results of functional testing and inspection for fire door assemblies, in compliance with NFPA 80.
      a. Written report to be provided to the Owner and be made available to the Authority Having Jurisdiction (AHJ).
      b. Report to include the door number for each fire door assembly, door location, door and frame material, fire rating, and summary of deficiencies.
   2. Submit a written report of the results of functional testing and inspection for required egress door assemblies, in compliance with NFPA 101.
      a. Written report to be provided to the Owner and be made available to the Authority Having Jurisdiction (AHJ).
      b. Report to include the door number for each required egress door assembly, door location, door and frame material, fire rating, and summary of deficiencies.

1.05 QUALITY ASSURANCE

A. Qualifications and Responsibilities:
   1. Supplier: Recognized architectural hardware supplier with record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that provides certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.
      a. Warehousing Facilities: In Project's vicinity.
      b. Scheduling Responsibility: Preparation of door hardware and keying schedules.
      c. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
      d. Coordination Responsibility: Assist in coordinating installation of electronic security hardware with Architect and electrical engineers and provide installation and technical data to Architect and other related subcontractors.
         1) Upon completion of electronic security hardware installation, inspect and verify that all components are working properly.
   2. Installer: Qualified tradesperson skilled in the application of commercial grade hardware with experience installing door hardware similar in quantity, type, and quality as indicated for this Project.

3. Architectural Hardware Consultant: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:
   a. For door hardware: DHI certified AHC or DHC.
   b. Can provide installation and technical data to Architect and other related subcontractors.
   c. Can inspect and verify components are in working order upon completion of installation.
   d. Capable of producing wiring diagram and coordinating installation of electrified hardware with Architect and electrical engineers.
4. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.

B. Certifications:
1. Fire-Rated Door Openings:
   a. Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction.
   b. Provide only items of door hardware that are listed products tested by Underwriters Laboratories, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.
2. Smoke and Draft Control Door Assemblies:
   a. Provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105
   b. Comply with the maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.
3. Electrified Door Hardware
   a. Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.
4. Accessibility Requirements:
   a. Comply with governing accessibility regulations cited in “REFERENCES” article, herein for door hardware on doors in an accessible route.

C. Pre-Installation Meetings
1. Keying Conference
   a. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:
      1) Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
      2) Preliminary key system schematic diagram.
      3) Requirements for key control system.
      4) Requirements for access control.
      5) Address for delivery of keys.
2. Pre-installation Conference
   a. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   b. Inspect and discuss preparatory work performed by other trades.
   c. Inspect and discuss electrical roughing-in for electrified door hardware.
   d. Review sequence of operation for each type of electrified door hardware.
   e. Review required testing, inspecting, and certifying procedures.
   f. Review questions or concerns related to proper installation and adjustment of door hardware.
3. Electrified Hardware Coordination Conference:
   a. Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site. Promptly replace products damaged during shipping.

B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package. Deliver each article of hardware in manufacturer’s original packaging.

C. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.

D. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.

E. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.

F. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

1.07 COORDINATION

A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.

B. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

E. Existing Openings: Where existing doors, frames and/or hardware are to remain, field verify existing functions, conditions and preparations and coordinate to suit opening conditions and to provide proper door operation.

1.08 WARRANTY

A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within published warranty period.
   1. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.
   2. Warranty Period: Beginning from date of Substantial Completion, for durations indicated in manufacturer’s published listings.

1.09 MAINTENANCE

A. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

B. Turn over unused materials to Owner for maintenance purposes.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Approval of manufacturers and/or products other than those listed as “Scheduled Manufacturer” or “Acceptable Manufacturers” in the individual article for the product category shall be in accordance with QUALITY ASSURANCE article, herein.

B. Approval of products from manufacturers indicated in "Acceptable Manufacturers" is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.

C. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

2.02 MATERIALS

A. Fasteners
   1. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
   2. Furnish screws for installation with each hardware item. Finish exposed (exposed under any condition) screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
   3. Provide concealed fasteners for hardware units exposed when door is closed except when no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless thru-bolts are required to fasten hardware securely. Review door specification and advise Architect if thru-bolts are required.
   4. Install hardware with fasteners provided by hardware manufacturer.

B. Modification and Preparation of Existing Doors: Where existing door hardware is indicated to be removed and reinstalled.
   1. Provide necessary fillers, Dutchmen, reinforcements, and fasteners, compatible with existing materials, as required for mounting new opening hardware and to cover existing door and frame preparations.
   2. Use materials which match materials of adjacent modified areas.
   3. When modifying existing fire-rated openings, provide materials permitted by NFPA 80 as required to maintain fire-rating.

C. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.
   1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

2.03 HINGES

A. Manufacturers and Products:
   1. Scheduled Manufacturer and Product:
      a. McKinney TA/T4A series
   2. Acceptable Manufacturers and Products:
      a. Hager BB series
      b. Ives 5BB series

B. Requirements:
   1. Provide hinges conforming to ANSI/BHMA A156.1.
   2. Provide five knuckle, ball bearing hinges.
   3. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914.4 mm) wide:
      a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches (114 mm) high
      b. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high
   4. 1-3/4 inch (44 mm) thick doors over 36 inches (914.4 mm) wide:
      a. Exterior: Heavy weight, bronze/stainless steel, 5 inches (127 mm) high
      b. Interior: Heavy weight, steel, 5 inches (127 mm) high
   5. 2 inches (50.8 mm) or thicker doors:
      a. Exterior: Heavy weight, bronze or stainless steel, 5 inches (127 mm) high
      b. Interior: Heavy weight, steel, 5 inches (127 mm) high
   6. Adjust hinge width for door, frame, and wall conditions to allow proper degree of opening.

7. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
8. Where new hinges are specified for existing doors or existing frames, provide new hinges of identical size to hinge preparation present in existing door or existing frame.
9. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
    a. Steel Hinges: Steel pins
    b. Non-Ferrous Hinges: Stainless steel pins
    c. Out-Swinging Exterior Doors: Non-removable pins
    d. Out-Swinging Interior Lockable Doors: Non-removable pins
    e. Interior Non-lockable Doors: Non-rising pins
10. Provide hinges with electrified options as scheduled in the hardware sets. Provide with sufficient number and wire gage to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to electrified locking component. Provide mortar guard for each electrified hinge specified.

2.04 SPRING HINGES

A. Manufacturers and Products:
    1. Scheduled Manufacturer and Product:
        a. McKinney
    2. Acceptable Manufacturers and Products:
        a. Hager
        b. Ives

B. Requirements:
    1. Provide hinges conforming to ANSI/BHMA A156.1.
    2. Provide 3 knuckle, spring full mortise hinges.
    3. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914.4 mm) wide:
        a. Exterior: Bronze or stainless steel, 4-1/2 inches (114 mm) high
        b. Interior: Steel, 4-1/2 inches (114 mm) high
    4. Doors over 1-3/4 inch (44 mm) thick or over 36 inches (914.4 mm) wide:
        a. Exterior: Bronze/stainless steel, 5 inches (127 mm) high
        b. Interior: Steel, 5 inches (127 mm) high
    5. Adjust hinge width for door, frame, and wall conditions to allow proper degree of opening.
    6. Provide two spring hinges and one bearing hinge per door leaf for doors 90 inches (2286 mm) or less in height. Provide one additional bearing hinge for each 30 inches (762 mm) of additional door height.
    7. Where new hinges are specified for existing doors or existing frames, provide new hinges of identical size to hinge preparation present in existing door or existing frame.

2.05 CONTINUOUS HINGES

A. Manufacturers:
    1. Scheduled Manufacturer:
        a. Pemko
    2. Acceptable Manufacturers:
        a. ABH
        b. Hager-Roton

B. Requirements:
    1. Provide aluminum geared continuous hinges conforming to ANSI/BHMA A156.26, Grade 1.
    2. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum.
    3. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
    4. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.

5. On fire-rated doors, provide aluminum geared continuous hinges classified for use on rated doors by testing agency acceptable to authority having jurisdiction.
6. Provide aluminum geared continuous hinges with electrified option scheduled in the hardware sets. Provide with sufficient number and wire gage to accommodate electric function of specified hardware.
7. Provide hinges 1 inch (25.4 mm) shorter in length than nominal height of door, unless otherwise noted or door details require shorter length and with symmetrical hole pattern.

2.06 CYLINDRICAL LOCKS – GRADE 1

A. Manufacturers and Products:
   1. Scheduled Manufacturer and Product:
      a. Corbin-Russwin CLX3300 series
   2. Acceptable Manufacturers and Products:
      a. Sargent 10X-Line

B. Requirements:
   1. Provide cylindrical locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 1, and UL Listed for 3 hour fire doors.
   2. Cylinders: Refer to “KEYING” article, herein.
   3. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2 inch (12.7 mm) latch throw. Provide proper latch throw for UL listing at pairs.
   4. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
   5. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
   6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
   7. Provide electrified options as scheduled in the hardware sets.
   8. Lever Trim: Solid cast levers without plastic inserts and wrought roses on both sides.
      a. Lever Design: Corbin Russwin Armstrong (AZ)

2.07 EXIT DEVICES

A. Manufacturers and Products:
   1. Scheduled Manufacturer and Product:
      a. Corbin Russwin PED5000 series
   2. Acceptable Manufacturers and Products:
      a. Von Duprin 98/99 series

B. Requirements:
   1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware.
   2. Cylinders: Refer to “KEYING” article, herein.
   3. Provide touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
   4. Touchpad must extend a minimum of one half of door width. No plastic inserts are allowed in touchpads.
   5. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrified requirements.
   6. Provide exit devices with weather resistant components that can withstand harsh conditions of various climates and corrosive cleaners used in outdoor pool environments.
   7. Provide flush end caps for exit devices.
   8. Provide exit devices with manufacturer’s approved strikes.
   9. Provide exit devices cut to door width and height. Install exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
   10. Mount mechanism case flush on face of doors or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
   11. Provide cylinder or hex-key dogging as specified at non fire-rated openings.

12. Removable Mullions: 2 inches (50.8 mm) x 3 inches (76.2 mm) steel tube. Where scheduled as keyed removable mullion, provide type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
13. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
14. Provide electrified options as scheduled.
15. Top latch mounting: double or single tab mount for steel doors, face mount for aluminum doors eliminating requirement of tabs, and double tab mount for wood doors.
16. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.

2.08 ELECTRIC STRIKES

A. Manufacturers and Products:
   1. Scheduled Manufacturer and Product:
      a. HES 1500/9500 series
   2. Acceptable Manufacturers and Products:
      a. No Substitute

B. Requirements:
   1. Provide electric strikes designed for use with type of locks shown at each opening.
   2. Provide electric strikes UL Listed as burglary-resistant.
   3. Where required, provide electric strikes UL Listed for fire doors and frames.
   4. Provide transformers and rectifiers for each strike as required. Verify voltage with electrical contractor.

2.09 CYLINDERS

A. Manufacturers and Products:
   1. Scheduled Manufacturer:
      a. Corbin-Russwin
   2. Acceptable Manufacturers and Products:
      a. Sargent

B. Requirements:
   1. Provide cylinders/cores, from the same manufacturer of locksets, compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset, manufacturer’s series as indicated. Refer to “KEYING” article, herein.
   2. Provide cylinders in the below-listed configuration(s), distributed throughout the Project as indicated.
      a. Cylinder with small format interchangeable core (SFIC) core

C. Construction Keying:
   1. Replaceable Construction Cores.
      a. Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
         1) 3 construction control keys
         2) 12 construction change (day) keys.
      b. Owner or Owner’s Representative will replace temporary construction cores with permanent cores.

2.10 KEYING

A. Provide a factory registered keying system, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.

B. Provide cylinders/cores keyed into Owner’s existing factory registered keying system. Comply with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.

C. Requirements:

1. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.
    a. Master Keying system as directed by the Owner.
2. Forward bitting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no additional cost to Owner.
3. Provide keys with the following features:
    a. Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
    b. Patent Protection: Keys and blanks protected by one or more utility patent(s)
4. Identification:
    a. Mark permanent cylinders/cores and keys with applicable blind code for identification. Do not provide blind code marks with actual key cuts.
    b. Identification stamping provisions must be approved by the Architect and Owner.
    c. Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.
    d. Failure to comply with stamping requirements will be cause for replacement of keys involved at no additional cost to Owner.
    e. Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.
5. Quantity: Furnish in the following quantities.
    a. Change (Day) Keys: 3 per cylinder/core.
    b. Permanent Control Keys: 3.
    c. Master Keys: 6.

2.11 DOOR CLOSERS

A. Manufacturers and Products:
    1. Scheduled Manufacturer and Product:
        a. Norton 7500 series
    2. Acceptable Manufacturers and Products:
        a. Corbin-Russwin DC8000 series

B. Requirements:
    1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
    2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
    3. Cylinder Body: 1-1/2 inch (38 mm) diameter with 5/8 inch (15.88 mm) diameter double heat-treated pinion journal.
    4. Hydraulic Fluid: Fireproof, passing requirements of UL 10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees Fahrenheit (48.89 degrees Celsius) to -30 degrees Fahrenheit (-1.11 degrees Celsius).
    5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
    6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.
    7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers.
    8. Pressure Relief Valve (PRV) Technology: Not permitted.
    9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
    10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.12 DOOR TRIM

A. Manufacturers:
   1. Scheduled Manufacturer:
      a. Rockwood
   2. Acceptable Manufacturers:
      a. Trimco
      b. Hager

B. Requirements:
   1. Provide push plates, push bars, pull plates, and pulls with diameter and length as scheduled.

2.13 PROTECTION PLATES

A. Manufacturers:
   1. Scheduled Manufacturer:
      a. Rockwood
   2. Acceptable Manufacturers:
      a. Trimco
      b. Hager

B. Requirements:
   1. Provide protection plates with a minimum of 0.050 inch (1.27 mm) thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
   2. Sizes plates 2 inches (50.8 mm) less width of door on single doors, pairs of doors with a mullion, and doors with edge guards. Size plates 1 inch (25.4 mm) less width of door on pairs without a mullion or edge guards.
   3. At fire rated doors, provide protection plates over 16 inches (406.4 mm) high with UL label.

2.14 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

A. Manufacturers:
   1. Scheduled Manufacturers:
      a. Rixson
   2. Acceptable Manufacturers:
      a. ABH

B. Requirements:
   1. Provide overhead stop at any door where conditions do not allow for a wall stop or floor stop presents tripping hazard.
   2. Provide friction type at doors without closer and positive type at doors with closer.

2.15 DOOR STOPS AND HOLDERS

A. Manufacturers:
   1. Scheduled Manufacturer:
      a. Rockwood
   2. Acceptable Manufacturers:
      a. Trimco
      b. Hager

B. Provide door stops at each door leaf:
   1. Provide wall stops wherever possible. Provide concave type where lockset has a push button or thumbturn.
   2. Where a wall stop cannot be used, provide universal floor stops.
   3. Where wall or floor stop cannot be used, provide overhead stop.
   4. Provide roller bumper where doors open into each other and overhead stop cannot be used.

2.16 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Manufacturers:
   1. Scheduled Manufacturer:
      a. Pemko
   2. Acceptable Manufacturers:
      a. National Guard
      b. Reese

B. Requirements:
   1. Provide thresholds, weather-stripping, and gasketing systems as specified and per architectural details. Match finish of other items.
   2. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
   3. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.
   4. Size thresholds 1/2 inch (12.7 mm) high by 5 inches (127 mm) wide by door width unless otherwise specified in the hardware sets or detailed in the drawings.

2.17 FINISHES

A. Finish: BHMA 626/652 (US26D); except:
   1. Hinges at Exterior Doors: BHMA 630 (US32D)
   2. Continuous Hinges: BHMA 628 (US28)
   3. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
   4. Protection Plates: BHMA 630 (US32D)
   5. Overhead Stops and Holders: BHMA 630 (US32D)
   6. Door Closers: Powder Coat to Match
   7. Wall Stops: BHMA 630 (US32D)
   8. Weatherstripping: Clear Anodized Aluminum
   9. Thresholds: Mill Finish Aluminum

PART 3 EXECUTION

3.01 EXAMINATION

A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance. Verify doors, frames, and walls have been properly reinforced for hardware installation.

B. Field verify existing doors and frames receiving new hardware and existing conditions receiving new openings. Verify that new hardware is compatible with existing door and frame preparation and existing conditions.

C. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

D. Submit a list of deficiencies in writing and proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Where on-site modification of doors and frames is required:
   1. Carefully remove existing door hardware and components being reused. Clean, protect, tag, and store in accordance with storage and handling requirements specified herein.
   2. Field modify and prepare existing doors and frames for new hardware being installed.
   3. When modifications are exposed to view, use concealed fasteners, when possible.
   4. Prepare hardware locations and reinstall in accordance with installation requirements for new door hardware and with:

a. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
b. Wood Doors: DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."
c. Doors in rated assemblies: NFPA 80 for restrictions on on-site door hardware preparation.

3.03 INSTALLATION

A. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.
1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
2. Custom Steel Doors and Frames: HMMA 831.
3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

B. Install each hardware item in compliance with manufacturer’s instructions and recommendations, using only fasteners provided by manufacturer.

C. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.

D. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.

E. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

F. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.

G. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated.

H. Lock Cylinders:
1. Install construction cores to secure building and areas during construction period.
2. Replace construction cores with permanent cores as indicated in keying section.
3. Furnish permanent cores to Owner for installation.

I. Wiring: Coordinate with Division 26, ELECTRICAL sections for:
1. Conduit, junction boxes and wire pulls.
2. Connections to and from power supplies to electrified hardware.
3. Connections to fire/smoke alarm system and smoke evacuation system.
4. Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
5. Testing and labeling wires with Architect’s opening number.

J. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

K. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.

L. Closer/Holders: Mount closer/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.

M. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

N. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.

O. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

P. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

Q. Door Bottoms and Sweeps: Apply to bottom of door, forming seal with threshold when door is closed.

3.04 FIELD QUALITY CONTROL

A. Inspection and Testing:
   1. Provide functional testing and inspection of fire door assemblies by a qualified person in accordance with NFPA 80.
      a. Schedule fire door assembly inspection within 90 days of Substantial Completion of the Project.
      b. Submit a signed, written final report as specified in Paragraph 1.03.E.1.
      c. Correct all deficiencies and schedule a reinspection of fire door assemblies noted as deficient on the inspection report.
      d. Inspector to reinspect fire door assemblies after repairs are made.
   2. Provide inspection of required egress door assemblies by a qualified person in accordance with NFPA 101.
      a. Schedule egress door assembly inspection within 90 days of Substantial Completion of the Project for the required openings.
      b. Submit a signed, written final report as specified in Paragraph 1.03.E.2.
      c. Correct all deficiencies and schedule a reinspection of egress door assemblies noted as deficient on the inspection report.
      d. Inspector to reinspect required egress door assemblies after repairs are made.

3.05 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
   1. Spring Hinges: Adjust to achieve positive latching when door can close freely from an open position of 30 degrees.
   2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
   3. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

B. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

3.06 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items per manufacturer’s instructions to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.07 DOOR HARDWARE SCHEDULE

A. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier’s responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.

B. Discrepancies, conflicting hardware, and missing items are to be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application.

C. Hardware items are referenced in the following hardware schedule. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.

D. Hardware Sets:

SET #1

EA HINGE AS SPECIFIED ABOVE MCKINNEY

1 EA PASSAGE SET CLX3310 626 CORBIN RUSSWIN

1 EA KICK PLATE K1050 8 X 2 LDW 630 ROCKWOOD

1 EA WALL STOP 406/409 AS REQ'D 630 ROCKWOOD

*** AT EXISTING DOORS AND/OR FRAMES, CONTRACTOR TO CONFIRM COMPATIBILITY OF NEW HARDWARE WITH EXISTING DOOR AND/OR FRAME PREPS PRIOR TO ORDERING.**

SET #2

EA HINGE AS SPECIFIED ABOVE MCKINNEY

1 EA PASSAGE SET CLX3310 626 CORBIN RUSSWIN

1 EA SURFACE CLOSER 7500 689 NORTON

1 EA ARMOR PLATE K1050 34 X 2 LDW 630 ROCKWOOD

1 EA WALL STOP 406/409 AS REQ'D 630 ROCKWOOD

1 SET PERIMETER SEAL 303CS 628 PEMKO

*** AT EXISTING DOORS AND/OR FRAMES, CONTRACTOR TO CONFIRM COMPATIBILITY OF NEW HARDWARE WITH EXISTING DOOR AND/OR FRAME PREPS PRIOR TO ORDERING.**

SET #3

EA HINGE AS SPECIFIED ABOVE MCKINNEY

1 EA PRIVACY SET W/ INDICATORS CLX3320 N X VSL-V33 626 CORBIN RUSSWIN 1 EA KICK PLATE K1050 8 X 2 LDW 630 ROCKWOOD

1 EA WALL STOP 406/409 AS REQ'D 630 ROCKWOOD

1 EA COAT HOOK RM820 626 ROCKWOOD

*** AT EXISTING DOORS AND/OR FRAMES, CONTRACTOR TO CONFIRM COMPATIBILITY OF NEW HARDWARE WITH EXISTING DOOR AND/OR FRAME PREPS PRIOR TO ORDERING.**

SET #4

EA HINGE AS SPECIFIED ABOVE MCKINNEY

1 EA PRIVACY SET W/ INDICATORS CLX3320 N X VSL-V33 626 CORBIN RUSSWIN 1 EA SURFACE CLOSER 7500 689 NORTON

1 EA KICK PLATE K1050 8 X 2 LDW 630 ROCKWOOD

1 EA WALL STOP 406/409 AS REQ'D 630 ROCKWOOD

1 EA COAT HOOK RM820 626 ROCKWOOD

*** AT EXISTING DOORS AND/OR FRAMES, CONTRACTOR TO CONFIRM COMPATIBILITY OF NEW HARDWARE WITH EXISTING DOOR AND/OR FRAME PREPS PRIOR TO ORDERING.**

SET #5

1 EA FIRESLIDE SLIDING DOOR SYSTEM BY SLIDING DOOR MANUFACTURER

1 EA SELF-LATCHING PASSAGE HARDWARE BY SLIDING DOOR MANUFACTURER

1 EA SELF-CLOSING (SOFT CLOSE) BY SLIDING DOOR MANUFACTURER

SET #6

EA HINGE AS SPECIFIED ABOVE MCKINNEY

1 EA RIM EXIT DEVICE PED5210 X 910PT 630 CORBIN RUSSWIN

1 EA SURFACE CLOSER 7500 689 NORTON

1 EA ARMOR PLATE K1050 34 X 2 LDW 630 ROCKWOOD

1 EA WALL STOP 406/409 AS REQ'D 630 ROCKWOOD

1 EA THRESHOLD 2005AT 719 PEMKO

1 EA SWEEP 315CN 628 PEMKO

1 SET PERIMETER SEAL 303CS 628 PEMKO

*** UNDERCUT DOOR AS REQUIRED FOR SCHEDULED THRESHOLD.**

*** AT EXISTING DOORS AND/OR FRAMES, CONTRACTOR TO CONFIRM COMPATIBILITY OF NEW HARDWARE WITH EXISTING DOOR AND/OR FRAME PREPS PRIOR TO ORDERING.**

SET #6A

EA HINGE AS SPECIFIED ABOVE MCKINNEY

1 EA RIM FIRE EXIT DEVICE PED5210-A X 910PT 630 CORBIN RUSSWIN

1 EA SURFACE CLOSER 7500 689 NORTON

1 EA UL ARMOR PLATE K1050F 42 X 2 LDW 630 ROCKWOOD

1 EA WALL STOP 406/409 AS REQ'D 630 ROCKWOOD

1 SET PERIMETER GASKETING 303CS 628 PEMKO

SET #6B

EA HINGE AS SPECIFIED ABOVE MCKINNEY

1 EA RIM FIRE EXIT DEVICE PED5210-A X 910PT 630 CORBIN RUSSWIN

1 EA SURFACE CLOSER W/ STOP CPS-7500 689 NORTON

1 EA UL ARMOR PLATE K1050F 34 X 2 LDW 630 ROCKWOOD

1 EA THRESHOLD 2005AT 719 PEMKO

1 EA SWEEP 315CN 628 PEMKO

1 SET PERIMETER SEAL 303CS 628 PEMKO

*** UNDERCUT DOOR AS REQUIRED FOR SCHEDULED THRESHOLD.**

SET #7

EA HINGE AS SPECIFIED ABOVE MCKINNEY

1 EA PASSAGE SET CLX3310 626 CORBIN RUSSWIN

1 EA SURFACE CLOSER 7500 689 NORTON

1 EA KICK PLATE K1050 8 X 2 LDW 630 ROCKWOOD

1 EA WALL STOP 406/409 AS REQ'D 630 ROCKWOOD

SET #8

EA HINGE AS SPECIFIED ABOVE MCKINNEY

1 EA PASSAGE SET CLX3310 626 CORBIN RUSSWIN

1 EA SURFACE CLOSER 7500 689 NORTON

1 EA ARMOR PLATE K1050 34 X 2 LDW 630 ROCKWOOD

1 EA WALL STOP 406/409 AS REQ'D 630 ROCKWOOD

1 EA THRESHOLD 2005AT 719 PEMKO

1 EA SWEEP 315CN 628 PEMKO

1 SET PERIMETER SEAL 303CS 628 PEMKO

*** UNDERCUT DOOR AS REQUIRED FOR SCHEDULED THRESHOLD.**

SET #9

EA HINGE AS SPECIFIED ABOVE MCKINNEY

1 EA PRIVACY SET W/ INDICATORS CLX3320 N X VSL-V33 626 CORBIN RUSSWIN 1 EA SURFACE CLOSER 7500 689 NORTON

1 EA KICK PLATE K1050 8 X 2 LDW 630 ROCKWOOD

1 EA WALL STOP 406/409 AS REQ'D 630 ROCKWOOD

1 SET PERIMETER GASKETING 303CS 628 PEMKO

1 EA DOOR BOTTOM 411ARL 719 PEMKO

SET #10

EA HINGE AS SPECIFIED ABOVE MCKINNEY

1 EA STOREROOM LOCK CLX3357 626 CORBIN RUSSWIN

1 EA SURFACE CLOSER W/ STOP CPS-7500 689 NORTON

1 EA KICK PLATE K1050 8 X 2 LDW 630 ROCKWOOD

1 EA THRESHOLD 2005AT 719 PEMKO

1 EA SWEEP 315CN 628 PEMKO

1 EA HEAD SEAL 2891AS 719 PEMKO

2 EA JAMB SEAL 290AS 719 PEMKO

1 EA RAIN DRIP 346C 628 PEMKO

*** UNDERCUT DOOR AS REQUIRED FOR SCHEDULED THRESHOLD.**

SET #11

1 EA CONTINUOUS HINGE C-FM-SLF-HD1 628 PEMKO

1 EA ELECTRIC STRIKE 1500C 630 HES

1 EA STOREROOM LOCK CLX3357 626 CORBIN RUSSWIN

1 EA SURFACE CLOSER W/ STOP CPS-7500 689 NORTON

1 EA THRESHOLD 2005AT 719 PEMKO

*** UNDERCUT DOOR AS REQUIRED FOR SCHEDULED THRESHOLD.**

*** PERIMETER GASKETING AND SWEEP BY ALUMINUM DOOR MANUFACTURER.**

*** CREDENTIAL READER, POWER SUPPLY, AND DOOR POSITION SWITCH BY SECURITY CONTRACTOR.**

OPERATION: DOOR IS NORMALLY CLOSED AND LOCKED. VALID CREDENTIAL PRESENTATION RELEASES ELECTRIC STRIKE FOR ENTRY. FREE EGRESS AT ALL TIMES. UPON LOSS OF POWER DOOR REMAINS LOCKED (FAIL-SECURE).

SET #12

1 EA HINGE AS SPECIFIED ABOVE MCKINNEY

2 EA SPRING HINGE AS SPECIFIED ABOVE MCKINNEY

1 EA STOREROOM LOCK CLX3357 626 CORBIN RUSSWIN

1 SET PERIMETER GASKETING 303CS X 4-SIDED FRAME 628 PEMKO

SET #13

EA HINGE AS SPECIFIED ABOVE MCKINNEY

1 EA PRIVACY SET W/ INDICATORS CLX3320 N X VSL-V33 626 CORBIN RUSSWIN 1 EA KICK PLATE K1050 8 X 2 LDW 630 ROCKWOOD

1 EA WALL STOP 406/409 AS REQ'D 630 ROCKWOOD

*** AT EXISTING DOORS AND/OR FRAMES, CONTRACTOR TO CONFIRM COMPATIBILITY OF NEW HARDWARE WITH EXISTING DOOR AND/OR FRAME PREPS PRIOR TO ORDERING.**

SET #14

EA HINGE AS SPECIFIED ABOVE MCKINNEY

1 EA PRIVACY SET W/ INDICATORS CLX3320 N X VSL-V33 626 CORBIN RUSSWIN 1 EA KICK PLATE K1050 8 X 2 LDW 630 ROCKWOOD

1 EA SURF. OVEREAD STOP 55 SERIES 630 ROCKWOOD

*** AT EXISTING DOORS AND/OR FRAMES, CONTRACTOR TO CONFIRM COMPATIBILITY OF NEW HARDWARE WITH EXISTING DOOR AND/OR FRAME PREPS PRIOR TO ORDERING.**

SET #15

EA HINGE AS SPECIFIED ABOVE MCKINNEY

1 EA PUSH PLATE 70C 630 ROCKWOOD

1 EA PULL PLATE 110 X 70C 630 ROCKWOOD

1 EA ARMOR PLATE K1050 34 X 2 LDW 630 ROCKWOOD

*** BALANCE OF HARDWARE EXISTING TO REMAIN/BE RE-USED. AT EXISTING DOORS AND/OR FRAMES, CONTRACTOR TO CONFIRM COMPATIBILITY OF NEW HARDWARE WITH EXISTING DOOR AND/OR FRAME PREPS PRIOR TO ORDERING.**

SET #16

EA HINGE AS SPECIFIED ABOVE MCKINNEY

1 EA PUSH PLATE 70C 630 ROCKWOOD

1 EA PULL PLATE 110 X 70C 630 ROCKWOOD

1 EA SURFACE CLOSER W/ STOP CPS-7500 689 NORTON

2 EA KICK PLATE K1050 8 X 1 LDW 630 ROCKWOOD

2 EA SWEEP 315CN 628 PEMKO

*** BALANCE OF HARDWARE EXISTING TO REMAIN/BE RE-USED. AT EXISTING DOORS AND/OR FRAMES, CONTRACTOR TO CONFIRM COMPATIBILITY OF NEW HARDWARE WITH EXISTING DOOR AND/OR FRAME PREPS PRIOR TO ORDERING.**

SET #17

EA HINGE AS SPECIFIED ABOVE MCKINNEY

1 EA PASSAGE SET CLX3310 626 CORBIN RUSSWIN

1 EA KICK PLATE K1050 8 X 2 LDW 630 ROCKWOOD

1 EA WALL STOP 406/409 AS REQ'D 630 ROCKWOOD

SET #17A

EA HINGE AS SPECIFIED ABOVE MCKINNEY

1 EA PASSAGE SET CLX3310 626 CORBIN RUSSWIN

1 EA KICK PLATE K1050 8 X 2 LDW 630 ROCKWOOD

1 EA CONCEALED OVERHEAD STOP 1ADJ SERIES 630 RIXSON

SET #18

EA HINGE AS SPECIFIED ABOVE MCKINNEY

1 EA PRIVACY SET W/ INDICATORS CLX3320 N X VSL-V33 626 CORBIN RUSSWIN 1 EA SURFACE CLOSER 7500 689 NORTON

1 EA KICK PLATE K1050 8 X 2 LDW 630 ROCKWOOD

1 EA WALL STOP 406/409 AS REQ'D 630 ROCKWOOD

1 SET PERIMETER GASKETING 303CS 628 PEMKO

1 EA DOOR BOTTOM 411ARL 719 PEMKO

SET #19

EA HINGE AS SPECIFIED ABOVE MCKINNEY

1 EA PUSH PLATE 70C 630 ROCKWOOD

1 EA PULL PLATE 110 X 70C 630 ROCKWOOD

1 EA SURFACE CLOSER 7500 689 NORTON

1 EA KICK PLATE K1050 8 X 2 LDW 630 ROCKWOOD

1 EA WALL STOP 406/409 AS REQ'D 630 ROCKWOOD

SET #19A

EA HINGE AS SPECIFIED ABOVE MCKINNEY

1 EA PUSH PLATE 70C 630 ROCKWOOD

1 EA PULL PLATE 110 X 70C 630 ROCKWOOD

1 EA SURFACE CLOSER W/ STOP CPS-7500 689 NORTON

1 EA KICK PLATE K1050 8 X 2 LDW 630 ROCKWOOD

1 SET PERIMETER SEAL 303CS 628 PEMKO

*** AT EXISTING DOORS AND/OR FRAMES, CONTRACTOR TO CONFIRM COMPATIBILITY OF NEW HARDWARE WITH EXISTING DOOR AND/OR FRAME PREPS PRIOR TO ORDERING.**

SET #20

EA HINGE AS SPECIFIED ABOVE MCKINNEY

1 EA RIM FIRE EXIT DEVICE PED5210-A X 910PT 630 CORBIN RUSSWIN

1 EA SURFACE CLOSER W/ STOP CPS-7500 689 NORTON

1 EA UL ARMOR PLATE K1050F 34 X 2 LDW 630 ROCKWOOD

1 SET PERIMETER SEAL 303CS 628 PEMKO

SET #21

EA HINGE AS SPECIFIED ABOVE MCKINNEY

1 EA RIM FIRE EXIT DEVICE PED5210-A X 910PT 630 CORBIN RUSSWIN

1 EA SURFACE CLOSER 7500 689 NORTON

1 EA UL ARMOR PLATE K1050F 34 X 2 LDW 630 ROCKWOOD

1 EA WALL STOP 406/409 AS REQ'D 630 ROCKWOOD

1 EA THRESHOLD 2005AT 719 PEMKO

1 EA SWEEP 315CN 628 PEMKO

1 SET PERIMETER SEAL 303CS 628 PEMKO

*** UNDERCUT DOOR AS REQUIRED FOR SCHEDULED THRESHOLD.**

SET #21A

EA HINGE AS SPECIFIED ABOVE MCKINNEY

1 EA RIM EXIT DEVICE PED5210 X 910PT 630 CORBIN RUSSWIN

1 EA SURFACE CLOSER W/ STOP CPS-7500 689 NORTON

1 EA ARMOR PLATE K1050 34 X 2 LDW 630 ROCKWOOD

1 EA THRESHOLD 2005AT 719 PEMKO

1 EA SWEEP 315CN 628 PEMKO

1 SET PERIMETER SEAL 303CS 628 PEMKO

*** UNDERCUT DOOR AS REQUIRED FOR SCHEDULED THRESHOLD.**

SET #22

2 EA PUSH PLATE 70C 630 ROCKWOOD

2 EA ARMOR PLATE K1050 34 X 2 LDW 630 ROCKWOOD

*** BALANCE OF HARDWARE EXISTING TO REMAIN/BE RE-USED. AT EXISTING DOORS AND/OR FRAMES, CONTRACTOR TO CONFIRM COMPATIBILITY OF NEW HARDWARE WITH EXISTING DOOR AND/OR FRAME PREPS PRIOR TO ORDERING.**

SET #23

1 EA ENTRY LOCK CLX3351 626 CORBIN RUSSWIN

1 EA ARMOR PLATE K1050 34 X 2 LDW 630 ROCKWOOD

1 EA SWEEP 315CN 628 PEMKO

*** BALANCE OF HARDWARE EXISTING TO REMAIN/BE RE-USED. AT EXISTING DOORS AND/OR FRAMES, CONTRACTOR TO CONFIRM COMPATIBILITY OF NEW HARDWARE WITH EXISTING DOOR AND/OR FRAME PREPS PRIOR TO ORDERING.**

END OF SECTION 08 7100

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SECTION 08 8000
GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Insulating glass units.

B. Glazing units.

C. Bullet resistant glazing.

D. Glazing compounds.

1.02 RELATED REQUIREMENTS

A. Section 07 2600 - Vapor Retarders.

B. Section 07 9200 - Joint Sealants: Sealants for other than glazing purposes.

C. Section 08 1113 - Hollow Metal Doors and Frames: Glazed lites in doors and borrowed lites.

D. Section 08 1416 - Flush Wood Doors: Glazed lites in doors.

E. Section 08 4313 - Aluminum-Framed Storefronts: Glazing provided as part of storefront assembly.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).

C. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2019).

D. ASTM C1036 - Standard Specification for Flat Glass; 2021.

E. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

F. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2021a.

G. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2016.

H. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2019.

I. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2023.

J. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2023.

K. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2023.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by each of the affected installers.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data on Insulating Glass Unit and Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

D. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

1.07 FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 40 degrees F (4 degrees C).

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Insulating Glass Units: Provide a five (5) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
   1. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
   2. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
   3. Glass thicknesses listed are minimum.

B. Weather-Resistive Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure water-resistive barrier, vapor retarder, and/or air barrier.
   1. In conjunction with weather barrier related materials described in other sections, as follows:
      a. Vapor Retarders: See Section 07 2600.

C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
   1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
   2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
   3. Solar Optical Properties: Comply with NFRC 300 test method.

2.02 GLASS MATERIALS

A. Float Glass: Provide float glass based glazing unless otherwise indicated.
   1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
   2. Kind FT - Fully Tempered Type: Complies with ASTM C1048.
   3. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.

2.03 INSULATING GLASS UNITS

A. Manufacturers:
   1. Guardian Glass, LLC: www.guardianglass.com/#sle.
   2. Pilkington North America Inc: www.pilkington.com/na/#sle.Pilkington North America Inc: www.pilkington.com/na/#sle.
   3. PPG Industries, Inc..

B. Fabricator: Certified by glass manufacturer for type of glass, coating, and treatment involved and capable of providing specified warranty.

C. Insulating Glass Units: Types as indicated.
   1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
   2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
   3. Metal-Edge Spacers: Aluminum, bent and soldered corners.
   4. Spacer Color: Black.
   5. Edge Seal:
      a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone, polysulfide, or polyurethane sealant as secondary seal applied around perimeter.
      b. Color: Black.
   6. Purge interpane space with dry air, hermetically sealed.

D. Type IG-1 - Insulating Glass Units: Vision glass, double glazed.
   1. Applications: Exterior glazing unless otherwise indicated.
   2. Space between lites filled with argon.
   3. Outboard Lite: Annealed float glass, 1/4 inch (6.4 mm) thick, minimum.
      a. Tint: As selected by Architect from manufacturer's full range.
   4. Metal edge spacer.
   5. Inboard Lite: Annealed float glass, 1/4 inch (6.4 mm) thick, minimum.
      a. Tint: Clear.
      b. Coating: Low-E, Pyrolytic or sputtered, on #3 surface.
   6. Total Thickness: 1 inch (25.4 mm).
   7. Thermal Transmittance (U-Value), Summer Daytime/Winter Nighttime: 0.29, nominal.
   8. Visible Light Transmittance (VLT): 44 percent, nominal.
   9. Solar Heat Gain Coefficient (SHGC): 0.52, nominal.
   10. Glazing Method: Dry glazing method, gasket glazing.

E. Type IG-2 - Insulating Glass Units: Safety glazing.
   1. Applications:
      a. Glazed lites in exterior doors.
      b. Glazed sidelights and panels next to doors.
      c. Other locations required by applicable federal, state, and local codes and regulations.
      d. Other locations indicated on drawings.
   2. Space between lites filled with argon.
   3. Glass Type: Same as Type IG-1 except use fully tempered float glass for both outboard and inboard lites.
   4. Total Thickness: 1 inch (25.4 mm).
   5. Metal edge spacer.
   6. Thermal Transmittance (U-Value), Summer Daytime/Winter Nighttime: 0.29, nominal.
   7. Visible Light Transmittance (VLT): 44 percent, nominal.
   8. Solar Heat Gain Coefficient (SHGC): 0.52, nominal.
   9. Glazing Method: Dry glazing method, gasket glazing.

2.04 GLAZING UNITS

A. Type G-1 - Monolithic Interior Vision Glazing:
   1. Applications: Interior glazing unless otherwise indicated.
   2. Glass Type: Annealed float glass.
   3. Tint: Clear.
   4. Thickness: 1/4 inch (6.4 mm), nominal.

B. Type G-2 - Monolithic Safety Glazing: Non-fire-rated.
   1. Applications:
      a. Glazed lites in doors, except fire doors.
      b. Glazed sidelights to doors, except in fire-rated walls and partitions.
      c. Other locations required by applicable federal, state, and local codes and regulations.
      d. Other locations indicated on drawings.
   2. Glass Type: Fully tempered safety glass as specified.
   3. Tint: Clear.
   4. Thickness: 1/4 inch (6.4 mm), nominal.

C. Type G-4 - Glass Shelves:
   1. Applications: Locations as indicated on drawings.
   2. Tint: Clear.
   3. Glass Type: Fully tempered float glass with ground edges and corners; ASTM C1048.
   4. Thickness: 1/4 inch (6.4 mm), nominal.

2.05 ACCESSORIES

A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot (25 mm for each square meter) of glazing or minimum 4 inch (100 mm) by width of glazing rabbet space minus 1/16 inch (1.5 mm) by height to suit glazing method and pane weight and area.

B. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

C. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

A. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.

3.04 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.

B. Place setting blocks at 1/4 points with edge block no more than 6 inch (152 mm) from corners.

C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.05 CLEANING

A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

B. Remove nonpermanent labels immediately after glazing installation is complete.

C. Clean glass and adjacent surfaces after sealants are fully cured.

D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.06 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION 08 8000

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SECTION 09 0561
COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This section applies to floors identified in Contract Documents that are receiving the following types of floor coverings:
   1. Resilient tile and sheet.
   2. Carpet tile.
   3. Thin-set ceramic tile and stone tile.

B. Removal of existing floor coverings.

C. Preparation of new and existing concrete floor slabs for installation of floor coverings.

D. Testing of concrete floor slabs for moisture and alkalinity (pH).

E. Testing of existing concrete floor slabs for moisture and alkalinity (pH) has already been conducted; test report is attached.

F. Remediation of concrete floor slabs due to unsatisfactory moisture or alkalinity (pH) conditions.
   1. Contractor shall perform all specified remediation of concrete floor slabs. If such remediation is indicated by testing agency's report and is due to a condition not under Contractor's control or could not have been predicted by examination prior to entering into the contract, a contract modification will be issued.

G. Patching compound.

H. Remedial floor treatment.

1.02 RELATED REQUIREMENTS

A. Section 01 4000 - Quality Requirements: Additional requirements relating to testing agencies and testing.

B. Section 01 7419 - Construction Waste Management and Disposal: Handling of existing floor coverings removed.

C. Section 03 3000 - Cast-in-Place Concrete: Moisture emission reducing curing and sealing compound for slabs to receive adhered flooring, to prevent moisture content-related flooring failures; to remain in place, not to be removed.

1.03 REFERENCE STANDARDS

A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 50 mm [2 in.] Cube Specimens); 2023.

B. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters, and Gypsum Concrete; 2020.

C. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2023.

D. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings; 2018.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate scheduling of cleaning and testing, so that preliminary cleaning has been completed for at least 24 hours prior to testing.

1.05 SUBMITTALS

A. Visual Observation Report: For existing floor coverings to be removed.

B. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
   1. Moisture and alkalinity (pH) limits and test methods.
   2. Manufacturer's required bond/compatibility test procedure.

C. Remedial Materials Product Data: Manufacturer's published data on each product to be used for remediation.
   1. Manufacturer's qualification statement.
   2. Certificate: Manufacturer's certification of compatibility with types of flooring applied over remedial product.
   3. Test reports indicating compliance with specified performance requirements, performed by nationally recognized independent testing agency.
   4. Manufacturer's installation instructions.
   5. Specimen Warranty: Copy of warranty to be issued by coating manufacturer and certificate of underwriter's coverage of warranty.

D. Testing Agency's Report:
   1. Description of areas tested; include floor plans and photographs if helpful.
   2. Summary of conditions encountered.
   3. Moisture and alkalinity (pH) test reports.
   4. Copies of specified test methods.
   5. Recommendations for remediation of unsatisfactory surfaces.
   6. Product data for recommended remedial coating.
   7. Submit report to Architect.
   8. Submit report not more than two business days after conclusion of testing.

E. Adhesive Bond and Compatibility Test Report.

F. Copy of RFCI (RWP).

1.06 QUALITY ASSURANCE

A. Moisture and alkalinity (pH) testing shall be performed by an independent testing agency employed and paid by Contractor.

B. Contractor may perform adhesive and bond test with Contractor's own personnel or hire a testing agency.

C. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.
   1. Submit evidence of experience consisting of at least 3 test reports of the type required, with project Owner's project contact information.

D. Contractor's Responsibility Relating to Independent Agency Testing:
   1. Provide access for and cooperate with testing agency.
   2. Confirm date of start of testing at least 10 days prior to actual start.
   3. Allow at least 4 business days on site for testing agency activities.
   4. Achieve and maintain specified ambient conditions.
   5. Notify Architect when specified ambient conditions have been achieved and when testing will start.

1.07 FIELD CONDITIONS

A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F (18 degrees C) or more than 85 degrees F (30 degrees C).

B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

PART 2 PRODUCTS

2.01 MATERIALS

A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:
   1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.
   2. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.

B. Alternate Flooring Adhesive: Floor covering manufacturer's recommended product, suitable for the moisture and pH conditions present; low-VOC. In the absence of any recommendation from flooring manufacturer, provide a product recommended by adhesive manufacturer as suitable for substrate and floor covering and for conditions present.

C. Remedial Floor Treatment: Penetrating, spray-applied, silicate-based product intended by its manufacturer to resist water vapor transmission to degree sufficient to meet flooring manufacturer's emission limits, resistant to the level of alkalinity (pH) found, and suitable for adhesion of flooring without further treatment.
   1. Use product recommended by testing agency.

PART 3 EXECUTION

3.01 CONCRETE SLAB PREPARATION

A. Perform following operations in the order indicated:
   1. Preliminary cleaning.
   2. Moisture vapor emission tests; 3 tests in the first 1000 square feet (100 square meters) and one test in each additional 1000 square feet (100 square meters), unless otherwise indicated or required by flooring manufacturer.
   3. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
   4. Alkalinity (pH) tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
   5. Specified remediation, if required.
   6. Patching, smoothing, and leveling, as required.
   7. Other preparation specified.
   8. Adhesive bond and compatibility test.
   9. Protection.

3.02 REMOVAL OF EXISTING FLOOR COVERINGS

A. Comply with local, State, and federal regulations and recommendations of RFCI (RWP), as applicable to floor covering being removed.

B. Dispose of removed materials in accordance with local, State, and federal regulations and as specified.

3.03 MOISTURE VAPOR EMISSION TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test in accordance with ASTM F1869 and as follows.

D. Plastic sheet test and mat bond test may not be substituted for the specified ASTM test method, as those methods do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if test values exceed 3 pounds per 1000 square feet (1.4 kg per 93 square meters) per 24 hours.

F. Report: Report the information required by the test method.

3.04 ALKALINITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if alkalinity (pH) test value is over 10.

3.05 PREPARATION

A. See individual floor covering section(s) for additional requirements.

B. Comply with requirements and recommendations of floor covering manufacturer.

C. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.

D. Do not fill expansion joints, isolation joints, or other moving joints.

3.06 ADHESIVE BOND AND COMPATIBILITY TESTING

A. Comply with requirements and recommendations of floor covering manufacturer.

3.07 APPLICATION OF REMEDIAL FLOOR TREATMENT

A. Comply with requirements and recommendations of treatment manufacturer.

END OF SECTION 09 0561

SECTION 09 2116
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.

B. Metal stud wall framing.

C. Acoustic insulation.

D. Cementitious backing board.

E. Gypsum wallboard.

F. Joint treatment and accessories.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.

B. Section 07 9200 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

1.03 REFERENCE STANDARDS

A. AISI S220 - North American Standard for Cold-Formed Steel Nonstructural Framing; 2020.

B. AISI S240 - North American Standard for Cold-Formed Steel Structural Framing; 2015, with Errata (2020).

C. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2018.

D. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 2019.

E. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members; 2015.

F. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories; 2020.

G. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017 (Reapproved 2022).

H. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2023.

I. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.

J. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2023.

K. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2022.

L. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2019.

M. ASTM C1325 - Standard Specification for Fiber-Mat Reinforced Cementitious Backer Units; 2022, with Editorial Revision (2023).

N. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.

O. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.

P. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.

Q. ASTM E413 - Classification for Rating Sound Insulation; 2022.

R. GA-216 - Application and Finishing of Gypsum Panel Products; 2021.

S. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the installation of gypsum board assemblies with size, location, and installation of service utilities.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data:
   1. Provide data on metal framing, gypsum board, accessories, and joint finishing system.
   2. Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store gypsum products and accessories indoors and keep above freezing. Elevate boards above floor, on nonwicking supports, in accordance with manufacturer's recommendations.

B. Store metal products to prevent corrosion.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.

B. Interior Partitions, Indicated as Acoustic: Provide completed assemblies with the following characteristics:
   1. Acoustic Attenuation: STC as indicated calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

C. Fire-Resistance-Rated Assemblies: Provide completed assemblies with the following characteristics:
   1. Fire-Resistance-Rated Partitions: UL listed assembly No. as indicated on the drawings.
   2. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL (FRD).

2.02 METAL FRAMING MATERIALS

A. Steel Sheet: ASTM A1003/A1003M, subject to the ductility limitations indicated in AISI S220 or equivalent.
   1. Corrosion Protection Coating Designation: G40, or equivalent in accordance with AISI S220.

B. Manufacturers - Metal Framing, Connectors, and Accessories:
   1. ClarkDietrich: www.clarkdietrich.com/#sle.
   2. MarinoWARE: www.marinoware.com/#sle.
   3. SCAFCO Corporation: www.scafco.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

C. Nonstructural Framing System Components: AISI S220; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf (L/120 at 240 Pa).
   1. Studs: C-shaped with knurled or embossed faces.
   2. Runners: U shaped, sized to match studs.
   3. Resilient Furring Channels: Single or double leg configuration; 1/2 inch (13 mm) channel depth.

D. Partition Head To Structure Connections: Provide track fastened to structure with legs of sufficient length to accommodate deflection, for friction fit of studs cut short and screwed to secondary deflection channel set inside but unattached to top track.

E. Deflection and Firestop Track: Intumescent strip factory-applied to track flanges expands when exposed to heat or flames to provide a perimeter joint seal.

2.03 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:
   1. CertainTeed Corporation: www.certainteed.com/#sle.
   2. Georgia-Pacific Gypsum: www.gpgypsum.com/#sle.
   3. USG Corporation: www.usg.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
   1. Application: Use Type X for vertical surfaces and ceilings, unless otherwise indicated.
   2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
      a. Mold resistant board is required as indicated on drawings.
   3. At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
   4. Thickness:
      a. Vertical Surfaces: 5/8 inch (16 mm).

C. Backing Board For Wet Areas: One of the following products:
   1. Application: Surfaces behind tile in wet areas where indicated on the drawings.
   2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   3. ANSI Cement-Based Board: Non-gypsum-based; aggregated Portland cement panels with glass fiber mesh embedded in front and back surfaces complying with ANSI A118.9 or ASTM C1325.
      a. Thickness: 1/2 inch (13 mm).
      b. Products:
         1) Custom Building Products; _____: www.custombuildingproducts.com/#sle.
         2) PermaBASE Building Products, LLC provided by National Gypsum Company; PermaBase Cement Board: www.goldbondbuilding.com/#sle.
         3) USG Corporation; Fiberock Brand Aqua-Tough AR Interior Panels Regular 1/2 in. (12.7 mm): www.usg.com/#sle.

2.04 GYPSUM BOARD ACCESSORIES

A. Acoustic Insulation: ASTM C665; preformed mineral-fiber, friction fit type, unfaced; thickness 2 inches (50.8 mm) or as indicated on the drawings.

B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.

C. Finishing Accessories: ASTM C1047, extruded aluminum alloy (6063 T5) or galvanized steel sheet ASTM A924/A924M G90, unless noted otherwise.
   1. Types: As detailed or required for finished appearance.

D. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.

E. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch (0.84 to 2.84 mm) in Thickness: ASTM C954; steel drill screws, corrosion-resistant.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 FRAMING INSTALLATION

A. Metal Framing: Install in accordance with ASTM C1007AISI S220 and manufacturer's instructions.

B. Studs: Space studs at 16 inches on center (at 406 mm on center).
   1. Extend partition framing to structure where indicated and to ceiling in other locations.
   2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
   3. Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs with continuous bridging.

C. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.

D. Blocking: Install mechanically fastened steel sheet blocking for support of:
   1. Wall-mounted cabinets.
   2. Plumbing fixtures.
   3. Toilet accessories.
   4. Wall mounted accessories.

3.03 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. Acoustic Sealant: Install in accordance with manufacturer's instructions.

3.04 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Nonrated: Install gypsum board parallel to framing, with ends and edges occurring over firm bearing.
   1. Exception: Tapered edges to receive joint treatment at right angles to framing.

C. Double-Layer, Nonrated: Use gypsum board for first layer, placed parallel to framing or furring members, with ends and edges occurring over firm bearing. Use glass mat faced gypsum board at exterior walls and at other locations as indicated. Place second layer perpendicular to framing or furring members. Offset joints of second layer from joints of first layer.

D. Fire-Resistance-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

E. Exposed Gypsum Board in Interior Wet Areas: Seal joints, cut edges, and holes with water-resistant sealant.

F. Cementitious Backing Board: Install over steel framing members and plywood substrate where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.

G. Installation on Metal Framing: Use screws for attachment of gypsum board.

3.05 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
   1. Not more than 30 feet (10 meters) apart on walls and ceilings over 50 feet (16 meters) long.
   2. At exterior soffits, not more than 30 feet (10 meters) apart in both directions.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.06 JOINT TREATMENT

A. Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with drying type joint compound.

B. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
   1. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish and other areas specifically indicated.
   2. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
   3. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
   4. Level 1: Wall areas above finished ceilings, whether or not accessible in the completed construction.

C. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch (0.8 mm).

D. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

E. Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.

3.07 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet (3 mm in 3 m) in any direction.

3.08 PROTECTION

A. Protect installed gypsum board assemblies from subsequent construction operations.

END OF SECTION 09 2116

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SECTION 09 3000
TILING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tile for floor applications.

B. Tile for wall applications.

C. Non-ceramic trim.

1.02 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants: Sealing joints between tile work and adjacent construction and fixtures.

B. Section 09 2116 - Gypsum Board Assemblies: Tile backer board.

1.03 REFERENCE STANDARDS

A. ANSI A108.19 - American National Standard Specifications for Interior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs by the Thin-Bed Method Bonded with Modified Dry-Set Cement Mortar or Improved Modified Dry-Set Cement Mortar; 2020.

B. ANSI A108.20 - American National Standard Specifications for Exterior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs; 2020.

C. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive; 2021.

D. ANSI A118.7 - American National Standard Specifications for High Performance Cement Grouts for Tile Installation; 2019.

E. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2022.

F. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2024.

G. TCNA (HB-GP) - Handbook for Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs Installation; 2023.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by affected installers.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

C. Installer's qualification statement.

D. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Tile: 1 percent of each size, color, and surface finish combination, but not less than 25 of each type.

1.06 QUALITY ASSURANCE

A. Installer Qualifications:
   1. Company specializing in performing tile installation, with minimum of five years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. See Section 01 7419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.08 FIELD CONDITIONS

A. Do not install solvent-based products in an unventilated environment.

B. Maintain ambient and substrate temperature above 50 degrees F (10 degrees C) and below 100 degrees F (38 degrees C) during installation and curing of setting materials.

PART 2 PRODUCTS

2.01 TILE

A. Manufacturers: All products by the same manufacturer.
   1. American Olean Corporation: www.americanolean.com/#sle.
   2. Dal-Tile Corporation: www.daltile.com/#sle.
   3. Substitutions: See Section 01 6000 - Product Requirements.

B. Ceramic Mosaic Tile, Type PTM-1: ANSI A137.1 standard grade.
   1. Products:
      a. American Olean Corporation, material and color as indicated on the drawings.

C. Porcelain Tile, Type PT-1, PTW-1 and PTWB-1: ANSI A137.1 standard grade.
   1. Products:
      a. Dal-Tile Corporation; Material and color indicated on the drawings: www.daltile.com/#sle.

2.02 TRIM AND ACCESSORIES

A. Non-Ceramic Trim: , style and dimensions as indicated on drawings, set with tile mortar or adhesive.
   1. Applications:
      a. Open edges of wall and floor tile.
      b. Transition between floor finishes of different heights.
      c. Floor-to-wall joints.
   2. Products:
      a. Schluter-Systems: www.schluter.com/#sle.

2.03 SETTING MATERIALS

A. Provide setting and grout materials from same manufacturer.

B. Manufacturers:
   1. Custom Building Products; _____: www.custombuildingproducts.com/#sle.
   2. LATICRETE International, Inc: www.laticrete.com/#sle.
   3. Mapei Corporation; _____: www.mapei.com/#sle.

C. Epoxy Adhesive and Mortar Bond Coat: ANSI A118.3.
   1. Products:
      a. Custom Building Products; EBM-Lite Epoxy Bonding Mortar: www.custombuildingproducts.com/#sle.

b. LATICRETE International, Inc; LATICRETE LATAPOXY 300 Adhesive: www.laticrete.com/#sle.
c. Mapei Corporation; Kerapoxy 410: www.mapei.com/#sle.

2.04 GROUTS

A. Provide setting and grout materials from same manufacturer.

B. High Performance Polymer Modified Grout: ANSI A118.7 polymer modified cement grout.
1. Applications: Use where indicated on drawings and where no other type of grout is indicated.
2. Use sanded grout for joints 1/8 inch (3.2 mm) wide and larger; use unsanded grout for joints less than 1/8 inch (3.2 mm) wide.
3. Color: As selected by Architect from manufacturer's full line.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify wall surfaces are smooth and flat within tolerances specified for that type of work, are dust-free, and are ready to receive tile.

3.02 PREPARATION

A. Vacuum clean surfaces and damp clean.

B. Seal substrate surface cracks with filler.

3.03 INSTALLATION - GENERAL

A. Lay tile to pattern indicated on drawings. Do not interrupt tile pattern through openings.

B. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

C. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.

D. Form internal angles square and external angles square.

E. Install non-ceramic trim in accordance with manufacturer's instructions.

F. Sound tile after setting. Replace hollow sounding units.

G. Keep control and expansion joints free of mortar, grout, and adhesive.

H. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

I. Grout tile joints unless otherwise indicated on drawings. Use standard grout unless otherwise indicated on drawings.

J. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

3.04 INSTALLATION - WALL TILE

A. Over cementitious backer units on studs, install in accordance with TCNA (HB) Method W244C, using membrane at toilet rooms, kitchens, and shower areas.

3.05 CLEANING

A. Clean tile and grout surfaces.

3.06 PROTECTION

A. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION 09 3000

SECTION 09 5100
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical panels.

1.02 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

B. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2022.

C. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2019.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

E. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2024a.

F. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2023.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

B. Do not install acoustical units until after interior wet work is dry.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on suspension system components and acoustical units.

C. Samples: Submit two samples 3 by 3 inch (76 by 76 mm) in size illustrating material and finish of acoustical units.

D. Samples: Submit two samples each, 6 inches (152 mm) long, of suspension system main runner, cross runner, and perimeter molding.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Acoustical Units: Quantity equal to 2 percent of total installed.

1.05 FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F (16 degrees C), and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acoustic Tiles/Panels: Subject to compliance with requirements, provide products as indicated on the drawings.
   1. Armstrong World Industries, Inc: www.armstrongceilings.com/#sle.
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. Suspension Systems:
   1. Same as for acoustical units.

2.02 ACOUSTICAL UNITS

A. Acoustical Units - General: ASTM E1264, Class A.
   1. Provide product type as indicated on the drawings.

2.03 SUSPENSION SYSTEM(S)

A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, clips, and splices as required.
   1. Materials:
      a. Steel Grid: ASTM A653/A653M, G30 coating, unless otherwise indicated.

B. Exposed Suspension System: Hot-dipped galvanized steel grid with steel cap.
   1. Structural Classification: Intermediate-duty, when tested in accordance with ASTM C635/C635M.
   2. Profile: Tee; 15/16 inch (24 mm) face width.
   3. Finish: Baked enamel.
   4. Color: White.
   5. Products:
      a. Armstrong World Industries, Inc.; Prelude XL..
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.04 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

B. Hanger Wire: 12 gauge, 0.106 inch (2.69 mm) galvanized steel wire.

C. Wood Veneer Panel Safety Clips: Galvanized 1-9/16 by 5-1/2 inch (40 by 139 mm) bent sheet metal clips screw anchored to back of adjacent panels and spanning over top of suspended tee grid.
   1. Wire Ties: No. 12 galvanized wire.

D. Wood Veneer Perimeter Trim: Field cut wood veneer panels to match acoustic ceiling panels.
   1. Support: Aluminum L angle, 1/8 inch (3.2 mm) thick.

E. Perimeter Moldings: Same metal and finish as grid.
   1. Angle Molding: L-shaped, for mounting at same elevation as face of grid.
   2. Channel Molding: U-shaped, for hold-down type installations.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.02 PREPARATION

A. Install after major above-ceiling work is complete.

B. Coordinate the location of hangers with other work.

C. Layout openings for penetrations centered on penetrating items.

3.03 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

C. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustical unit size unless otherwise indicated.

D. Locate system on room axis according to reflected plan.

E. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Use longest practical lengths.

F. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

G. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

H. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

I. Support fixture loads using supplementary hangers located within 6 inches (152 mm) of each corner, or support components independently.

J. Do not eccentrically load system or induce rotation of runners.

3.04 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

E. Cutting Acoustical Units:
   1. Make field cut edges of same profile as factory edges.

F. Install safety clips on wood veneer panels 2 inches (51 mm) from outside edge of panel and at 24 inches (610 mm) on center.

G. Install wood veneer trim using aluminum L angle to attach to suspended grid system as required for application.

3.05 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet (3 mm in 3 m).

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.06 CLEANING

A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.

B. Clean surfaces.

C. Replace damaged or abraded components.

END OF SECTION 09 5100

SECTION 09 6500
RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient tile flooring.

B. Resilient base.

C. Installation accessories.

1.02 RELATED REQUIREMENTS

A. Section 09 0561 - Common Work Results for Flooring Preparation: Removal of existing floor coverings, cleaning, and preparation.

1.03 REFERENCE STANDARDS

A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2023.

B. ASTM F1700 - Standard Specification for Solid Vinyl Floor Tile; 2020.

C. ASTM F1861 - Standard Specification for Resilient Wall Base; 2021.

D. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2023.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.

D. Verification Samples: Submit two samples, 4 by 4 inch (101.6 by 101.6 mm) in size illustrating color and pattern for each resilient flooring product specified.

E. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Wall Base: 10 linear feet (3 linear meters) of each type and color.
   3. Extra Stair Materials: Quantity equivalent to 5 percent of each type and color.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials off of the floor in an acclimatized, weather-tight space.

C. Maintain temperature in storage area between 55 degrees F (13 degrees C) and 90 degrees F (72 degrees C).

D. Protect roll materials from damage by storing on end.

E. Do not double stack pallets.

1.06 FIELD CONDITIONS

A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F (21 degrees C) to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F (13 degrees C).

PART 2 PRODUCTS

2.01 TILE FLOORING

A. Vinyl Tile - Type _____: Printed film type, with transparent or translucent wear layer; acoustic interlayer or backing.
   1. Manufacturers:
      a. Interface; Brushed Lines (Basis of Design).
      b. Substitutions: See Section 01 6000 - Product Requirements.
   2. Minimum Requirements: Comply with ASTM F1700, Class III.
   3. Plank Tile Size: 9.845 by 39.38 inch (_____ by _____ mm).
   4. Wear Layer Thickness: 22 mil
   5. Total Thickness: 0.18 inch (4.5 mm).
   6. Color: As indicated on drawings.

2.02 RESILIENT BASE

A. Resilient Base - Type RB-#: ASTM F1861, Type TS, rubber, vulcanized thermoset; style as scheduled.
   1. Manufacturers:
      a. Johnsonite, a Tarkett Company: www.johnsonite.com/#sle.
      b. Mannington Commercial: www.manningtoncommercial.com#sle.
      c. Roppe Corporation: www.roppe.com/#sle.
      d. Substitutions: See Section 01 6000 - Product Requirements.
   2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
   3. Height: 4 inches (100 mm) or as otherwise indicated on the drawings.
   4. Thickness: 0.125 inch (3.2 mm).
   5. Finish: Satin.
   6. Length: Roll.
   7. Color: As indicated on drawings.

2.03 ACCESSORIES

A. Moldings, Transition and Edge Strips: Same material as flooring.
   1. Manufacturers:
      a. Mannington Commercial: www.manningtoncommercial.com#sle.
      b. Johnsonite, a Tarkett Company
      c. Roppe Corporation.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

3.02 PREPARATION

A. Prepare floor substrates for installation of flooring in accordance with Section 09 0561.

B. Clean substrate.

3.03 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Adhesive-Applied Installation:
   1. Spread only enough adhesive to permit installation of materials before initial set.
   2. Fit joints and butt seams tightly.

D. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
   1. Resilient Strips: Attach to substrate using adhesive.

3.04 INSTALLATION - TILE FLOORING

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

B. Lay flooring with joints and seams parallel to building lines to produce symmetrical pattern.

3.05 INSTALLATION - RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches (45 mm) between joints.

B. Miter internal corners. At external corners, 'V' cut back of base strip to 2/3 of its thickness and fold. At exposed ends, use premolded units.

C. Install base on solid backing. Bond tightly to wall and floor surfaces.

D. Scribe and fit to door frames and other interruptions.

3.06 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

3.07 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION 09 6500

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SECTION 09 6566
RESILIENT ATHLETIC FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interlocking, loose-laid rubber tile.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied flooring.

B. Section 09 6513 - Resilient Base & Accessories

1.03 REFERENCE STANDARDS

A. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2023.

B. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed data sheets for products specified.

C. Shop Drawings: Fabrication and installation details, and layout, colors, and widths of game lines and equipment locations.

D. Verification Samples: Actual flooring material specified, not less than 12 inch (305 mm) square, mounted on solid backing.

E. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.

F. Manufacturer's Instructions: Indicate standard and special installation procedures.

G. Installer's qualification statement.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Flooring Material: 10 square yards (9 sq m) matching installed flooring.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site in unopened containers clearly labeled with manufacturer's name and identification of contents.

B. Store materials in dry and clean location until needed for installation. During installation, handle in a manner that will prevent marring and soiling of finished surfaces.

1.07 FIELD CONDITIONS

A. Maintain temperature in spaces to receive adhesively installed resilient flooring within range of 70 to 95 degrees F (21 to 35 degrees C) for not less than 48 hours before the beginning of installation and for not less than 48 hours after installation has been completed. Subsequently, do not allow temperature in installed spaces to drop below 50 degrees F (10 degrees C) or to go above 100 degrees F (38 degrees C).

PART 2 PRODUCTS

2.01 PREFORMED ATHLETIC FLOORING

A. Rubber Tile Flooring: Two-layer vulcanized rubber.
   1. Thickness: Minimum 1/4 inch (6 mm).
   2. Tile Edge/Installation: Interlocking shape, loose-laid installation.
   3. Surface Texture: Hammered.
   4. Products:
      a. Roppe, Recoil, refer to drawings for color, size and pattern.
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ACCESSORIES

A. Leveling Compound: Latex-modified cement formulation as recommended by flooring manufacturer for substrate conditions.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates for conditions detrimental to installation of athletic flooring. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of athletic flooring to substrate.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
   1. Test as Follows:
      a. Alkalinity (pH): ASTM F710.
      b. Internal Relative Humidity: ASTM F2170.
      c. Moisture Vapor Emission: ASTM F1869.
   2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Concrete: Use leveling compound as necessary to achieve substrate flatness of plus or minus 1/8 inch within 10 ft radius (1/1000).

C. Broom clean areas to receive athletic flooring immediately before beginning installation.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Rubber Tile Flooring:
   1. Lay out center lines in spaces to receive tile flooring, based on location of principal walls. Start tile installation from center, and adjust as necessary to avoid tiles less than one-half width at perimeter.
   2. Lay tiles square with room axis, matching for color and pattern by selecting from cartons and mixing as recommended by manufacturer.
   3. Install loose-laid tile in a staggered pattern; fit interlocking edges tightly.

3.04 CLEANING

A. Clean flooring using methods recommended by manufacturer.

3.05 PROTECTION

A. Protect finished athletic flooring from construction traffic to ensure that it is without damage upon Date of Substantial Completion.

END OF SECTION 09 6566

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SECTION 09 6813
TILE CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Carpet tile, fully adhered.

1.02 REFERENCE STANDARDS

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

C. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.

D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

E. Installer's Qualification Statement.

F. Operation and Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Carpet Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience and approved by carpet tile manufacturer.

1.05 FIELD CONDITIONS

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Tile Carpeting:
   1. Patcraft; www.patcraft.com.

2.02 MATERIALS

A. Tile Carpeting, Type CPT-#: Tufted, manufactured in one color dye lot.
   1. Product: Refer to drawings for carpet style, size and color.

B. Tile Carpeting: Type MAT-1, manufactured in one color dye lot.
   1. Product: Refer to drawings for carpet style, size and color.

2.03 ACCESSORIES

A. Edge Strips: Vinyl, color as selected by Architect.

B. Carpet Tile Adhesive: Recommended by carpet tile manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.

B. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.

3.02 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler.

C. Vacuum clean substrate.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install carpet tile in accordance with manufacturer's instructions.

C. Blend carpet from different cartons to ensure minimal variation in color match.

D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

E. Lay carpet tile in square pattern, with pile direction parallel to next unit, set parallel to building lines.

F. Locate change of color or pattern between rooms under door centerline.

G. Fully adhere carpet tile to substrate.

H. Trim carpet tile neatly at walls and around interruptions.

I. Complete installation of edge strips, concealing exposed edges.

3.04 CLEANING

A. Remove excess adhesive without damage, from floor, base, and wall surfaces.

B. Clean and vacuum carpet surfaces.

END OF SECTION 09 6813

SECTION 09 9113
EXTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
   5. Floors, unless specifically indicated.
   6. Brick, glass unit masonry, architectural concrete, cast stone, integrally colored plaster and stucco.
   7. Glass.
   8. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 09 9123 - Interior Painting.

1.03 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; Current Edition.

B. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating; 2023.

C. ASTM D4259 - Standard Practice for Preparation of Concrete by Abrasion Prior to Coating Application; 2024.

D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

E. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

F. SSPC-SP 6/NACE No.3 - Commercial Blast Cleaning; 2006.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. MPI product number (e.g. MPI #47).
   3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
   4. Manufacturer's installation instructions.

C. Samples: Submit two paper chip samples, 8.5 x 11 inch (216 x 279 mm) in size illustrating range of colors and textures available for each surface finishing product scheduled.

D. Certification: By manufacturer that paints and finishes comply with VOC limits specified.

E. Manufacturer's Instructions: Indicate special surface preparation procedures.

F. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Paint and Finish Materials: 1 gallon (4 L) of each color; from the same product run, store where directed.
   3. Label each container with color in addition to the manufacturer's label.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.06 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the paint product manufacturer's temperature ranges.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

D. Minimum Application Temperatures for Latex Paints: 50 degrees F (10 degrees C) for exterior; unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candles (860 lx) measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.

B. Paints:
   1. Subject to compliance with requirements, provide products by the following.
   2. Behr Paint Company; _____: www.behr.com/#sle.
   3. Pittsburgh Paints; _____: www.ppgpaints.com/#sle.
   4. Sherwin-Williams Company: www.sherwin-williams.com/#sle. (Basis of Design)

C. Primer Sealers: Same manufacturer as top coats.

D. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless required to be a field-catalyzed paint.
   1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.

2. Supply each paint material in quantity required to complete entire project's work from a single production run.
3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is described explicitly in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content:
1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

C. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

D. Colors: As indicated on drawings.

2.03 PAINT SYSTEMS - EXTERIOR

A. Paint E-OP - Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including primed metal.
1. Two top coats and one coat primer.
2. Top Coat(s): Exterior Latex; MPI #10, 11, 15, 119, or 214.
a. Products:
1) Sherwin-Williams Pro Industrial Acrylic, Semi-Gloss.

2.04 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
1. Water Based Primer for Galvanized Metal; MPI #134.
a. Products:
1) Sherwin-Williams Pro Industrial Pro-Cryl Universal Primer. (MPI #134)
2. Rust-Inhibitive Water Based Primer; MPI #107.
a. Products:
1) Sherwin-Williams Pro Industrial Pro-Cryl Universal Primer. (MPI #107)

2.05 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

C. Test shop-applied primer for compatibility with subsequent cover materials.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Galvanized Surfaces:
   1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

G. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.
   2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
   3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning in accordance with SSPC-SP 6/NACE No.3. Protect from corrosion until coated.

H. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

C. Apply each coat to uniform appearance.

D. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

E. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection.

3.05 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.06 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION 09 9113

SECTION 09 9123
INTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
   1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
   2. Prime surfaces to receive wall coverings and vinyl wall protection.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
   5. Floors, unless specifically indicated.
   6. Ceramic and other tiles.
   7. Brick, architectural concrete, cast stone, integrally colored plaster, and stucco.
   8. Glass.
   9. Acoustical materials, unless specifically indicated.
   10. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 09 9113 - Exterior Painting.

1.03 DEFINITIONS

A. Comply with ASTM D16 for interpretation of terms used in this section.

1.04 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; Current Edition.

B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2024.

C. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating; 2023.

D. ASTM D4259 - Standard Practice for Preparation of Concrete by Abrasion Prior to Coating Application; 2024.

E. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

F. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

G. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").
   2. MPI product number (e.g., MPI #47).
   3. Cross-reference to specified paint system products to be used in project; include description of each system.

C. Samples: Submit two paper chip samples, 8.5 x 11 inch (216 x 279 mm) in size illustrating range of colors and textures available for each surface finishing product scheduled.

D. Manufacturer's Instructions: Indicate special surface preparation procedures.

E. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Paint and Finish Materials: 1 gal (4 L) of each color; from the same product run, store where directed.
   3. Label each container with color in addition to the manufacturer's label.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.07 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply materials when relative humidity exceeds 85 percent, at temperatures less than 5 degrees F (3 degrees C) above the dew point, or to damp or wet surfaces.

D. Minimum Application Temperatures for Paints: 50 degrees F (10 degrees C) for interiors unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 fc (860 lux) measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.

B. Paints:
   1. Subject to compliance with requirements, provide products by the following.
   2. Behr Paint Company: www.behr.com/#sle.
   3. Pittsburgh Paints: www.ppgpaints.com/#sle.
   4. Sherwin-Williams Company: www.sherwin-williams.com/#sle. (Basis of Design)
   5. Benjamin Moore.

C. Primer Sealers: Same manufacturer as top coats.

D. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.
   1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Supply each paint material in quantity required to complete entire project's work from a single production run.
   3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content:
   1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
      a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
   2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

C. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

D. Colors: As indicated on drawings.

2.03 PAINT SYSTEMS - INTERIOR

A. Paint I-OP-MD-DT - Medium Duty Door/Trim: For surfaces subject to frequent contact by occupants, including metals:
   1. Medium duty applications include doors, door frames, railings, handrails, guardrails, and balustrades. Including steel substrates below 8'-0" in Apparatus Bays.
   2. Two top coats and one coat primer.
   3. Top Coat(s): High Performance Architectural Interior Latex; MPI #138, 139, 140, or 141.
      a. Products:
         1) Sherwin-Williams Pro Industrial Pre-Catalyzed Waterbased Epoxy, Eg-Shel. (MPI #139)
   4. Top Coat Sheen:
      a. Eggshell: MPI gloss level 3; use this sheen at all locations.

B. Paint I-OP-MD-WC - Medium Duty Vertical and Overhead: Including gypsum board and concrete masonry units.
   1. Two top coats and one coat primer.
   2. Top Coat(s): High Performance Architectural Interior Latex; MPI #138, 139, 140, or 141. For Apparatus Bays and all rooms directly adjacent.
   3. Top Coat(s): Institutional Low Odor/VOC Interior Latex; MPI #143, 144, 145, 146, 147, or 148. For all areas except for Apparatus Bays and rooms directly adjacent.
      a. Products:
         1) Sherwin-Williams ProMar 200 Zero VOC Interior Latex, Low Sheen. (MPI #144)
   4. Top Coat(s): Interior Light Industrial Coating, Water Based; MPI #151, 153, or 154. Where epoxy paint is indicated on the drawings.
      a. Products:
         1) Sherwin-Williams Pro Industrial Pre-Catalyzed Waterbased Epoxy, Semi-Gloss. (MPI #153)
   5. Top Coat Sheen:
      a. Eggshell: MPI gloss level 3; use this sheen at all locations.

C. Paint I-OP-DF - Dry Fall: Metals; exposed structure and overhead-mounted services In Fitness Rooms at both Stations above 8'-0", including shop primed steel deck, structural steel, metal fabrications, galvanized ducts, galvanized conduit, and galvanized piping.
   1. Shop primer by others.
   2. One top coat.
   3. Top Coat: Latex Dry Fall; MPI #118, 155, or 226.
      a. Products:
         1) Sherwin-Williams Waterborne Acrylic Dryfall, Eg-Shel. (MPI #155, 226)

2.04 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
   1. Interior Institutional Low Odor/VOC Primer Sealer; MPI #149.
      a. Products:
         1) Sherwin-Williams ProMar 200 Zero VOC Interior Latex Primer.
   2. Interior/Exterior Latex Block Filler; MPI #4.
      a. Products:
         1) Sherwin-Williams ConFlex Block Filler. (MPI #4)
   3. Interior Rust-Inhibitive Water Based Primer; MPI #107.
      a. Products:
         1) Sherwin-Williams Pro-Cryl Universal Primer. (MPI #107)
   4. Interior Water Based Primer for Galvanized Metal; MPI #134 or #134 X-Green.
      a. Products:
         1) Sherwin-Williams Pro-Cryl Universal Primer. (MPI #134)

2.05 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been adequately prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

D. Test shop-applied primer for compatibility with subsequent cover materials.

E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
   1. Gypsum Wallboard: 12 percent.
   2. Masonry, Concrete, and Concrete Masonry Units: 12 percent.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Concrete:
   1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.

F. Masonry:
   1. Remove efflorescence and chalk. Do not coat surfaces if moisture content, alkalinity of surfaces, or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.

G. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

H. Galvanized Surfaces:
   1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

I. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.
   2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
   3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 Commercial Blast Cleaning. Protect from corrosion until coated.

J. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with clear sealer.

3.03 APPLICATION

A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

C. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

D. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.

E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

F. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection.

3.05 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.06 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION 09 9123

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SECTION 10 1423
PANEL SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Panel signage.

1.02 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's product literature for each type of panel sign, indicating styles, font, foreground and background colors, locations, and overall dimensions of each sign.

C. Shop Drawings:
   1. Include dimensions, locations, elevations, materials, text and graphic layout, attachment details, and schedules.
   2. Schedule: Provide information sufficient to completely define each panel sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
      a. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
      b. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
      c. Submit for approval by Owner through Architect prior to fabrication.

D. Selection Samples: Where colors, materials, and finishes are not specified, submit two sets of color selection charts or chips.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Package signs as required to prevent damage before installation.

B. Store tape adhesive at normal room temperature.

1.05 FIELD CONDITIONS

A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

B. Maintain minimum ambient temperature during and after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Panel Signage:
   1. Best Sign Systems, Inc: www.bestsigns.com/#sle.
   2. Inpro Corporation: www.inprocorp.com/#sle.
   3. Vista System LLC: www.vistasystem.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 REGULATORY REQUIREMENTS

A. Accessibility Requirements: Comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most restrictive requirements.

2.03 PANEL SIGNAGE

A. Panel Signage:
   1. Application: Signs as indicated on the drawings .
   2. Description: Flat signs with engraved panel media, tactile characters.
   3. Sign Size: As indicated on drawings.
   4. Total Thickness: 1/8 inch (3 mm).
   5. Sign Edges: Squared.
   6. Color and Font, unless otherwise indicated:
      a. Character Font: Helvetica, Arial, or other sans serif font.
      b. Character Case: Upper and lower case (title case).
      c. Background Color: As scheduled.
      d. Character Color: Contrasting color.
   7. Material: Acrylic plastic base with applied plastic letters and braille.
   8. Tactile Letters: Raised 1/32 inch minimum.
   9. Braille: Grade II, ADA-compliant.
   10. One-Sided Wall Mounting: Concealed anchors, adhesive or two-face tape..

2.04 ACCESSORIES

A. Concealed Screws: Noncorroding metal; stainless steel, galvanized steel, chrome plated, or other.

B. Tape Adhesive: Double-sided tape, permanent adhesive.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install with horizontal edges level.

C. Locate panel signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.

D. Protect from damage until mm-dd-yyyy; repair or replace damaged items.

END OF SECTION 10 1423

SECTION 10 2600
WALL AND DOOR PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Corner guards.

B. Protective wall covering.

1.02 REFERENCE STANDARDS

A. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 2023, with Editorial Revision.

B. ASTM D543 - Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents; 2021.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Indicate physical dimensions, features, wall mounting brackets with mounted measurements, anchorage details, and rough-in measurements.

C. Samples: Submit samples illustrating component design, configurations, joinery, color and finish.

D. Manufacturer's Instructions: Indicate special procedures, perimeter conditions requiring special attention.

E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver wall and door protection items in original, undamaged protective packaging. Label items to designate installation locations.

B. Do not deliver products to project site until areas for storage and installation are fully enclosed, and interior temperature and humidity are in compliance with manufacturer's recommendations for each type of item.

C. Store products in either horizontal or vertical position, in compliance with manufacturer's instructions.

1.05 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 5-year manufacturer warranty for metal crash rails. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Corner Guards:
   1. Inpro: www.inprocorp.com/#sle.

B. Protective Wall Covering:

1. Inpro: www.inprocorp.com/#sle.

2.02 PERFORMANCE CRITERIA

A. Impact Strength: Unless otherwise noted, provide protection products and assemblies that have been successfully tested for compliance with applicable provisions of ASTM D256 and/or ASTM F476.

B. Chemical and Stain Resistance: Unless otherwise noted, provide protection products and assemblies with chemical and stain resistance complying with applicable provisions of ASTM D543.

2.03 PRODUCT TYPES

A. Corner Guards - Surface Mounted:
1. Material: High impact vinyl with full height extruded aluminum retainer.
2. Performance: Resist lateral impact force of 100 lbs (445 N) at any point without damage or permanent set.
3. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
4. Width of Wings: 2 inches (51 mm).
5. Corner: Radiused.
6. Color: As indicated.
7. Length: One piece.
8. Preformed end caps.

B. Protective Wall Covering:
1. Material: High-impact acrylic-modified vinyl.
2. Thickness: 0.060 inch (1.52 mm).
3. Color: As indicated on drawings.
4. Accessories: Provide manufacturer's standard color-matched trim and moldings.
5. Mounting: Adhesive.

C. Adhesives and Primers: As recommended by manufacturer.

D. Mounting Brackets and Attachment Hardware: Appropriate to component and substrate.

2.04 FABRICATION

A. Fabricate components with tight joints, corners and seams.

2.05 SOURCE QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Provide wall and door protection systems of each type from a single source and manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.

B. Verify that substrate surfaces for adhered items are clean and smooth.

C. Start of installation constitutes acceptance of project conditions.

3.02 INSTALLATION

A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to supporting construction.

B. Position corner guard 6 inch (152.4 mm) above finished floor to height as indicated on the drawings.

C. Position protective wall covering no less than 1 inch (25.4 mm) above finished floor to allow for floor level variation.
   1. Wainscot Installation: Establish a level line at the specified height for entire length of run. Install by aligning top of edge of covering with this line.
   2. Apply adhesive with 1/8 inch (3.2 mm) V-notch trowel to an area of wall surface that can be completed within cure time of the adhesive.
   3. Install trim pieces as required for a complete installation. Allow tolerance for thermal movement.
   4. At joints indicated to be caulked, allow for a minimum 1/16 inch (1.6 mm) wide gap between edges of sheets. Gaps are required to be of consistent width throughout the project.
   5. Use a roller to ensure maximum contact with adhesive.
   6. At inside and outside corners cut covering sheets to facilitate installation of trim pieces or corner guards.

3.03 TOLERANCES

A. Maximum Variation From Required Height: 1/4 inch (6 mm).

B. Maximum Variation From Level or Plane For Visible Length: 1/4 inch (6 mm).

3.04 CLEANING

A. Clean wall and door protection items of excess adhesive, dust, dirt, and other contaminants.

END OF SECTION 10 2600

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SECTION 10 2800
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Commercial toilet accessories.

B. Commercial shower and bath accessories.

C. Utility room accessories.

1.02 RELATED REQUIREMENTS

A. Section 22 4000 - Plumbing Fixtures: Under-lavatory pipe and supply covers.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2022.

C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.

D. ASTM C1036 - Standard Specification for Flat Glass; 2021.

E. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2024.

F. ASTM C1822 - Standard Specification for Insulating Covers on Accessible Lavatory Piping; 2021.

G. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Commercial Toilet, Shower, and Bath Accessories:
   1. American Specialties, Inc: www.americanspecialties.com/#sle.
   2. Bradley Corporation: www.bradleycorp.com/#sle.
   3. Bobrick Washroom Equipment, Inc. (Basis-of-Design).

B. Substitutions: Section 01 6000 - Product Requirements.

2.02 OWNER FURNISHED ITEMS

A. Items furnished by the Owner are indicated on the drawings as Owner Furnished/Contractor Installed (OFCI) and/or Owner Furnished/Owner Installed (OFOI).
   1. Soap Dispenser

2. Paper Towel Dispenser

2.03 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
   1. Grind welded joints smooth.
   2. Fabricate units made of metal sheet of seamless sheets with flat surfaces.

B. Keys: Provide two keys for each accessory to Owner.

C. Stainless Steel Sheet: ASTM A666, Type 304.

D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.

E. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.

F. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

2.04 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

2.05 COMMERCIAL TOILET ACCESSORIES

A. Toilet Paper Dispenser: Double roll, surface mounted, for coreless type rolls.
   1. Products:
      a. American Specialties, Inc: www.americanspecialties.com/#sle.
      b. Bobrick Washroom Equipment Inc., B-2888 (Basis-of-Design).

B. Waste Receptacle: Stainless steel, freestanding style.
   1. Liner: Removable seamless stainless steel receptacle.
   2. Minimum capacity: 12 gallons (Toilet/Shower Rooms)
   3. Minimum capacity: 32 gallons (Public Restrooms)
   4. Products:
      a. American Specialties, Inc: www.americanspecialties.com/#sle.
      b. Global Industrial Stainless Steel Slim Open Top Trash Can, (Basis-of-Design) (T-13).
      c. Global Industrial, Frost Stainless Steel Round Open Top Trash Can, (Basis-of-Design) (T-15).

C. Mirrors: (TS-02), Stainless steel framed, 1/4 inch (6 mm) thick annealed float glass; ASTM C1036.
   1. Annealed Float Glass: Silvering, protective and physical characteristics in compliance with ASTM C1503.
   2. Size: As indicated on drawings.
   3. Frame: 0.05 inch (1.3 mm)angle shapes, with mitered and welded and ground corners, and tamperproof hanging system; satin finish.
   4. Products:
      a. American Specialties, Inc: www.americanspecialties.com/#sle.
      b. Bobrick Washroom Equipment, Inc., B-290, (Basis-of-Design).

D. Mirrors: (EQ-10) frameless mirror.
   1. Size: As indicated on drawings.
   2. Products:
      a. American Specialties, Inc., Model No. 8287, (Basis-of-Design)

E. Grab Bars: Stainless steel, smooth surface.
   1. Standard Duty Grab Bars:
      a. Push/Pull Point Load: 250 pound-force (1112 N), minimum.
      b. Dimensions: 1-1/4 inch (32 mm) outside diameter, minimum 0.05 inch (1.3 mm) wall thickness, exposed flange mounting, 1-1/2 inch (38 mm) clearance between wall and inside of grab bar.

c. Finish: Satin.
d. Length and Configuration: As indicated on drawings.
e. Products:
1) American Specialties, Inc: www.americanspecialties.com/#sle.
2) Bobrick Washroom Equipment, Inc., B-6806, (Basis-of-Design).

F. Sanitary Napkin Disposal Unit: Stainless steel, surface-mounted, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.
1. Products:
a. American Specialties, Inc: www.americanspecialties.com/#sle.
b. Bobrick Washroom Equipment, Inc., B-270, (Basis-of-Design).

2.06 COMMERCIAL SHOWER AND BATH ACCESSORIES

A. Shower Curtain Rod: Stainless steel tube, 1 inch (25 mm) outside diameter, 0.04 inch (1.0 mm) wall thickness, satin-finished, with 2.5 inch (63.5 mm) square minimum 0.04 inch (1.0 mm) thick satin-finished stainless steel flanges, for installation with exposed fasteners.
1. Products:
a. American Specialties, Inc: www.americanspecialties.com/#sle.
b. Bobrick Washroom Equipment, Inc., B-207, (Basis-of-Design).

B. Shower Curtain:
1. Material: Opaque vinyl, 0.008 inch (0.2 mm) thick, matte finish, with antibacterial treatment, flameproof and stain-resistant.
2. Size: 72 by 72 inches (1830 by 1830 mm), hemmed edges.
3. Grommets: Stainless steel; pierced through top hem on 6 inch (150 mm) centers.
4. Color: As selected from manufacturer's standard colors.
5. Shower Curtain Hooks: Chrome-plated or stainless steel spring wire designed for snap closure.
6. Products:
a. Bobrick Washroom Equipment, Inc., 204-3 and 204-1, (Basis-of-Design).

C. Folding Shower Seat: Wall-mounted surface; aluminum seat frame, structural support members, hinges, and mechanical fasteners of Type 304 stainless steel, rectangular seat.
1. Seat: Bamboo slats secured to supporting frame members with stainless steel screws. Ease edges of each slat. 18 inch wide.
2. Products:
a. HealthCraft, SerenaSeat (WSAL), INV-WSAL-AA-WNT-BBB, (Basis-of-Design).

D. Wall-Mounted Soap Shelf in showers: Normal duty, seamless solid surface material , surface mounted, wedge trim.
1. Size: 8 inch x 8 inch.
2. Color: As selected from manufacturer's standard colors.
3. Quantity: Two per shower.
4. Products:
a. Inpro Corporation;, Prism Soap Shelf (Basis-of-Design).

E. Robe Hook: Heavy-duty stainless steel, single-prong, rectangular-shaped bracket and backplate for concealed attachment, satin finish.
1. Products:
a. Bobrick Washroom Equipment, Inc., B-76727, (Basis-of-Design).

2.07 UTILITY ROOM ACCESSORIES

A. Combination Utility Shelf/Mop and Broom Holder: 0.05 inch (1.3 mm) thick stainless steel, Type 304, with 1/2 inch (12 mm) returned edges, 0.06 inch (1.6 mm) steel wall brackets.
1. Drying rod: Stainless steel, 1/4 inch (6 mm) diameter.
2. Hooks: Four, 0.06 inch (1.6 mm) stainless steel rag hooks at shelf front.
3. Mop/broom holders: Three spring-loaded rubber cam holders at shelf front.
4. Length: Manufacturer's standard length for number of holders/hooks.

5. Products:
   a. American Specialties, Inc: www.americanspecialties.com/#sle.
   b. Bobrick Washroom Equipment, Inc., B-239, (Basis-of-Design).

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

3.02 PREPARATION

A. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.

B. Mounting Heights: As required by accessibility regulations, unless otherwise indicated or as indicated on the drawings.

3.04 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION 10 2800

SECTION 12 2400
WINDOW SHADES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior manual roller shades.

1.02 REFERENCE STANDARDS

A. WCMA A100.1 - Standard for Safety of Window Covering Products; 2022.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Sequencing:
   1. Do not fabricate shades until field dimensions for each opening have been taken with field conditions in place.
   2. Do not install shades until final surface finishes and painting are complete.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets, including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.

C. Shop Drawings: Include shade schedule indicating size, location and keys to details, head, jamb and sill details, mounting dimension requirements for each product and condition, and operation direction.

D. Verification Samples: Minimum size 6 inches (150 mm) square, representing actual materials, color and pattern.

E. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of this type with minimum 5 years of documented experience with shading systems of similar size and type.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.

B. Handle and store shades in accordance with manufacturer's recommendations.

1.07 FIELD CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide manufacturer's warranty from Date of Substantial Completion, covering the following:
   1. Shade Hardware: One year.
   2. Fabric: One year.
   3. Aluminum and Steel Coatings: One year.

PART 2 PRODUCTS

2.01 ROLLER SHADES

A. General:
   1. Provide shade system components that are easy to remove or adjust without removal of mounted shade brackets.
   2. Provide shade system that operates smoothly when shades are raised or lowered.

B. Roller Shades - Basis of Design: MechoShade Systems LLC; Mecho/5 System; www.mechoshade.com/#sle.
   1. Description: Single roller, manually operated fabric window shades.
      a. Drop Position: Regular roll.
      b. Mounting: Ceiling mounted.
      c. Size: As indicated on drawings.
      d. Fabric: As indicated under Shade Fabric article.
   2. Brackets and Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.
      a. Material: Steel, 1/8 inch (3 mm) thick.
   3. Roller Tubes:
      a. Material: Extruded aluminum.
      b. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.
      c. Fabric Attachment: Utilize extruded channel in tube to accept vinyl spline welded to fabric edge. Shade band to be removable and replaceable without removing roller tube from brackets or inserting spline from the side of the roller tube.
      d. Capable of being removed and reinstalled without affecting roller shade limit adjustments.
   4. Hembars: Designed to maintain bottom of shade straight and flat.
      a. Style: Full wrap fabric covered bottom bar, flat profile with heat sealed closed ends.
      b. Room-Darkening Shades: Provide a slot in bottom bar with wool-pile light seal.
   5. Clutch Operator: Manufacturer's standard material and design integrated with bracket/brake assembly.
      a. Provide a permanently lubricated brake assembly mounted on an oil-impregnated hub with wrapped spring clutch.
      b. Brake must withstand minimum pull force of 50 lb (22.7 kg) in the stopped position.
      c. Mount clutch/brake assembly on the support brackets, fully independent of the roller tube components.
   6. Drive Chain: Continuous loop stainless steel beaded ball chain, 95 lb (43 kg) minimum breaking strength. Provide upper and lower limit stops.
      a. Chain Retainer: Chain tensioning device complying with WCMA A100.1.
   7. Accessories:
      a. Fascia: Extruded aluminum, size as required to conceal shade mounting, attachable to brackets without exposed fasteners; clear anodized finish.
         1) Profile: Square.
      b. Room-Darkening Channels: Extruded aluminum side and center channels with brush pile edge seals, SnapLoc mounting base, and concealed fasteners. Channels to accept one-piece exposed blackout hembar to assure side light control and sill light control.

2.02 SHADE FABRIC

A. Fabric for Room-Darkening Shades: Nonflammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.
   1. Manufacturers:
      a. MechoShade Systems LLC: www.mechoshade.com/#sle.
   2. Material: As selected from manufacturer's standard line of fabrics.

B. Fabric - for Black Out Shades: Nonflammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.

1. Manufacturers:
   a. MechoShade Systems LLC; www.mechoshade.com/#sle.
2. Material: As selected from manufacturer's standard line of fabrics.

2.03 ROLLER SHADE FABRICATION

A. Field measure finished openings prior to ordering or fabrication.

B. Dimensional Tolerances: Fabricate shades to fit openings within specified tolerances.
   1. Vertical Dimensions: Fill openings from head to sill with 1/2 inch (13 mm) space between bottom bar and window stool.
   2. Horizontal Dimensions - Inside Mounting: Fill openings from jamb to jamb.

C. Dimensional Tolerances: As recommended in writing by manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine finished openings for deficiencies that may preclude satisfactory installation.

B. Start of installation shall be considered acceptance of substrates.

3.02 PREPARATION

A. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under the project conditions.

B. Coordinate with window installation and placement of concealed blocking to support shades.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.

B. Replace shades that exceed specified dimensional tolerances at no extra cost to Owner.

C. Adjust level, projection, and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.04 CLEANING

A. Clean soiled shades and exposed components as recommended by manufacturer.

B. Replace shades that cannot be cleaned to "like new" condition.

3.05 PROTECTION

A. Protect installed products from subsequent construction operations.

B. Touch-up, repair, or replace damaged products before Substantial Completion.

END OF SECTION 12 2400

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SECTION 12 3600
COUNTERTOPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Countertops for architectural cabinet work.

B. Wall-hung counters and vanity tops.

C. Sinks molded into countertops.

1.02 RELATED REQUIREMENTS

A. Section 06 4100 - Architectural Wood Casework

1.03 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 2022.

B. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications; 2022.

C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

E. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

F. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

G. IAPMO Z124 - Plastic Plumbing Fixtures; 2022, with Editorial Revision.

H. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.

I. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

J. PS 1 - Structural Plywood; 2023.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Specimen warranty.

C. Shop Drawings: Complete details of materials and installation ; combine with shop drawings of cabinets and casework specified in other sections.

D. Verification Samples: For each finish product specified, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

E. Test Reports: Chemical resistance testing, showing compliance with specified requirements.

F. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.07 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 COUNTERTOPS

A. Quality Standard: Premium Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Plastic Laminate Countertops: High-pressure decorative laminate (HPDL) sheet bonded to substrate.
   1. Laminate Sheet: NEMA LD 3, Grade HGS, 0.048 inch (1.2 mm) nominal thickness.
      a. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
      b. Finish: As indicated on the drawings.
      c. Surface Color and Pattern: As indicated on drawings.
   2. Exposed Edge Treatment: Molded rubber edge with T-spline, sized to completely cover edge of panel.
      a. Color: As selected by Architect from the manufacturer's full line.
   3. Back and End Splashes: Same material, same construction.
   4. Fabricate in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 11 - Countertops, Premium Grade.

C. Wood Countertops: One-piece, glued-laminated under pressure.
   1. Thickness: 1-1/4 inch (32 mm), minimum.
   2. Construction (Butcher Block): Maximum 1/2 inch (12 mm) thick strips glued perpendicular to surface.
   3. Species: Maple; clear grade.
   4. Exposed Edges: Rounded to approximately 3/8 inch (9 mm) radius.
   5. Back and End Splashes: Same material, same construction; 3/4 inch (19 mm) thick, square edges.
   6. Finish: Sanded smooth; transparent, waterproof, acrylic wood finish.
   7. Fabricate in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 11 - Countertops, Premium Grade.

D. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.
   1. Flat Sheet Thickness: 1/2 inch (12 mm), minimum.
   2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
      a. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
      b. Sinks and Bowls: Separate units for undercounter mounting; minimum 3/4 inch (19 mm) wall thickness; comply with IAPMO Z124.
         1) Manufacturer, model and size as indicated on the drawings.
      c. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
      d. Color and Pattern: As indicated on drawings.

3. Other Components Thickness: 1/2 inch (12 mm), minimum.
4. Exposed Edge Treatment: Built up to minimum 1-1/2 inch (38 mm) thick; radiused edge; use marine edge at sinks.
5. Back and End Splashes: Same sheet material, radiused top; minimum 4 inches (102 mm) high or as indicated on the drawings.
6. Fabricate in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 11 - Countertops, Premium Grade.

E. Stainless Steel Countertops: , Type 304, stainless steel sheet; 16 gauge, 0.0625 inch (1.59 mm) nominal sheet thickness.
1. Finish: 4B satin brushed finish.
2. Exposed Edge Shape: Straight turndown with return; 1-1/2 inch (38 mm) high face, 1/2 inch (12 mm) return to face of case ; reinforced with hardwood or steel.
3. Back and End Splashes: Same material; welded 1/4 inch (6 mm) radius coved joint to countertop; square top edge with 1 inch (25 mm) wide top surface and minimum 1/2 inch (12 mm) turndown.
4. Splash Dimensions: 4 inch (100 mm) high by 1 inch (25 mm) thick, unless otherwise indicated.
5. Sinks: Same material, same thickness; flush welded to counter; bottom sloped to outlet; radiused interior corners; drain outlet located in back corner.

2.02 MATERIALS

A. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch (19 mm) thick; join lengths using metal splines. Use at sink locations.

B. Particleboard for Supporting Substrate: ANSI A208.1 Grade 2-M-2, 45 pcf (20 kg/cu m) minimum density; minimum 3/4 inch (19 mm) thick; join lengths using metal splines.

C. Medium Density Fiberboard for Supporting Substrate: ANSI A208.2.

D. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

E. Joint Sealant: Mildew-resistant silicone sealant, clear.

2.03 FABRICATION

A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
1. Join lengths of tops using best method recommended by manufacturer.
2. Fabricate to overhang fronts and ends of cabinets 1 inch (25 mm) except where top butts against cabinet or wall.
3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.

B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
2. Height: 4 inches (102 mm), unless otherwise indicated.

C. Solid Surfacing: Fabricate tops and wall panels up to 144 inches (3657 mm) long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.
1. Integral sinks: Shop-mount securely to countertop with adhesives, using flush configuration, as per manufacturer's instructions, and as detailed on drawings.

D. Stainless Steel: Fabricate tops up to 144 inches (3,657 mm) long in one piece including nosings and back and end splashes; accurately fitted mechanical field joints in lengths over that dimension are permitted.
1. Weld joints; grind smooth and polish to match.

2. Provide stainless steel hat channel stiffeners, welded or soldered to underside, where indicated on drawings.
3. Provide wall clips for support of back/end splash turndowns.
4. Sound Deadening: Apply water resistant, fire resistant sound deadening mastic to entire bottom surface.
5. Integral sinks: Fabricate with corners rounded and coved, double-walls for sink compartment partitions. Factory-punch holes for fittings, and weld sinks to countertops.

E. Wall-Mounted Counters: Provide brackets and braces as indicated on drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install vanities in accordance with manufacturer’s instructions and approved shop drawings

B. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.

C. Attach plastic laminate countertops using screws with minimum penetration into substrate board of 5/8 inch (16 mm).

D. Attach wood countertops using screws with minimum penetration into substrate board of 5/8 inch (16 mm).

E. Attach stainless steel countertops using stainless steel fasteners and clips.

F. Seal joint between back/end splashes and vertical surfaces.

3.04 TOLERANCES

A. Variation From Horizontal: 1/8 inch in 10 feet (3 mm in 3 m), maximum.

B. Offset From Wall, Countertops: 1/8 inch (3 mm) maximum; 1/16 inch (1.5 mm) minimum.

C. Field Joints: 1/8 inch (3 mm) wide, maximum.

3.05 CLEANING

A. Clean countertops surfaces thoroughly.

3.06 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 12 3600

DIVISION 21 FIRE SUPPRESSION

21 0000 General Requirements for Fire Suppression Systems

21 0001 Basic Fire Suppression Requirements
21 0002 Basic Fire Suppression Materials and Methods
21 0003 Fire Suppression Work in Existing Buildings
21 0004 Firestopping for Fire Suppression Systems

21 0500 Common Work Results for Fire Suppression

21 0519 Meters and Gauges
21 0529 Pipe Hangers and Supports
21 0553 Identification for Fire Suppression Systems

21 1000 Water Based Fire Suppression Systems

21 1313 Wet-Pipe Sprinkler Systems

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SECTION 21 0001 – BASIC FIRE SUPPRESSION REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes the following:

1. General Requirements
2. Definitions
3. Scope of Work
4. Drawings and Specifications
5. Reference Standards
6. Allowances, Unit Prices and Alternates
7. Site Visit
8. Permits and Regulations
9. Project Management and Coordination
10. Workmanship
11. Protection
12. Painting
13. Cleaning
14. Equipment Selection
15. Shop Drawings
16. Final Inspection and Punch List
17. Operation and Maintenance Manuals
18. Record Drawings
19. Warranties
20. Project Closeout
21. Operation and Adjustment of Equipment
22. Operating Demonstration and Instruction

1.2 GENERAL REQUIREMENTS

A. All provisions of Division 00 Front End Documents and Division 01 General Requirements apply to work specified in this Division.

B. Specification provisions of other relevant Divisions shall apply where applicable work is required to be performed under this Fire Suppression work.

C. A complete and functional Fire Suppression system installation shall be provided under this Division. Should overlap of work among trades become evident, this shall be called to the attention of the architect. In such an event, none of the trades or their suppliers shall assume that he relieved of the work which is specified under his branch until instructions in writing are received from the Architect.

D. The Fire Suppression, Plumbing, HVAC and Electrical drawings and specifications assign work (labor and/or materials) to be provided by the General, Fire Suppression, Plumbing, HVAC or

Electrical Contractor or their sub-contractors. Understanding that the contractors for mechanical and electrical work are sub-contractors to the (General) Contractor, such assignments are not intended to restrict the General Contractor in assignment of work among the sub-contractor to accommodate trade agreements and practices or the normal conduct of the construction work.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.4 SCOPE OF WORK

A. The scope of the Fire Suppression work includes furnishing, installing, testing and warranty of all Fire Suppression work shown on the Fire Suppression drawings and specified herein, including Division 00, division 01, Division 21 and applicable provisions of other relevant Divisions.

1.5 DRAWINGS AND SPECIFICATIONS

A. The drawings indicate the general arrangement of the work and are to be followed insofar as possible. The word “proved,” as used, shall mean “furnish and install.” If significant deviations from the layout are necessitated by field conditions, detailed layouts of the proposed departures shall be submitted to the Architect for approval before proceeding with the work.

B. Make all necessary field measurements to ensure correct fitting. Coordinate work with all other trades in such a manner as to cause a minimum of conflict or delay.

C. The drawings and specifications shall be carefully studied during the course of bidding and construction. Any errors, omissions or discrepancies encountered shall be referred immediately to the Architect for interpretation or correction, so that misunderstandings at a later date may be avoided. The contract drawings are not intended to show every vertical or horizontal offset which may be necessary to complete the systems. Having pipe and fittings fabricated and delivered in advance of making actual measurements shall be sufficiently in advance as to not

cause extra work, or unduly delay the work. Coordinate work in advance with all other trades and report immediately any difficulties which can be anticipated.

D. The Architect shall reserve the right to make minor adjustment in locations of system runs and components where he considers such adjustments desirable in the interest of concealing work or presenting a better appearance where exposed. Any such changes shall be anticipated and requested sufficiently in advance as to not cause extra work, or unduly delay the work. Coordinate work in advance with all other trades and report immediately any difficulties.

E. Equipment, or piping shall not be installed or run above electrical switchgear or panelboards, nor in or above the access space in the immediate vicinity of the electrical switchgear/panelboards, in accordance with NEC Article 384.

F. Where any system runs and components are so placed as to cause or contribute to a conflict, it shall be readjusted at the expense of the contractor causing such conflict. The Architect's decision shall be final in regard to the arrangement of ductwork, piping, etc., where conflict arises.

G. Provides offsets in system runs, additional fittings, necessary drains and minor valves, traps, and devices required to complete the installation, or for the proper operation of the system. Each Contractor shall exercise due and particular caution to determine that all parts of the work are made quickly and easily accessible.

H. Should overlap of work among the trades become evident, this shall be called to the attention of the Architect. In such event, none of the trades or their suppliers shall assume that he is relieved of the work which is specified under his branch until instructions in writing are received from the Architect.

1.6 REFERENCE STANDARDS

A. Where standards (NFPA, NEC, ADTM, UL, etc.) are referenced in the specifications or on the drawings, the latest edition is to be used except, however, where the authority having jurisdiction has not yet adopted the latest edition, the edition so recognized shall be used.

1.7 ALLOWANCES, UNIT PRICES AND ALTERNATES

A. Refer to Sections 012100 Allowances, 012200 Unit Prices and 012300 Alternates.

1.8 SITE VISIT

A. Refer to Sections 017300 Execution.

B. Each bidder shall visit the project site to understand the existing conditions and compare the conditions with information shown on the drawings. Report immediately to the Architect any issues or discrepancies which are discovered that affect the bid. Changes to contract price will not be considered for site condition issues that are readily apparent from a thorough site review.

1.9 PERMITS, REGULATIONS AND INSPECTION

A. Work must conform to applicable local, state and federal laws, ordinances and regulations. Where drawings or specifications exceed code requirements, the drawing and specifications shall govern. Install no work contrary to minimum legal standards.

B. The fire suppression contractor shall be responsible to prepare a permit set of documents to file for and obtain all required permits from the governing inspection agencies. Include payment of all permit and inspection fees applicable to the work in this Division.

C. All work shall be subject to inspection and approval of Federal, State and local agencies as may be appropriate as well as the Architect and Engineer.

D. Furnish for the Owner certificates of approval from the governing inspection agencies as a condition for final payment.

1.10 PROJECT MANAGEMENT AND COORDINATION

A. Refer to Section 013100 Project Management and Coordination.

1.11 WORKMANSHIP

A. Refer to Section 014000 Quality Requirements.

B. Materials and equipment shall be installed and supported in a first-class and workmanlike manner by mechanics skilled in their particular trades. Workmanship shall be first-class in all respects, and the Architect shall have the right to stop the work if highest quality workmanship is not maintained.

C. Fire suppression design and work shall be performed by licensed Fire Suppression Contractors in accordance with requirements of the jurisdiction.

1.12 PROTECTION

A. Each Contractor shall be entirely responsible for all material and equipment furnished in connection with his work. Special care shall be taken to properly protect all parts thereof from theft, damage or deterioration during the entire construction period in such a manner as may be necessary, or as directed by the Architect.

B. The Owner’s property and the property of other contractors shall be scrupulously respected at all times. Provide plastic sheeting, drop cloths or similar barriers where dust and debris is generated, to protect adjacent areas.

C. Contractor shall protect all equipment and materials from detrimental effects of weather or construction activity. All items shall be stored and secured in a protected location away from the daily work area. Equipment or materials shall be placed on raised skids to protect from surface moisture. Where appropriate, provide plastic sheeting or similar vapor barrier underneath the stored products to reduce the effects of ground moisture or curing concrete on the local

humidity levels. Where unfinished ferrous products or finished ferrous products with raw edges are stored, provide local, dry heat to maintain ambient relative humidity levels below 65% RH to prevent rust.

D. All equipment shall retain the original packaging until required to be removed for installation or operation. Open ends of ducts, piping, conduit, etc. shall be capped or sealed and ventilation openings into equipment shall be wrapped and sealed in plastic sheeting to prevent dust or dirt entry both when stored and after installation but still open to the effects of construction activity. Stored items as well as installed equipment shall be covered with plastic sheeting at all times until placed in service or until dust generating activity in the area has ceased.

1.13 PAINTING

A. In addition to any painting specified for various individual items of equipment, the following painting shall be included in Division 21:

1. Ferrous metal which is no factory or shop painted or galvanized and which remains exposed to view in the finished areas of the building / building including finished areas, mechanical rooms, storage rooms, and other unfinished areas shall be given a prime coat of paint.

2. Ferrous metal installed outside the building which is not factory or shop painted or galvanized shall be given a prime coat of paint.

3. Equipment and materials which have been factory or shop coated (prime or finished painted or galvanized), on which the finish has been damaged or has deteriorated, shall be cleaned and refinished equal to its original condition. The entire surface shall be repainted if a uniform appearance cannot be accomplished by touch-up.

B. Paint, surface preparation and application shall conform to applicable portions of the Painting section of Division 09 Finishes. All rust must be removed before application of paint.

C. Finish painting is included in the General Contract except where otherwise required under remodeling work.

1.14 CLEANING

A. Debris, dust, dirt, etc shall be removed daily, particular attention shall be paid to areas that the Owner is continuing to occupy or use; any mess created in corridors, stairwells and egress paths that are maintained during construction shall be cleaned immediately.

B. The Owners dumpsters and trash receptacles shall not be used. If a dumpster is required, it shall be provided by the contractor and located where approved by the Owner. Coordinate dumpster requirements with other contractors.

C. Before turning an area back over to the Owner, thoroughly clean the space to leave the area in a similar condition before the start of the project where finishes are to remain. The contractor shall also clean duct interiors and interior components of new or existing air handling system equipment if dirt, dust or debris have generated in the course of work have accumulated on

these surfaces.

1.15 EQUIPMENT SELECTION

A. Materials and equipment furnished under this contract shall be in strict accordance with the specifications and drawings and shall be new and of best grade and quality. When two or more articles of the same material or equipment are required, the shall be of the same manufacturer. The selection of materials and equipment to be furnished under this contract shall be governed by the following:

1. Where trade names, brands, or manufacturers of equipment or materials are listed in the specifications, the exact equipment listed shall be furnished. Where more than one name is used, the Contractor shall have the option of selecting between any one of the several specified. All products shall be first quality line of manufacturer's listed.

2. Where the words "or approved equal: appear after a manufacturer's name, specific approval must be obtained from the Architect during the bidding period in sufficient time to be included in an addendum. The same shall apply for equipment and materials not named in the specifications, where approval is sought.

3. Where the words "equal to" appear, followed by a manufacturer's name and sometimes a model or series designation, such designation is intended to establish a model or series designation, such designation is intended to establish quality level and standard features. Equal equipment by other manufacturers will be acceptable, subject to the Engineer's approval.

B. Substitute equipment of equal quality and capacity will be considered when the listing of such is included as a separate item of the bid. State the deduction or addition in cost to that of the specified product.

C. Before bidding equipment, and again in the preparation of shop drawings the Contractor and his supplier shall verify that adequate space is available for entry and installation of the item of equipment, including associated piping and accessories. Also verify that adequate space is available for servicing of the equipment.

D. If extensive changes in pipe, duct or equipment layout or electrical wiring and equipment are brought about by the use of equipment which is not compatible with the layout shown on the drawings, necessary changes shall be deemed to be included in the contract.

1.16 SHOP DRAWINGS

A. Refer to Section 01600 Product Requirements.

B. Shop drawings for equipment fixtures, devices and materials shall be labeled and identified same as on the Contract Documents. Failure to do so may be cause for rejection of shop drawings.

C. The review of shop drawings by the Architect or Engineer shall not relieve the Contactor from responsibility for errors in the shop drawings. Deviations from specifications and drawing

requirements shall be called to the Engineer's attention in a separate clearly stated notification at the time of submittal for the Engineer's review.

D. Shop drawings for the following Fire Suppression equipment and materials shall be submitted:

1. Pipe, fittings and joining methods for the various systems.
2. Firestopping systems for pipe penetrations.
3. Pipe hangers.
4. Valves.
5. Gauges.
6. Sprinkler heads and accessories.
7. Wet pipe and dry pipe components.
8. Sprinkler system installation drawings per NFPA 13, applicable calculations and water supply flow curve.

1.17 FINAL INSPECION AND PUNCH LIST

A. Refer to Section 017700 Closeout Procedures.

1.18 OPERATING AND MAINTENANCE MANUALS

A. Refer to Section 017823 Operation and Maintenance Data.

B. All shop drawing and installation, maintenance and operating instruction pamphlets or brochures, wiring diagrams, parts list and other information, along with warranties, shall be obtained from each manufacturer of the principal items of equipment. In addition, the Contractor shall prepare a chart listing all items of equipment which are furnished under his contract and indicating the nature of maintenance required, the recommended frequency of checking these points and the type of lubricating media or replacement material required.

C. These shall be assembled into three-ring loose lead binders or other appropriate binding and also combined into a single electronic file in .PDF format. An index and tabbed sheets to separate the sections shall be included. These shall be submitted to the Architect or Engineer for review. Upon approval, manuals shall be turned over to the Owner.

1.19 RECORD DRAWINGS

A. Refer to Section 017839 Project Record Drawings.

B. Each Contractor shall maintain a separate set of prints of the contract documents and shall show all changes or variations, in a manner to be clearly discernible, which are made during construction. Upon completion of the work, these drawing shall be turned over to the Architect.

1.20 WARRANTIES

A. Refer to Section 017700 Closeout Procedures.

B. This Contractor shall warrant all workmanship, equipment and material entering into this contact for a period of one year of date of final acceptance or date of beneficial use, as agreed to between Contractor and Architect. Any materials or equipment proving to be defective during this warranty period shall be made good by this Contractor without expense to the Owner.

C. This provision is intended specifically to cover deficiencies in contract completion or performance which are discovered after systems are placed in operation. Also included shall be supplementary assistance in balancing, adjusting or providing operating instructions as the need develops, and replacing overload heater elements in starters where necessary to keep systems in operation. Heater element sizes shall not exceed the motor manufacturer's recommendations.

D. This provision shall not be construed to include maintenance items such as replacing filters, re-tightening or repacking glands, greasing, oiling belt tightening and cleaning strainers after these have been done for final close-out.

E. Provisions of this warranty shall be considered supplementary to warranty provisions under General Conditions.

1.21 PROJECT CLOSEOUT

A. Refer to Section 017700 Closeout Procedures.

1.22 OPERATIONS AND ADJUSTMENT OF EQUIPMENT

A. As the fire suppression systems are placed in operation, all items of equipment included therein shall be adjusted to proper working order. This shall include balancing air and water systems, adjusting fan speeds, belts, pulleys, tightening packing glands, and adjusting all operating equipment.

B. Caution: Verify that all bearings are lubricated, all motors are operating in the right direction, and correct overload heater elements are provided on all motors. Do not depend wholly on the electrician's judgment in these matters. Follow specific instructions in regard to lubrication. Do not oil or grease presealed ball bearings unless upon manufacturer's specific instructions.

C. Test relief valves, air vents and regulating valves to insure proper operation.

1.23 OPERATING DEMONSTRATION AND INSTRUCTIONS

A. Refer to Section 017900 Demonstration and Training as well as individual Division 21 Sections for requirements.

PART 2 - PRODUCTS – NOT APPLICABLE

PART 3 - EXECUTION – NOT APPLICABLE

END OF SECTION 21 0001

SECTION 21 0002 – FIRE SUPPRESSION WORK IN EXISTING BUILDINGS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes the following:

1. General Requirements for Renovation Work
2. Inspection of Existing Building
3. Asbestos Material
4. Work Hours
5. Tobacco Products
6. Barriers and Signage
7. Storage of Tools and Materials
8. Protection of Existing Building and Equipment
9. Confined Spaces
10. Noise, Fumes and Dust Control
11. Soldering Welding and Cutting
12. Removals Disposal and Reuse
13. Draining, Flush and Refill of Piping Systems
14. Continuity of Systems
15. Cutting and Patching
16. Cleaning

1.2 GENERAL REQUIREMENTS FOR RENOVATION WORK

A. Refer to Article 1 Specification requirements and notes on the drawings where provided for requirements related to renovation work.

B. Meet with the Owner, Architect before demolition or construction begins to establish procedures for work effort in the existing building. Provide names and phone numbers and establish emergency contact information where work is performed. Provide security information to the Owner for all personnel who will be working on site. Educate all construction personnel in regard to the project requirements and procedures.

C. Coordinate effort with other contractors involved in the renovation project to minimize the disruption, system outages, phasing of work, share cleaning responsibilities, etc.

1.3 INSPECTION OF EXISTING BUILDING

A. Each bidder shall inspect the project site and the existing building in the early time frame of the bidding period. Conditions shall be compared with information shown on the drawings. Report to the Architect any significant discrepancies which may be discovered in a timely fashion so that direction may be provided in an addendum. After the contract is signed, no allowance will be made for failure to have made a thorough inspection.

1.4 ASBESTOS MATERIAL

A. Abatement, removal or encapsulation of existing materials containing asbestos is not included in the Contract. Necessary work of this nature will be arranged by the Owner to be done outside of this construction and remodeling project buy a company regularly engaged in asbestos abatement. Such work will be scheduled and performed in advance of work in the construction and remodeling project.

B. If, in the performance of the fire suppression work, materials are observed which are suspected to contain asbestos, the Contractor shall immediately inform the Architect who in turn will notify the Owner. Work that would expose workers to the inhalation of asbestos particles shall be terminated. Work may be resumed only after a determination has been made and unsafe materials have been removed or encapsulated and the area declared safe.

1.5 WORK HOURS

A. Work hours for construction shall be as defined in Section 01150- Project Phasing or other specification sections or drawing notes.

B. Where allowed, contractors may work normal hours except after hours is required for operations that are noisy, generate obnoxious fumes or dust, require shut down of ventilation systems, etc. The Owner reserves the right to stop normal hour work where the Owner deems the effort to be disruptive to their ongoing operations.

C. Any work that creates hazards in or requires closure of corridors, exit pathways or stairwells work in corridors must be performed after hours when the building is not occupied.

D. All occupied areas, corridors exit pathways and stairwells must be left clean, lighted (including emergency egress and exit signage) usable and safe at the end of each work shift.

E. Access to the work area shall be coordinated with the Owner; follow all security protocols for parking, sign in, key control, etc. established by the Owner.

1.6 TOBACCO PRODUCTS

A. Smoking or chewing tobacco products are expressly prohibited to be used within the building and on the premises except where specifically permitted by the Owner or in construction company trailers or vehicles where permitted by the construction company.

PART 2 - PRODUCTS- NOT APPLICABLE

PART 3 - EXECUTION

3.1 BARRIERS AND SIGNAGE

A. Barriers and signage shall be provided as appropriate to identify work areas and to prevent unauthorized entry by non construction personnel. Refer to appropriate Division 1 specification requirements and notes on the drawings where provided.

B. All barriers and signs should be high visibility type and be maintained at all times.

3.2 STORAGE OF TOOLS AND MATERIALS

A. Store all site material and tools in the active job site area, specific storage areas are not provided except where otherwise noted for material and tools. The contractor is responsible for security.

B. Storage is specifically prohibited in means of egress paths and stairwells.

3.3 PROTECTION OF EXISTING BUILDING AND EQUIPMENT

A. The Owners' property and the property of other contractors shall be respected at all times. Provide drop clothes, visqueen or other suitable barriers where dust and debris is generated. Tape ends of barriers for sealing purposes.

B. Provide 55 gallon drums or smaller buckets as appropriate and use funnels, hoses, etc. where draining liquid systems.

C. Provide plywood sheets for protection of walls, floors or Owner equipment or systems that are remaining in place near demolition or new installation work where there is possible damage from heavy material or equipment.

3.4 CONFINED SPACES

A. Notify the Owner when performing work in confined spaces. Provide a written procedure for approval and obtain approval from the Owner when so requested.

B. All work in confined spaces shall be done in accordance with OSHA regulations.

3.5 NOISE FUME AND DUST CONTROL

A. Provide barriers and ventilation as required to limit the effect from construction generated noise fume and dust control on spaces that continue to be occupied by the Owner. Refer to protection of building and equipment paragraph above. In addition to the basic protection, provide additional visqueen barriers to limit airborne migration of dust and fumes. Provide supplemental portable fans to exhaust air to the outside of the building where appropriate. Use of the Owners' ventilation systems to induce positive or negative pressure is prohibited unless authorized by the Owner. Shut off ventilation systems serving the area where use of these systems can induce fumes or dust into return or exhaust ducts. Where systems need to remain operational for occupied areas, arrange to temporarily shutoff portions of the system in the work area. Provide taped visqueen covers on HVAC air supply and exhaust devices to limit migration. Coordinate all efforts requiring modification or shutdown of ventilation systems with the Owner. Contractor shut down of these systems is prohibited without Owner permission.

B. Arrange with the Owner when required to shutoff fire alarm or smoke detectors to perform work. With the Owners' prior approval. Cover smoke detectors where needed to prevent false alarms due to generated dust or fumes. Minimize outages and coordinate efforts to limit the effect due to false alarms.

C. Where significant dust or fume generating work, welding or cutting operations are required for removal or new work, provide fume removal equipment with telescoping arms to locally capture the fumes. Fume exhaust shall be directed outside or adequately filtered and recirculated.

D. Areas shall be thoroughly ventilated after completion of the work on a daily basis to remove residual odors and fumes before occupancy occurs the next day.

E. Provide vacuum cleaners and other equipment to clean and restore conditions.

3.6 SOLDERING WELDING AND CUTTING

A. For soldering, welding or cutting operations, provide insulated, fire rated barriers and blankets to isolate cover and protect remaining systems and materials, furniture, furnishings, floors, walls, ceilings, etc.

B. Refer to noise, fume and dust control provisions in the previous paragraph.

C. Obtain burn approval from the Owner before commencing any soldering or welding effort. Coordinate outages of fire alarm systems as noted in the previous paragraph.

D. Provide a Fire Watch at each welding location. Fire Watch personnel shall be dedicated for the sole purpose of fire prevention during welding operations. All Fire Watch personnel shall be properly trained and equipped, including fire extinguisher, fire blanket and communication equipment for assistance request.

E. Provide a fire extinguisher at every soldering or welding location.

3.7 REMOVALS DISPOSAL AND REUSE

A. Refer to the drawings for the scope of remodeling in the existing building.

B. Cooperate with the General Contractor regarding all removal and remodeling work. Each Contractor shall remove existing work which is associated with his trade and which will be superfluous when the new work is installed and made operational.

C. Extraneous piping which is or becomes accessible shall be removed and stubs shall be capped at the first active pipe encountered. p piping that is and remains inaccessible shall be abandoned. Ends of abandoned duct and pipe shall be capped so as to be concealed by finished surfaces. Upon completion of the work no abandoned duct. Pipe, valve or stub shall extend thru finished floors, walls or ceilings.

D. When it is necessary to reroute a section of active ductwork or piping the rerouted section shall be installed before removing the existing in order to minimize system down time. Rerouted sections shall be insulated as required for new work. Patch insulation on existing ductwork and piping which has been damaged or removed in this work.

E. Where existing piping is removed and holes are left in existing walls, finished ceilings, floors, etc., these holes shall be patched using materials to match the existing construction to restore and maintain the integrity of the existing partition.

F. Materials and equipment which are removed shall not be reused within the scope of this project unless specifically noted to be relocated or reused. Turn over to the Owner and place where directed on the premises all removed material and equipment so designated by the Owner. All material and equipment which the Owner does not wish to retain shall become the property of the Contractor responsible for removal and shall be removed from the premises and properly disposed.

G. Disposal of materials regulated by EPA shall be done in strict accordance with latest requirements. Provide documentation to the Owner that disposal was properly executed.

H. Remove, store and reinstall lay-in ceiling tile and grid as needed to perform work in areas where such removal and re-installation is not to be done by the General Contractor. Damaged tile and/or grid shall be replaced with new matching tile and/or grid.

I. In areas of minor work where the space is not completely vacated, temporarily move portable equipment and furnishings within the space as required to complete the work. Coordinate this activity with Owner. Protect the Owner’s property by providing dust covers and temporary plastic film barriers to contain dust. Remove barriers and return equipment and furniture upon completion of the work.

J. Refinish any surface disturbed under this work match existing, except where refinishing of that surface is included under the General Contract.

3.8 DRAINING FLUSHING AND REFILL OF PIPING SYSTEMS

A. Existing liquid systems shall be drained as required before removal or connection of new piping extensions.

B. Draining of the system shall be the responsibility of the contractor. Provide threaded connections, etc. to direct fluids to drainage points. Water systems may be drained to sanitary systems or where permitted, to storm systems. Verify any chemical treatment, inhibitors or freeze protection additives in the existing systems and obtain a permit from the local sewer authority before disposing.

C. Provide drums or containers to accept other than water drainage and remove from the premises and properly dispose. Provide visqueen to protect Owners' property when opening pipes, even where piping has been drained to prevent damage from residual liquid that remains in the pipe.

3.9 CONTINUITY OF SYSTEMS

A. Work shall be so planned and executed as to provide reasonably continuous services of existing systems throughout the construction period. Where necessary to disrupt services for short periods of time for connection, alteration or switch-over, the Owner shall be notified in advance and outages scheduled at the Owner's reasonable convenience.

B. Submit, on request, a written step-by-step sequence of operations proposed to accomplish the work, The outline must include tentative dates, times of day for disruption, downtime and restoration services. Submit the outline sufficiently in advance of the proposed work to allow the Architect or Engineer to review the information with the Owner. Upon approval, final planning and the work shall be done in close coordination with the Owner.

C. Shutdown of system and work undertaken during shutdowns shall be bid as being done during normal working hours. If the Owner should require such work be performed outside of normal working hours, reimbursement shall be made for premium time expenses only.

3.10 CUTTING AND PATCHING

A. Refer to Division 1 – General Requirements for information regarding cutting and patching.

B. Plan the work well ahead of the general construction. Where pipes and ducts are to pass thru new walls, partitions, floors, roof or ceilings, place sleeves in these elements or arrange with the General Contractor to provide openings where sleeves are not practical. Where sleeves or openings have not been installed, cut holes and patch as required for the installation of this work, or pay other trades for doing this work when so directed by the Architect. Any damage caused to the building shall be repaired or rectified.

C. Where pipes and ducts are to pass thru, above or behind existing walls, partitions, floors, roof or ceiling, cutting, patching and refinishing of same shall be included in this contract. Core drilling and saw cutting shall be utilized.

D. All material, methods and procedures used in patching and refinishing shall be in accordance with applicable provisions of specifications governing the various trades. The final appearance and integrity of the patched and refinished areas must meet the approval if the Architect. Wall, floor and ceiling refinishing must extend to logical termination lines (entire ceiling of the room repainted, for instance), if an acceptable appearance cannot be attained by finishing a partial area.

E. Provide steel angle or channel lintels to span openings which are cut in existing jointed masonry wall where the opening span exceeds 16 inches. Provide framing around roof openings for required support of the roof deck.

3.11 CLEANING

A. Debris, dust, dirt, etc shall be removed daily, particular attention shall be paid to areas that the Owner is continuing to occupy or use; any mess created in corridors, stairwells and egress paths that are maintained during construction shall be cleaned immediately.

B. The Owners dumpsters and trash receptacles shall not be used. If a dumpster is required, it shall be provided by the contractor and located where approved by the Owner. Coordinate dumpster requirements with other contractors.

C. Cleaning responsibility remains with the contractor creating the dust or debris unless noted otherwise in Division 1 specifications. Before turning an area back over to the Owner, thoroughly clean the space to leave the area in a similar condition before the start of the project where finishes are to remain.

D. The contractor shall also clean duct interiors and interior components of new or existing air handling system equipment if dirt, dust or debris have generated in the course of work have accumulated on these surfaces.

END OF SECTION 21 0002

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SECTION 21 0004 – FIRESTOPPING FOR FIRE SUPPRESSION SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes through-penetration firestop systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items.

1.2 PERFORMANCE REQUIREMENTS

A. General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.

B. Rated Systems: Firestopping assemblies shall be tested and rated in accordance with ASTM E814 (ANSI/UL 1479) Fire Tests of Through-Penetration Fire Stops (minimum positive pressure of .01 inches of water column) and E119 (ANSI/UL 263) Fire Tests of Building Construction and Materials Time-Temperature Curve. Firestopping shall provide an “F” fire rating equal to that of the construction being penetrated. Firestop systems shall meet all requirements of the Ohio Building Code.

C. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.

D. For through-penetration firestop systems exposed to view or above ceilings in air return plenums, provide products with flame-spread and smoke-developed indexes of less than 25 and 50, respectively, as determined per ASTM E 84.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For each through-penetration firestop system, submit documentation, including illustrations, from a qualified testing and inspecting agency, showing each type of construction condition penetrated, relationships to adjoining construction, and type of penetrating item.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Firestopping materials shall be manufactured and/or supplied by:

1. Hilti, Inc.
2. Specified Technologies Inc.
3. 3M; Fire Protection Products Division.

2.2 FIRESTOPPING

A. Materials shall be in the form of caulk, putty, sealant, intumescent material, wrap strip, fire blocking, ceramic wool and other materials required for the UL listed assemblies. These shall be installed in conjunction with sleeves and materials for fill and damming.

PART 3 - EXECUTION

3.1 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

A. General: Installation of all materials and assemblies shall be in accordance with UL assembly drawings and the manufacturer’s instructions.

B. Installation shall be done by an experienced installer who is certified, licensed or otherwise qualified by the firestopping manufacturer as having the necessary training and experience.

C. Provide firestop system for every pipe at penetration of all fire resistance rated walls and horizontal assemblies.

D. Provide rigid support for pipes on both sides of the fire resistance rated wall or assembly where required as part of the fire stop assembly.

E. Coordinate opening size and additional framing requirements with the General Contractor for each opening to meet the firestop installation requirements.

F. Annular space of penetrations of non-fire-resistant-rated floor, floor/ceiling assemblies, or the ceiling membrane of a non-fire-resistant rated roof/ceiling assembly shall be filled with an approved firestopping material to resist the free passage of flame and products of combustion.

G. Smoke Barriers:
1. Penetrations shall be sealed with a firestopping system to prevent the passage of smoke.

H. Smoke Partitions:
1. Penetrations shall be sealed with a caulking material to prevent the passage of smoke. Non-rated smoke partitions do not require a fire stopping system.

3.2 BUILDING STRUCTURE FIRE STOPPING

A. Where building structural members have a fire stopping system installed and portions of this fire stopping system are removed to install new systems hangers, the F.C. shall provide new fire stopping system onto portions of the building structure and hanger where fire stopping was removed. The fire stopping system shall be equal to the existing system and be 2-hour rated.

END OF SECTION 21 0004

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SECTION 21 0519 - METERS AND GAUGES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Thermometers.
2. Gauges.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 THERMOMETERS

A. Thermometers shall be 9” red reading mercury tube column type with adjustable angle hinge assembly and insertion stem, equal to Trerice BX91403-1/2.

B. Thermometers shall be 5” diameter dial face bi-metallic type with adjustable angle hinge, stainless steel insertion stem and recalibration feature, equal to Trerice B85604.

C. Separable socket insertion well shall be furnished with each thermometer. An extension neck, with appropriate increase in thermometer stem length, shall also be furnished where insulation thickness exceeds 2.

D. Ranges of thermometers shall be selected to be consistent with anticipated temperatures.

2.2 PRESSURE GAUGES

A. Pressure gauges, including compound gauges and vacuum gauges, shall be Bourdon tube type with 4-1/2” dial and cast aluminum case, equal to Trerice 600C Series. Accuracy shall be 1% at mid-range.

B. Pressure gauges for low pressure application, calibrated in inches of water gauge, ounces per sq. in. or 0-5 psi, as appropriate, shall be equal to Trerice 860.

C. Pressure gauges at pumps shall be liquid filled Bourdon tube type with 4” dial and stainless-steel case and internals, equal to Trerice 700 Series.

D. A brass cock or bronze ball valve and a pressure snubber shall be furnished with each pressure gauge.

E. Ranges of pressure gauges shall be selected to be consistent with anticipated pressures. Range shall be approximately twice the normal system working pressure at the gauge location.

2.3 TEST PLUGS

A. Pressure-temperature test plugs for insertion of pressure gauge or thermometer shall be a brass fitting with neoprene or Nordel self-sealing insert and knurled brass cap with plastic capture tab. Fittings shall be equal to Peterson “PT”. Furnish two thermometers and two pressure gauges with integral insertion stem appropriate for use with the test plugs.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Thermometers shall be installed where shown on the drawings and also at:

B. Pressure gauges shall be installed where shown on the drawings, where required by applicable codes and also at:

C. Thermometers and gauges shall be positioned to be read with unobstructed view from the floor. Pressure-temperature test plugs shall be installed where shown, located in a position to be most readable.

D. Install thermometer wells in piping tees in the vertical position. Fill the well with oil or graphite and secure the thermometer in position

END OF SECTION 21 0519

SECTION 21 0529 – PIPE HANGERS AND SUPPORTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Steel pipe hangers and supports.
2. Hanger Rods and Attachments.
3. Pipe Riser Supports
4. Base Mounted Pipe Supports

B. See Specification Section 21 0516 "Expansion Fittings and Loops " for pipe guides and anchors.

C. See Specification Section 21 Seismic Control for Fire Suppression Systems for seismic isolation devices.

1.2 DEFINITIONS

A. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.3 SUBMITTALS

A. Product Data: For the following:

1. Steel pipe hangers and supports.

PART 2 - PRODUCTS

2.1 STEEL PIPE HANGERS

A. Hangers and supports for piping shall be equal to the Anvil catalog numbers as follows:

1. Pear shaped band hanger with adjustable swivel ring type per NFPA standards, lock nut and rod attachment, carbon steel with galvanized finish, Anvil fig. 69.

2.2 HANGER RODS AND ATTACHMENTS

A. Hanger rods shall be solid steel, threaded-end or all-thread rod, of diameter listed below. A hanger attachment device (for attachment to the structure) and locking nut at the hanger attachment shall be provided on each hanger.

Pipe Size	Min. Rod Dia.
4” and smaller	3/8"
5" to 6"	1/2"
8"	5/8"

B. Hanger rod attachment devices for attachment to the structure shall be:

1. Beam clamps for steel construction equal to Anvil Fig. 92, 93, or 94. Utilize swivel type in sloped steel construction to provide vertical support of pipe without bending hanger rods.

2. Channel support system equal to Unistrut or Hilti.

2.3 PIPE RISER SUPPORTS

A. Riser clamps shall be:

1. Carbon steel, epoxy coated or galvanized finish- Anvil Fig. 261.

2.4 BASE MOUNTED PIPE SUPPORTS

A. Base mounted pipe supports shall be factory or shop prime coat painted equal to Anvil Fig. numbers as follows:

1. Adjustable pipe saddle support and yoke– Fig. 265.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Spacing of hangers shall be as follows:

1. Steel pipe - Vertical:
   a. At the base and 15 ft. maximum spacing unless otherwise shown.

2. Steel pipe - Horizontal:
   a. 2” size and smaller – 8 ft. intervals
   b. 2-1/2” thru 6” – 10 ft. intervals
   c. 8” and larger – 12 ft.. intervals.

B. In piping systems with rolled or cut groove end pipe and mechanical joint couplings, pipe hangers shall be provided on horizontal piping at normal specified intervals and, in addition, so that no pipe shall be left unsupported between any two couplings nor left unsupported whenever a change in direction takes place. Added supports may be omitted on “rigid” couplings such as Victaulic Style 07 Zero-Flex. Vertical piping shall be supported at normal specified intervals or every other pipe length, which ever is more frequent. The base of the riser or base fitting shall be supported.

C. Attachment of pipe hangers to the structure shall be with:

1. Provide anchoring where steel beam clamps are attached to sloping surfaces of beam flanges and where otherwise required to insure permanent attachment.

2. Attachment to steel deck is prohibited. Span from steel structural members with supplementary steel shapes where direct attachment to structural members is not practical.

D. Attachment to manufactured trusses and other engineered structural members and supports shall be done in strict accordance with the structural manufacturer’s recommendations. Refer to the architectural and structural drawings for type of engineered structural systems being used. Connections to these structural members shall be made with connection devices and methods approved by the structural manufacturer. Provide additional supports with supplemental steel shapes when spacing between structural members exceeds specified distances.

E. Pipe hangers shall be adjusted to proper elevation and all hanger rods set in a vertical position.

F. Extended legs of pipe riser clamps shall be shortened as needed to maintain concealment of the clamp within finished spaces. Ensure that adequate support is still maintained.

END OF SECTION 21 0529

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SECTION 21 0553 - IDENTIFICATION FOR FIRE SUPPRESSION SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe labels.
2. Valve Tags

1.2 SUBMITTAL

A. Product Data: For each type of product indicated.

1.3 QUALITY ASSURANCE

A. Labels, tags and markers shall comply with ANSI A13.1 for lettering size, colors and length of color field.

PART 2 - PRODUCTS

2.1 PIPE LABELS

A. Pipe markings shall be applied to all piping.

B. Labeling shall be:

1. Plastic semi-rigid snap-on type, manufacturer’s standard pre-printed color coded pipe markers extending fully around the pipe and insulation or pressure-sensitive vinyl pipe markers similar to above.

2.2 VALVE TAGS

A. Each shutoff valve, other than at equipment, shall be identified with a stamped tag. Valves and tagging shall be scheduled, typewritten on 8-1/2” x 11” paper, tabulating valve number, piping system, abbreviation, location of valve (room or area) and service (e.g. – south wing reheat boxes).

B. Valve tags shall be engraved plastic laminate with solid brass S hook. Tags shall be engraved with “F” for Fire Suppression and the designated number.

2.3 ACCEPTABLE MANUFACTURERS

A. Labels, markings and tags shall be manufactured by W.H. Brady, Seton, Allen or Industrial Safety Supply.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Identification marking and tagging shall be applied after painting has been completed.

B. Coordinate names, abbreviations and other designations used with corresponding designations shown, specified or scheduled on drawings. Verify with Owners' desired identification marking system.

C. The Plumbing, Fire Suppression and HVAC Contractors shall coordinate labeling, marking and tagging to attain coordinated and consistent systems of identification.

D. Equipment labeling shall consist of unit designation as shown on the drawings.

E. Pipe markers shall be placed at 25 ft. centers in mechanical rooms and concealed spaces and at 50 ft. centers in other exposed locations.

F. Refer to appropriate sections of this specification for installation of underground line marker tape.

G. Valve tags shall be placed on each valve except those intended for isolation of individual items of equipment. Valve tag schedules shall be prepared as specified above.

END OF SECTION 21 0553

SECTION 211313 - WET-PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipes, fittings, and specialties.
2. Fire-protection valves.
3. Fire-department connections.
4. Sprinklers.
5. Excess-pressure pumps.
6. Alarm devices.
7. Pressure gages.

B. Related Sections:

1. Division 21 Section "Dry-Pipe Sprinkler Systems" for dry-pipe sprinkler piping.
2. Division 21 Section "Electric-Drive, Vertical-Turbine Fire Pumps" for fire pumps, pressure-maintenance pumps, and fire-pump controllers.

1.2 SYSTEM DESCRIPTIONS

A. Wet-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing water and that is connected to water supply through alarm valve. Water discharges immediately from sprinklers when they are opened. Sprinklers open when heat melts fusible link or destroys frangible device. Hose connections are included if indicated.

1.3 PERFORMANCE REQUIREMENTS

A. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.

B. Design sprinkler system(s), by a State certified designer, using performance requirements and design criteria indicated.

1. Margin of Safety for Available Water Flow and Pressure: 20 percent, including losses through water-service piping, valves, and backflow preventers.

C. System shall conform to the requirements of NFPA 13 and OBC chapter 9 and other requirements of the authority having jurisdiction.

D. Sprinkler system design shall be approved by authorities having jurisdiction.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Approved Sprinkler Piping Drawings and Calculations: Working plans and hydraulic calculations, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.

C. Welding certificates.

D. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."

E. Field quality-control reports.

F. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.

    a. Design Responsibility: Preparation of working plans, calculations, and field test reports by a certified sprinkler designer.

B. Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. NFPA Standards: Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:

1. NFPA 13, "Installation of Sprinkler Systems."
2. NFPA 24, "Installation of Private Fire Service Mains and Their Appurtenances."

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Refer to piping schedule on the Drawings for piping material and applications.

2.2 LISTED FIRE-PROTECTION VALVES

A. General Requirements:

1. Valves shall be UL listed or FM approved.
2. Minimum Pressure Rating: 175 psig.
3. Acceptable Manufacturers: Subject to compliance with requirements:
   a. Anvil International, Inc.
   b. Kennedy Valve; a division of McWane, Inc.
   c. Stockholm Valve and Fittings.
   d. Tyco Fire & Building Products LP.
   e. Victaulic Company.
   f. Watts Water Technologies, Inc.

B. Check Valves 2 1/2” and larger:

1. Standard: UL 312.
2. Type: Swing check.
3. Body Material: Cast iron.
4. Disc Material: Bronze
5. End Connections: Flanged or grooved.

C. Check Valves 2” and smaller:

1. Standard: UL 312.
2. Type: Swing check.
3. Body Material: Bronze.
4. Disc Material: Composition faced
5. End Connections: Threaded.

D. OS&Y Gate Valves 2” and smaller:

1. Standard: UL 262.
2. Body Material: Bronze.
3. End Connections: Threaded.

E. OS&Y Gate Valves:2 1/2” and larger

1. Standard: UL 262.
2. Body Material: Cast or ductile iron.
3. End Connections: Flanged or grooved.

F. Indicating-Type Butterfly Valves:

1. Standard: UL 1091.
2. Pressure Rating: 175 psig minimum.
3. Valves 2” and Smaller:

   a. Valve Type: Ball or butterfly.
   b. Body Material: Bronze.

c. End Connections: Threaded.

4. Valves 2-1/2” and Larger:

a. Valve Type: Butterfly.
b. Body Material: Cast or ductile iron.
c. End Connections: Flanged, grooved, or wafer.

5. Valve Operation: Integral electrical, 24-V ac, pre-wired, single-circuit, supervisory switch indicating device.

G. Trim and Drain Ball Valves:

1. Standard: UL’s "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Body Material: Bronze.
3. End Connections: Threaded.

2.3 SPRINKLER SPECIALTY PIPE FITTINGS

A. Flow Detection and Test Assemblies:

1. Standard: UL’s "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating: 175 psig .
3. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.
4. Size: Same as connected piping.
5. Inlet and Outlet: Threaded.
6. Acceptable Manufacturers
   a. Reliable Automatic Sprinkler Co., Inc.
   b. Tyco Fire & Building Products LP.
   c. Victaulic Company.

B. Branch Line Testers:

1. Standard: UL 199.
2. Pressure Rating: 175 psig minimum.
3. Body Material: Brass.
4. Size: Same as connected piping.
5. Inlet: Threaded.
6. Drain Outlet: Threaded and capped.
7. Branch Outlet: Threaded, for sprinkler.
8. Acceptable Manufacturers:
   a. Elkhart Brass Mfg. Company, Inc.
   b. Fire-End & Croker Corporation.
   c. Potter Roemer.

C. Sprinkler Inspector's Test Fittings:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating: 175 psig.
3. Body Material: Cast- or ductile-iron housing with sight glass.
4. Size: Same as connected piping.
5. Inlet and Outlet: Threaded.
6. Acceptable Manufacturers:
   a. Tyco Fire & Building Products LP.
   b. Victaulic Company.
   c. Viking Corporation.

2.4 SPRINKLERS

A. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating for Automatic Sprinklers: 175 psig minimum.
3. Acceptable Manufacturers:
   a. Globe Fire Sprinkler Corporation.
   b. Reliable Automatic Sprinkler Co., Inc.
   c. Tyco Fire & Building Products LP.
   d. Victaulic Company.
   e. Viking Corporation.

B. Automatic Sprinklers:

1. Non-residential Applications: UL 199.
2. Characteristics: Quick-response type with nominal 1/2-inch orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.

C. Sprinkler Finishes:

1. Painted.

D. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications.
1. Concealed Recessed Sprinklers: White -plated steel, two-piece, with 1-inch vertical adjustment and a flat cover plate.

E. Spare sprinklers. Furnish spare sprinklers and sprinkler wrench in accordance with the requirements of NFPA 25. spare sprinklers shall include each type and temperature rating in a proportional amount equal of those installed. Provide a wall mounted cabinet for sprinklers and wrench.

2.5 ALARM DEVICES

A. Alarm-device types shall match piping and equipment connections.

B. Water-Flow Indicators:

1. Standard: UL 346.
2. Water-Flow Detector: Electrically supervised.
3. Components: Two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
4. Type: Paddle operated.
5. Pressure Rating: 250 psig.
6. Design Installation: Horizontal or vertical.
7. Manufacturers:
   a. ADT Security Services, Inc.
   b. McDonnell & Miller; ITT Industries.
   c. Potter Electric Signal Company.
   d. System Sensor; a Honeywell company.
   e. Viking Corporation.
   f. Victaulic Company.

C. Valve Supervisory Switches:

1. Standard: UL 346.
2. Type: Electrically supervised.
3. Components: Single-pole, double-throw switch with normally closed contacts.
4. Design: Signals that controlled valve is in other than fully open position.
5. Manufacturers:
   a. Fire-Lite Alarms, Inc.; a Honeywell company.
   b. Kennedy Valve; a division of McWane, Inc.
   c. Potter Electric Signal Company.
   d. System Sensor; a Honeywell company.

2.6 PIPE ESCUTCHEONS

A. General: Manufactured ceiling, floor, and wall escutcheons and floor plates.

B. One-Piece, Cast-Brass Escutcheons: Polished chrome-plated finish with setscrews.

C. One-Piece, Deep-Pattern Escutcheons: Deep-drawn, box-shaped brass with chrome-plated finish.

D. Split-Casting Floor Plates: Cast brass with concealed hinge.

2.7 SLEEVES

A. Cast-Iron Wall Pipe Sleeves: Cast or fabricated of cast iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, standard weight, zinc coated, plain ends.

PART 3 - EXECUTION

3.1 SERVICE-ENTRANCE PIPING

A. Connect sprinkler piping to water-service piping for service entrance to building.

B. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated at connection to water-service piping.

3.2 PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.

1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.

B. Locate sprinkler piping in areas protected from freezing.

C. Piping Standard: Comply with requirements for installation of sprinkler piping in NFPA 13.

D. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

E. Install unions adjacent to each valve in pipes 2” and smaller.

F. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having 2-1/2” and larger end connections.

G. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.

H. Install sprinkler piping with drains for complete system drainage.

I. Install alarm devices in piping systems.

J. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13.

K. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than 1/4” and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gauges to permit removal, and install where they will not be subject to freezing.

L. Install escutcheons for penetrations of walls, ceilings, and floors.

M. Fill sprinkler system piping with water.

3.3 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.

B. Ream ends of pipes and tubes and remove burs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

D. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.

E. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dyes. Ream threaded pipe ends to remove burs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

F. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.

1. Shop weld pipe joints where welded piping is indicated.

G. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.

H. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

I. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.4 VALVE AND SPECIALTIES INSTALLATION

A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.

B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.

C. Install backflow preventer in potable-water-supply sources.

D. Specialty Valves:

1. General Requirements: Install in vertical position for proper direction of flow, in main supply to system.

3.5 SPRINKLER INSTALLATION

A. Refer to the drawing for the locations of various types of sprinklers.

B. Install sprinklers in suspended ceilings in center of acoustic ceiling panels or at the quarter points along the long axis for rectangular panels.

C. Install dry-type sprinklers with water supply from heated space. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing.

D. Install sprinkler guards on sprinklers in gymnasiums.

3.6 SLEEVE INSTALLATION

A. General Requirements: Install sleeves for pipes and tubes passing through penetrations in floors, partitions, and walls.

B. Sleeves are not required for core-drilled holes in cast walls or floors.

C. Cut sleeves to length for mounting flush with both surfaces unless otherwise indicated.

D. Install sleeves in new partitions, slabs, and walls as they are built.

E. For interior wall penetrations, seal annular space between sleeve and pipe or pipe insulation using joint sealants appropriate for size, depth, and location of joint. Comply with requirements for joint sealants in Division 07 Section "Joint Sealants."

F. For exterior wall penetrations above grade, seal annular space between sleeve and pipe using joint sealants appropriate for size, depth, and location of joint. Comply with requirements for joint sealants in Division 07 Section "Joint Sealants."

G. Seal space outside of sleeves in concrete slabs and walls with grout.

H. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestop materials and installations in Division 07 Section "Penetration Firestopping."

3.7 IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.

B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
4. Coordinate with fire-alarm tests. Operate as required.
5. Verify that equipment hose threads are same as local fire-department equipment.

C. Sprinkler piping system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Turn spare sprinklers, wrench and cabinet over to owner

3.9 CLEANING

A. Clean dirt and debris from sprinklers.

B. Remove and replace sprinklers with paint other than factory finish.

END OF SECTION 211313

DIVISION 22 PLUMBING

22 0000 General Requirements for Plumbing Systems

22 0001 Basic Plumbing Requirements
22 0002 Plumbing Work in Existing Buildings
22 0004 Firestopping for Plumbing Systems
22 0005 Excavation, Backfill and Surface Restoration

22 0500 Common Work Results for Plumbing

22 0519 Meters and Gauges
22 0523 General Duty Valves
22 0529 Pipe Hangers and Supports
22 0530 Equipment Bases and Supports
22 0553 Identification for Plumbing Systems

22 0700 Plumbing Insulation

22 0719 Pipe Insulation

22 1000 Plumbing Piping and Pumps

22 1116 Domestic Water Piping
22 1119 Domestic Water Piping Specialties
22 1123 Domestic Water Pumps
22 1316 Sanitary Waste and Vent Piping
22 1319 Sanitary Waste Piping Specialties
22 1613 – Natural Gas House Piping

22 3000 Plumbing Equipment

22 3436 Gas-Fired Storage Water Heaters

224000 Plumbing Fixtures

22 4200 Plumbing Fixtures

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SECTION 22 0001 – BASIC PLUMBING REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes the following:

1. General Requirements
2. Definitions
3. Scope of Work
4. Drawings and Specifications
5. Reference Standards
6. Allowances, Unit Prices and Alternates
7. Site Visit
8. Permits, Regulations and Inspections
9. Project Management and Coordination
10. Temporary Utilities
11. Workmanship
12. Protection
13. Painting
14. Cleaning
15. Miscellaneous Equipment Connections
16. Equipment Selection
17. Shop Drawings
18. Final Inspection and Punch List
19. Operation and Maintenance Manuals
20. Record Drawings
21. Warranties
22. Project Closeout
23. Operation and Adjustment of Equipment
24. Operating Demonstration and Instruction

1.2 GENERAL REQUIREMENTS

A. All provisions of Division 00 Front End Documents and Division 01 General Requirements apply to work specified in this Division.

B. Specification provisions of other relevant Divisions shall apply where applicable work is required to be performed under this Plumbing work.

C. A complete and functional Plumbing system installation shall be provided under this Division. Should overlap of work among trades become evident, this shall be called to the attention of the architect. In such event, none of the trades or their suppliers shall assume that he relieved of the work which is specified under his branch until instructions in writing are received from the Architect.

D. The Mechanical and Electrical drawings and specifications assign work (labor and/or materials to be provided by the General, Plumbing, Fire Suppression, HVAC or Electrical Contractor or their sub-contractors. Understanding that the contractors for mechanical and electrical work are sub-contractors to the (General) Contractor, such assignments are not intended to restrict the Contractor in assignment of work among the sub-contractor to accommodate trade agreements and practices or the normal conduct of the construction work.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.4 SCOPE OF WORK

A. The scope of the Plumbing work includes furnishing, installing, testing and warranty of all Plumbing work shown on the Plumbing drawings and specified herein, including Division 00, Division 01, Division 22 and applicable provisions of other relevant Divisions..

1.5 DRAWINGS AND SPECIFICATIONS

A. The drawings indicate the general arrangement of the work and are to be followed insofar as possible. The word “provide,” as used, shall mean “furnish and install.” If significant deviations from the layout are necessitated by field conditions, detailed layouts of the proposed departures shall be submitted to the Architect for approval before proceeding with the work.

B. Make all necessary field measurements to ensure correct fitting. Coordinate work with all other trades in such a manner as to cause a minimum of conflict or delay.

C. The drawings and specifications shall be carefully studied during the course of bidding and construction. Any errors, omissions or discrepancies encountered shall be referred immediately to the Architect for interpretation or correction, so that misunderstandings at a later date may be avoided. The contract drawings are not intended to show every vertical or horizontal offset which may be necessary to complete the systems. Having pipe and fittings fabricated and delivered in advance of making actual measurements shall be sufficiently in advance as to not

cause extra work, or unduly delay the work. Coordinate work in advance with all other trades and report immediately any difficulties which can be anticipated.

D. The Architect shall reserve the right to make minor adjustment in locations of system runs and components where he considers such adjustments desirable in the interest of concealing work or presenting a better appearance where exposed. Any such changes shall be anticipated and requested sufficiently in advance as to not cause extra work, or unduly delay the work. Coordinate work in advance with all other trades and report immediately any difficulties.

E. Equipment or piping shall not be installed or run above electrical switchgear or panelboards, nor in or above the access space in the immediate vicinity of the electrical switchgear/panelboards, in accordance with NEC Article 384.

F. Where any system runs and components are so placed as to cause or contribute to a conflict, it shall be readjusted at the expense of the contractor causing such conflict. The Architect's decision shall be final in regard to the arrangement of ductwork, piping, etc., where conflict arises.

G. Provides offsets in system runs, additional fittings, necessary drains and minor valves, traps, and devices required to complete the installation, or for the proper operation of the system. Each Contractor shall exercise due and particular caution to determine that all parts of the work are made quickly and easily accessible.

H. Should overlap of work among the trades become evident, this shall be called to the attention of the Architect. In such event, none of the trades or their suppliers shall assume that he is relieved of the work which is specified under his branch until instructions in writing are received from the Architect.

1.6 REFERENCE STANDARDS

A. Where standards (NFPA, NEC, ADTM, UL, ASPE, etc.) are referenced in the specifications or on the drawings, the latest edition is to be used except, however, where the authority having jurisdiction has not yet adopted the latest edition, the edition so recognized shall be used.

1.7 ALLOWANCES, UNIT PRICES AND ALTERNATES

A. Refer to Sections 01200 Allowances, 012200 Unit Prices and 012300 Alternates.

1.8 SITE VISIT

A. Refer to Section 017300 Execution.

B. Each bidder shall visit the project site to understand the existing conditions and compare the conditions with information shown on the drawings. Report immediately to the Architect any issues or discrepancies which are discovered that affect the bid. Changes to contract price will not be considered for site condition issues that are readily apparent from a thorough site review.

1.9 PERMITS, REGULATIONS AND INSPECTION

A. Work must conform to applicable local, state and federal laws, ordinances and regulations. Where drawings or specifications exceed code requirements, the drawing and specifications shall govern. Install no work contrary to minimum legal standards.

B. Except where the permit application is made by the Architect or the Engineer, the Plumbing contractor shall be responsible to file for and obtain all required permits from the governing inspection agencies for the plumbing work. Where the Architect or Engineer is the Architect or Engineer of record, they will furnish sealed and signed drawings and specifications required by the permit authorities.

C. Include payment of all permit and inspection fees applicable to the work in this Division.

D. All work shall be subject to inspection and approval of Federal, State and local agencies as may be appropriate as well as the Architect and Engineer.

E. Furnish for the Owner certificates of approval from the governing inspection agencies as a condition for final payment.

1.10 PROJECT MANAGEMENT AND COORDINATION

A. Refer to Section 013100 Project Management and Coordination.

1.11 TEMPORARY UTILITIES

A. Refer to Section 015000 – Temporary Facilities and Controls for division of responsibilities for temporary utilities.

B. Each Contractor requiring water for construction purposes shall connect to wall hydrants or other connection points within the existing building.

1.12 WORKMANSHIP

A. Refer to Section 014000 Quality Requirements.

B. Materials and equipment shall be installed and supported in a first-class and workmanlike manner by mechanics skilled in their particular trades. Workmanship shall be first-class in all respects, and the Architect shall have the right to stop the work if highest quality workmanship is not maintained.

C. Plumbing work shall be performed by licensed Plumbing Contractors in accordance with requirements of the jurisdiction.

1.13 PROTECTION

A. Each Contractor shall be entirely responsible for all material and equipment furnished in connection with his work. Special care shall be taken to properly protect all parts thereof from theft, damage or deterioration during the entire construction period in such a manner as may be necessary, or as directed by the Architect.

B. The Owner's property and the property of other contractors shall be scrupulously respected at all times. Provide plastic sheeting, drop cloths or similar barriers where dust and debris is generated, to protect adjacent areas.

C. Contractor shall protect all equipment and materials from detrimental effects of weather or construction activity. All items shall be stored and secured in a protected location away from the daily work area. Equipment or materials shall be placed on raised skids to protect from surface moisture. Where appropriate, provide plastic sheeting or similar vapor barrier underneath the stored products to reduce the effects of ground moisture or curing concrete on the local humidity levels. Where unfinished ferrous products or finished ferrous products with raw edges are stored, provide local, dry heat to maintain ambient relative humidity levels below 65% RH to prevent rust.

D. All equipment shall retain the original packaging until required to be removed for installation or operation. Open ends of piping, conduit, etc. shall be capped or sealed and ventilation openings into equipment shall be wrapped and sealed in plastic sheeting to prevent dust or dirt entry both when stored and after installation but still open to the effects of construction activity. Stored items as well as installed equipment shall be covered with plastic sheeting at all times until placed in service or until dust generating activity in the area has ceased.

1.14 PAINTING

A. In addition to any painting specified for various individual items of equipment, the following painting shall be included in Division 22:

1. Ferrous metal which is no factory or shop painted or galvanized and which remains exposed to view in the finished areas of the building / building including finished areas, mechanical rooms, storage rooms, and other unfinished areas shall be given a prime coat of paint.

2. Ferrous metal installed outside the building which is not factory or shop painted or galvanized shall be given a prime coat of paint.

3. Equipment and materials which have been factory or shop coated (prime or finished painted or galvanized), on which the finish has been damaged or has deteriorated, shall be cleaned and refinished equal to its original condition. The entire surface shall be repainted if a uniform appearance cannot be accomplished by touch-up.

B. Paint, surface preparation and application shall conform to applicable portions of the Painting section of Division 9 of the Specifications. All rust must be removed before application of paint.

C. Finish painting is included in the General Contract except where otherwise required under remodeling work. Refer to the Cutting and Patching paragraph in this Section for finishing requirements

1.15 CLEANING

A. Debris, dust, dirt, etc shall be removed daily, particular attention shall be paid to areas that the Owner is continuing to occupy or use; any mess created in corridors, stairwells and egress paths that are maintained during construction shall be cleaned immediately.

B. The Owners dumpsters and trash receptacles shall not be used. If a dumpster is required, it shall be provided by the contractor and located where approved by the Owner. Coordinate dumpster requirements with other contractors.

C. Before turning an area back over to the Owner, thoroughly clean the space to leave the area in a similar condition before the start of the project where finishes are to remain.

1.16 MISCELLANEOUS EQUIPMENT CONNETIONS

A. Certain categories of fixtures and equipment, including kitchen equipment, sterilizers, washers, laundry and laboratory equipment, require piping connections and duct connections as shown on the drawings. Equipment will be furnished and set in places by the equipment supplier.

B. Make all final connections to these fixture and equipment, as indicated and in accordance with the manufacturer’s recommendations. All piping connections shall be valved and final connections made with unions.

C. Fixtures and equipment, unless otherwise noted, will be furnished complete with the basic plumbing supply and waste trim. The trim will generally be furnished “loose” and shall be installed under this work. Countertop sinks furnished “loose” shall also be installed by the Plumbing Contractor.

D. Provide supplies, supply stops, traps, shut-off valves, fixture drains, continuous wastes and indirect wastes. Provide a water-hammer arrestor on the system side of each automatic (quick-closing) valve on water supply lines. Items not specifically described elsewhere in these specifications shall be of the same manufacturer as similar items specified in conjunction with the plumbing fixtures.

E. Supply piping and devices connecting to equipment, where exposed to view in the finished space, shall be chrome plated and insulation shall be omitted.

F. Roughing-in drawings shall be obtained for the various fixtures and items of equipment as the time approaches when such information is required; allow a reasonable period, from the time of notice to obtain this information.

G. Connections to equipment shall be in accordance with manufacturers’ installation guidelines. Any additional accessories recommended by the manufacturer such as gauges, shut-off valves, unions at connection points, etc., shall be provided by this Contractor.

1.17 EQUIPMENT SELECTION

A. Materials and equipment furnished under this contract shall be in strict accordance with the specifications and drawings and shall be new and of best grade and quality. When two or more articles of the same material or equipment are required, they shall be of the same manufacturer.

B. The selection of materials and equipment to be furnished under this contract shall be governed by the following:

1. Where trade names, brands, or manufacturers of equipment or materials are listed in the specifications, the exact equipment listed shall be furnished. Where more than one name is used, the Contractor shall have the option of selecting between any one of the several specified. All products shall be first quality line of manufacturers listed.

2. Where the words “or approved equal: appear after a manufacturer’s name, specific approval must be obtained from the Architect during the bidding period in sufficient time to be included in an addendum. The same shall apply for equipment and materials not named in the specifications, where approval is sought.

3. Where the words “equal to” appear, followed by a manufacturer’s name and sometimes a model or series designation, such designation is intended to establish a model or series designation, such designation is intended to establish quality level and standard features. Equal equipment by other manufacturers will be acceptable, subject to the Engineer’s approval.

C. Substitute equipment of equal quality and capacity will be considered when the listing of such is included as a separate item of the bid. State the deduction or addition in cost to that of the specified product.

D. Before bidding equipment, and again in the preparation of shop drawings the Contractor and his supplier shall verify that adequate space is available for entry and installation of the item of equipment, including associated piping and accessories. Also verify that adequate space is available for servicing of the equipment.

E. If extensive changes in pipe, or equipment layout or electrical wiring and equipment are brought about by the use of equipment which is not compatible with the layout shown on the drawings, necessary changes shall be deemed to be included in the contract.

1.18 SHOP DRAWINGS

A. Refer to Section 016000 Product Requirements.

B. Shop drawings for equipment fixtures, devices and materials shall be labeled and identified same as on the Contract Documents. Failure to do so may be cause for rejection of shop drawings.

C. The review of shop drawings by the Architect or Engineer shall not relieve the Contactor from responsibility for errors in the shop drawings. Deviations from specifications and drawing requirements shall be called to the Engineer’s attention in a separate clearly stated notification at the time of submittal for the Engineer’s review.

D. Shop drawings for the following Plumbing equipment and materials shall be submitted:

1. Pipe, fittings and joining methods for the various systems.
2. Firestopping systems for pipe penetrations.
3. Pipe hangers and saddles.
4. Valves.
5. Gauges.
6. Pipe insulation
7. Supply system specialties.
8. Backflow preventers
9. Drainage system specialties
10. Plumbing fixtures and trim
11. Sewage ejectors, basin and controls
12. Water heating equipment

1.19 OPERATING AND MAINTENANCE MANUALS

A. Refer to Section 017823 Operation and Maintenance Data.

B. All shop drawing and installation, maintenance and operating instruction pamphlets or brochures, wiring diagrams, parts list and other information, along with warranties, shall be obtained form each manufacturer of the principal items of equipment. In addition, the Contractor shall prepare a chart listing all items of equipment which are furnished under his contract and indicating the nature of maintenance required, the recommended frequency of checking these points and the type of lubricating media or replacement material required.

C. These shall be assembled into three-ring loose lead binders or other appropriate binding and also combined into a single electronic file in .PDF format. An index and tabbed sheets to separate the sections shall be included. These shall be submitted to the Architect or Engineer for review. Upon approval, manuals shall be turned over to the Owner.

1.20 RECORD DRAWINGS

A. Refer to Section 017839 Project Record Drawings.

B. Each Contractor shall maintain a separate set of prints of the contract documents and shall show all changes or variations, in a manner to be clearly discernible, which are made during construction. Upon completion of the work, these drawings shall be turned over to the Architect.

1.21 WARRANTIES

A. This Contractor shall warrant all workmanship, equipment and material entering into this contact for a period of one year of date of final acceptance or date of beneficial use, as agreed to between Contractor and Architect. Any materials or equipment proving to be defective during this warranty period shall be made good by this Contractor without expense to the Owner.

B. This provision is intended specifically to cover deficiencies in contract completion or performance which are discovered after systems are placed in operation. Also included shall be

supplementary assistance in balancing, adjusting or providing operating instructions as the need develops, and replacing overload heater elements in starters where necessary to keep systems in operation. Heater element sizes shall not exceed the motor manufacturer's recommendations.

C. This provision shall not be construed to include maintenance items such as replacing filters, and cleaning strainers after these have been done for final close-out.

D. Provisions of this warranty shall be considered supplementary to warranty provisions under General Conditions.

1.22 PROJECT CLOSEOUT

A. Refer to Section 017700 Closeout Procedures.

1.23 OPERATIONS AND ADJUSTMENT OF EQUIPMENT

A. As each piping system is put into operation, all items of equipment included therein shall be adjusted to proper working order. This shall include balancing the domestic hot water return system,

B. Caution: Verify that all bearings are lubricated, all motors are operating in the right direction, and correct overload heater elements are provided on all motors. Do not depend wholly on the electrician's judgment in these matters. Follow specific instructions in regard to lubrication. Do not oil or grease presealed ball bearings unless upon manufacturer's specific instructions.

C. Test relief valves, air vents and regulating valves to insure proper operation.

1.24 OPERATING DEMONSTRATION AND INSTRUCTIONS

A. Refer to Section 017900 Demonstration and Training as well as individual Division 22 Sections for requirements.

PART 2 - PRODUCTS – NOT APPLICABLE

PART 3 - EXECUTION– NOT APPLICABLE

END OF SECTION 22 0001

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SECTION 22 0002 – PLUMBING WORK IN EXISTING BUILDINGS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes the following:

1. General Requirements for Renovation Work
2. Inspection of Existing Building
3. Asbestos Material
4. Work Hours
5. Tobacco Products
6. Barriers and Signage
7. Storage of Tools and Materials
8. Protection of Existing Building and Equipment
9. Confined Spaces
10. Noise, Fumes and Dust Control
11. Soldering Welding and Cutting
12. Removals Disposal and Reuse
13. Draining, Flush and Refill of Piping Systems
14. Continuity of Systems
15. Cutting and Patching
16. Cleaning

1.2 GENERAL REQUIREMENTS FOR RENOVATION WORK

A. Refer to Article 1 Specification requirements and notes on the drawings where provided for requirements related to renovation work.

B. Meet with the Owner, Architect and Engineer before demolition or construction begins to establish procedures for work effort in the existing building. Provide names and phone numbers and establish emergency contact information where work is performed. Provide security information requested by the Owner for all personnel who will be working on site. Educate all construction personnel in regard to the project requirements and procedures.

C. Coordinate effort with other contractors involved in the renovation project to minimize the disruption, phasing of work, share cleaning responsibilities, etc.

1.3 INSPECTION OF EXISTING BUILDING

A. Each bidder shall inspect the project site and the existing building in the early time frame of the bidding period. Conditions shall be compared with information shown on the drawings. Report

to the Architect/Engineer any significant discrepancies which may be discovered in a timely fashion so that direction may be provided in an addendum. After the contract is signed, no allowance will be made for failure to have made a thorough inspection.

1.4 ASBESTOS MATERIAL

A. Abatement, removal or encapsulation of existing materials containing asbestos is not included in the Contract. Necessary work of this nature will be arranged by the Owner to be done outside of this construction and remodeling project by a company regularly engaged in asbestos abatement. Such work will be scheduled and performed in advance of work in the construction and remodeling project.

B. If, in the performance of the mechanical work, materials are observed which are suspected to contain asbestos, the Contractor shall immediately inform the Architect who in turn will notify the Owner. Work that would expose workers to the inhalation of asbestos particles shall be terminated. Work may be resumed only after a determination has been made and unsafe materials have been removed or encapsulated and the area declared safe.

1.5 WORK HOURS

A. Work hours for construction shall be as defined in Section 01150- Project Phasing or other specification sections or drawing notes.

B. Where allowed, contractors may work normal hours except after hours is required for operations that are noisy, generate obnoxious fumes or dust, require shut down of ventilation systems, etc. The Owner reserves the right to stop normal hour work where the Owner deems the effort to be disruptive to their ongoing operations.

C. Any work that creates hazards in or requires closure of corridors, exit pathways or stairwells work in corridors must be performed after hours when the building is not occupied.

D. All occupied areas, corridors exit pathways and stairwells must be left clean, lighted (including emergency egress and exit signage) usable and safe at the end of each work shift.

E. Access to the work area shall be coordinated with the Owner; follow all security protocols for parking, sign in, key control, etc. established by the Owner.

1.6 TOBACCO PRODUCTS

A. Smoking or chewing tobacco products are expressly prohibited to be used within the building and on the premises except where specifically permitted by the Owner or in construction company trailers or vehicles where permitted by the construction company.

PART 2 - PRODUCTS- NOT APPLICABLE

PART 3 - EXECUTION

3.1 BARRIERS AND SIGNAGE

A. Barriers and signage shall be provided as appropriate to identify work areas and to prevent unauthorized entry by non-construction personnel. Refer to appropriate Division 1 specification requirements and notes on the drawings where provided.

B. All barriers and signs should be high visibility type and be maintained at all times.

3.2 STORAGE OF TOOLS AND MATERIALS

A. Store all site material and tools in the active job site area, specific storage areas are not provided except where otherwise noted for material and tools. The contractor is responsible for security.

B. Storage is specifically prohibited in means of egress paths and stairwells.

3.3 PROTECTION OF EXISTING BUILDING AND EQUIPMENT

A. The Owners' property and the property of other contractors shall be respected at all times. Provide drop clothes, visqueen or other suitable barriers where dust and debris is generated. Tape ends of barriers for sealing purposes.

B. Provide 55 gallon drums or smaller buckets as appropriate and use funnels where draining liquid systems.

C. Provide plywood sheets for protection of walls, floors or Owner equipment or systems that are remaining in place near demolition or new installation work where there is possible damage from heavy material or equipment.

3.4 CONFINED SPACES

A. Notify the Owner when performing work in confined spaces. Provide a written procedure for approval and obtain approval from the Owner when so requested.

B. All work in confined spaces shall be done in accordance with OSHA regulations.

3.5 NOISE, FUME, AND DUST CONTROL

A. Provide barriers and ventilation as required to limit the effect from construction generated noise fume and dust control on spaces that continue to be occupied by the Owner. Refer to protection of building and equipment paragraph above. In addition to the basic protection, provide additional visqueen barriers to limit airborne migration of dust and fumes. Provide supplemental portable fans to exhaust air to the outside of the building where appropriate. Use of the Owners' ventilation systems to induce positive or negative pressure is prohibited unless authorized by the Owner. Shut off ventilation systems serving the area where use of these systems can induce fumes or dust into return or exhaust ducts. Where systems need to remain operational for occupied areas, arrange to temporarily shut off portions of the system in the work area. Provide taped visqueen covers on HVAC air supply and exhaust devices to limit migration. Coordinate all efforts requiring modification or shutdown of ventilation systems with the Owner. Contractor shut down of these systems is prohibited without Owner permission.

B. Arrange with the Owner when required to shutoff fire alarm or smoke detectors to perform work. With the Owners' prior approval. Cover smoke detectors where needed to prevent false alarms due to work generated dust or fumes. Minimize outages and coordinate efforts to limit the effect due to false alarms.

C. Where significant dust or fume generating work, welding or cutting operations are required for removal or new work, provide fume removal equipment with telescoping arms to locally capture the fumes. Fume exhaust shall be directed outside or adequately filtered and recirculated.

D. Areas shall be thoroughly ventilated after completion of the work on a daily basis to remove residual odors and fumes before occupancy occurs the next day.

E. Provide vacuum cleaners and other equipment to clean and restore conditions.

3.6 SOLDERING WELDING AND CUTTING

A. For soldering, welding or cutting operations, provide insulated, fire rated barriers and blankets to isolate cover and protect remaining systems and materials, furniture, furnishings, floors, walls, ceilings, etc.

B. Refer to noise, fume and dust control provisions in the previous paragraph.

C. Obtain burn approval from the Owner before commencing any soldering or welding effort. Coordinate outages of fire alarm systems as noted in the previous paragraph.

D. Provide a Fire Watch at each welding location. Fire Watch personnel shall be dedicated for the sole purpose of fire prevention during welding operations. All Fire Watch personnel shall be properly trained and equipped, including fire extinguisher, fire blanket and communication equipment for assistance request.

E. Provide a fire extinguisher at every soldering or welding location.

3.7 REMOVALS, DISPOSAL, AND REUSE

A. Refer to the drawings for the scope of remodeling in the existing building.

B. Cooperate with the General Contractor regarding all removal and remodeling work. Each Contractor shall remove existing work which is associated with his trade and which will be superfluous when the new work is installed and made operational.

C. Extraneous piping which is or becomes accessible shall be removed and stubs shall be capped at the first active pipe encountered. Piping that is and remains inaccessible shall be abandoned. Ends of abandoned pipe shall be capped so as to be concealed by finished surfaces. Upon completion of the work no abandoned duct. Pipe, valve or stub shall extend thru finished floors, walls or ceilings.

D. When it is necessary to reroute a section of active piping the rerouted section shall be installed before removing the existing in order to minimize system downtime. Rerouted sections shall be insulated as required for new work. Patch insulation on existing piping which has been damaged or removed in this work.

E. Where existing piping is removed and holes are left in existing walls, finished ceilings, floors, etc., these holes shall be patched using materials to match the existing construction to restore and maintain the integrity of the existing partition.

F. Materials and equipment which are removed shall not be reused within the scope of this project unless specifically noted to be relocated or reused. Turn over to the Owner and place where directed on the premises all removed material and equipment so designated by the Owner. All material and equipment which the Owner does not wish to retain shall become the property of the Contractor responsible for removal and shall be removed from the premises and properly disposed.

G. Disposal of materials regulated by EPA shall be done in strict accordance with latest requirements. Provide documentation to the Owner that disposal was properly executed.

H. Remove, store and reinstall lay-in ceiling tile and grid as needed to perform work in areas where such removal and re-installation is not to be done by the General Contractor. Damaged tile and/or grid shall be replaced with new matching tile and/or grid.

I. In areas of minor work where the space is not completely vacated, temporarily move portable equipment and furnishings within the space as required to complete the work. Coordinate this activity with Owner. Protect the Owner’s property by providing dust covers and temporary plastic film barriers to contain dust. Remove barriers and return equipment and furniture upon completion of the work.

J. Refinish any surface disturbed under this work match existing, except where refinishing of that surface is included under the General Contract.

3.8 DRAINING, FLUSHING, AND REFILL OF PIPING SYSTEMS

A. Existing liquid systems shall be drained as required before removal or connection of new piping extensions.

B. Draining of the system shall be the responsibility of the contractor. Provide threaded connections, etc. to direct fluids to drainage points. Water systems may be drained to sanitary systems or where permitted, to storm systems. Verify any chemical treatment, inhibitors or freeze protection additives in the existing systems and obtain a permit from the local sewer authority before disposing.

C. Provide drums or containers to accept other than water drainage and remove from the premises and properly dispose. Provide visqueen to protect Owners' property when opening pipes, even where piping has been drained to prevent damage from residual liquid that remains in the pipe.

D. After new piping is connected and tested, flush clean and disinfect all existing piping that has been drained and new piping as specified in Section 22001, Basic Plumbing Requirements. Provide full port, 0.75" ball valves with hose connectors as described to facilitate flushing operations.

3.9 CONTINUITY OF SYSTEMS

A. Work shall be so planned and executed as to provide reasonably continuous services of existing systems throughout the construction period. Where necessary to disrupt services for short periods of time for connection, alteration or switch-over, the Owner shall be notified in advance and outages scheduled at the Owner's reasonable convenience.

B. Submit, on request, a written step-by-step sequence of operations proposed to accomplish the work, The outline must include tentative dates, times of day for disruption, downtime and restoration services. Submit the outline sufficiently in advance of the proposed work to allow the Architect or Engineer to review the information with the Owner. Upon approval, final planning and the work shall be done in close coordination with the Owner.

C. Shutdown of system and work undertaken during shutdowns shall be bid as being done during normal working hours. If the Owner should require such work be performed outside of normal working hours, reimbursement shall be made for premium time expenses only.

3.10 CUTTING AND PATCHING

A. Refer to Division 1 – General Requirements for information regarding cutting and patching.

B. Plan the work well ahead of the general construction. Where pipes are to pass thru new walls, partitions, floors, roof or ceilings, place sleeves in these elements or arrange with the General Contractor to provide openings where sleeves are not practical. Where sleeves or openings have not been installed, cut holes and patch as required for the installation of this work, or pay other trades for doing this work when so directed by the Architect. Any damage caused to the building shall be repaired or rectified.

C. Where pipes are to pass through, above, or behind existing walls, partitions, floors, roof or ceiling, cutting, patching and refinishing of same shall be included in this contract. Core drilling and saw cutting shall be utilized.

D. All material, methods and procedures used in patching and refinishing shall be in accordance with applicable provisions of specifications governing the various trades. The final appearance and integrity of the patched and refinished areas must meet the approval if the Architect. Wall, floor and ceiling refinishing must extend to logical termination lines (entire ceiling of the room repainted, for instance), if an acceptable appearance cannot be attained by finishing a partial area.

E. Provide steel angle or channel lintels to span openings which are cut in existing jointed masonry wall where the opening span exceeds 16 inches. Provide framing around roof openings for required support of the roof deck.

3.11 CLEANING

A. Debris, dust, dirt, etc shall be removed daily, particular attention shall be paid to areas that the Owner is continuing to occupy or use; any mess created in corridors, stairwells and egress paths that are maintained during construction shall be cleaned immediately.

B. The Owners dumpsters and trash receptacles shall not be used. If a dumpster is required, it shall be provided by the contractor and located where approved by the Owner. Coordinate dumpster requirements with other contractors.

C. Before turning an area back over to the Owner, thoroughly clean the space to leave the area in a similar condition before the start of the project where finishes are to remain. The contractor shall also clean duct interiors and interior components of new or existing air handling system equipment if dirt, dust or debris have generated in the course of work have accumulated on these surfaces.

END OF SECTION 22 0002

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SECTION 22 0004 – FIRESTOPPING FOR PLUMBING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes through-penetration firestoping systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items.

1.2 PERFORMANCE REQUIREMENTS

A. General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.

B. Rated Systems: Firestopping assemblies shall be tested and rated in accordance with ASTM E814 (ANSI/UL 1479) Fire Tests of Through-Penetration Fire Stops (minimum positive pressure of .01 inches of water column) and E119 (ANSI/UL 263) Fire Tests of Building Construction and Materials Time-Temperature Curve. Firestopping shall provide an “F” fire rating equal to that of the construction being penetrated. Firestop systems shall meet all requirements of the Ohio Building Code.

C. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.

1. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.
2. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

D. For through-penetration firestop systems exposed to view or above ceilings in air return plenums, provide products with flame-spread and smoke-developed indexes of less than 25 and 50, respectively, as determined per ASTM E 84.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For each through-penetration firestop system, submit documentation, including illustrations, from a qualified testing and inspecting agency, showing each type of construction condition penetrated, relationships to adjoining construction, and type of penetrating item.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Firestopping materials shall be manufactured and/or supplied by:

1. Hilti, Inc.
2. Specified Technologies Inc.
3. 3M; Fire Protection Products Division.

2.2 FIRESTOPPING

A. Materials shall be in the form of caulk, putty, sealant, intumescent material, wrap strip, fire blocking, ceramic wool and other materials required for the UL listed assemblies. These shall be installed in conjunction with sleeves and materials for fill and damming.

PART 3 - EXECUTION

3.1 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

A. General: Installation of all materials and assemblies shall be in accordance with UL assembly drawings and the manufacturer’s instructions.

B. Installation shall be done by an experienced installer who is certified, licensed or otherwise qualified by the firestopping manufacturer as having the necessary training and experience.

C. Provide firestop system for every pipe at penetration of all fire resistance rated walls and horizontal assemblies.

D. Coordinate opening size and additional framing requirements with the General Contractor for each opening to meet the firestop installation requirements.

E. Annular space of penetrations of non-fire-resistant-rated floor, floor/ceiling assemblies, or the ceiling membrane of a non-fire-resistant rated roof/ceiling assembly shall be filled with an approved firestopping material to resist the free passage of flame and products of combustion.

F. Smoke Barriers:
1. Penetrations shall be sealed with a firestopping system to prevent the passage of smoke.

G. Smoke Partitions:
1. Penetrations shall be sealed with a caulking material to prevent the passage of smoke. Non-rated smoke partitions do not require a fire stopping system.

3.2 BUILDING STRUCTURE FIRE STOPPING

A. Where building structural members have a fire stopping system installed and portions of this fire stopping system are removed to install new systems hangers, the P.C. shall provide new fire stopping system onto portions of the building structure and hanger where fire stopping was removed. The fire stopping system shall be equal to the existing system and be 2-hour rated.

END OF SECTION 22 0004

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SECTION 22 0005 – EXCAVATION, BACKFILL AND SURFACE RESTORATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Excavating and backfilling for utility trenches.

1.2 DEFINITIONS

A. Backfill: Soil material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Bedding Course: Course placed over the excavated subgrade in a trench before laying pipe.

C. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

D. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions changes in the Work.
2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

E. Fill: Soil materials used to raise existing grades.

F. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

G. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below topsoil materials.

H. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.3 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Architect and then only after arranging to provide temporary utility services according to requirements indicated.

1.4 GENERAL

A. Excavate for all in-grade, under-floor piping, underground, exterior piping, and incidental work which are included in the Plumbing contract. Backfill to finish grade or to levels consistent with the General Contractor's and Site Contractor's activities. Cut existing street, drive and parking lot paving, walks, curbs and other permanent hard surfaces which are to be encountered. Repair or restore exterior surfaces to original condition where such are not affected by Division 2 – Site Work. Cut existing floor slabs and replace slabs in conformance to 22 0002.

B. Excavation and trench wall supporting, cribbing, sloping and stepping of excavations required for safety shall be done in accordance with OSHA and local requirements. Pumping of water from excavations and trenches which may be required during construction shall be included in this contract.

C. Contact the Ohio Utilities Protection Service (1-800-362-2764) well in advance of the start of any excavation to determine if any of the utility companies or departments have underground utilities in or near the project area.

D. Contact local water and sewer departments, gas company, electric company, telephone company, etc., regarding the possibility of encountering existing utilities. The integrity of all existing utilities shall be respected.

E. Existing utilities encountered during excavation work shall be protected in a manner acceptable to the utility owner. Any utilities that are damaged shall be repaired or replaced by the Contractor to the full satisfaction of the utility owner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Bedding Course: Naturally or artificially graded natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch (25-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.

B. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.

PART 3 - EXECUTION

3.1 EXCAVATION FOR UTILITY TRENCHES

A. Trenches for interior and exterior piping shall be over-excavated, and the pipe shall be laid on 6” minimum depth sand bed.

B. Backfilling of excavations and trenches inside the building and outside under paved or other hard surfaced areas, shall be with graded pea gravel, graded coarse sand or compacted, crushed limestone, 3/4” maximum size, to prevent undue settlement. Backfill material for plastic piping shall be pea gravel or sand. Other excavations and trenches shall be backfilled with similar materials up to 18” above the top of the piping. The remainder shall be with similar materials or with excavated material having no large clods, stones or rocks.

C. Maintain in place adequate barricades, guards, planking, plating signage, warning lights, etc., at and around excavations.

D. Backfill shall be mechanically compacted in layers not over 6” deep. Water settling will not be permitted. Where excavations have not been properly filled or where settlement occurs, they shall be refilled, compacted, smoothed off, and finally made to conform to the initial requirements. Excess excavated materials shall be removed from the site or disposed of as directed by the General Contractor. Refer to Division 31 Earthwork for compaction requirements.

E. Concrete floor slabs, paving, sidewalks, curbs sodded and other finished surfaces which have been damaged or removed in order to install the underground work shall be replaced but this Contractor equal to original conditions. Refer to Division 32 for Surface Restoration requirements. This requirement is not applicable in areas where the General Contractor or the Site Contractor is obligated to provide new surfaces.

F. Excavation, backfill, surface repair and traffic control within the public right-of-way shall be in accordance with governing agency rules and regulations. Any fee for activity in the roadways shall be included in this contract so that no additional cost will accrue to the Owner.

G. All exterior underground piping shall be protected against future excavation damage by placing a plastic tape warning marker in each trench during backfill. Tape shall be 6’ wide with black letters identifying the piping service. Tape shall be equal to that manufactured by Seton. Install tape full length of the trench approximately 18’ above and on the centerline of the pipe.

END OF SECTION 22 0005

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SECTION 22 0519 - METERS AND GAUGES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Thermometers.
2. Gauges.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 THERMOMETERS

A. Thermometers shall be 9” blue reading organic spirit filled tube column type with cast aluminum case with epoxy finish, acrylic window, aluminum scale with white background and black markings, 1% accuracy, adjustable angle hinge assembly and 3.5” aluminum insertion stem, equal to Trerice BX91403.

B. Thermometers shall be 5” diameter dial face bi—metallic type with adjustable angle hinge, stainless steel insertion stem and recalibration feature, equal to Trerice B85604.

C. Provide a separable socket insertion thermowell shall be furnished with each thermometer. An extension neck, with appropriate increase in thermometer stem length, shall also be furnished where insulation thickness exceeds 2”.

D. Ranges of thermometers shall be selected from standard Fahrenheit scales to be consistent with anticipated temperatures, typically 0 deg.F.- 160 deg.F.

2.2 PRESSURE GAUGES

A. Pressure gauges, including compound gauges and vacuum gauges, shall be Bourdon tube type with 4-1/2” dial and cast aluminum case, equal to Trerice 600C Series. Accuracy shall be 1% at mid-range.

B. Pressure gauges for low pressure application, calibrated in inches of water gauge, ounces per sq. in. or 0-5 psi, as appropriate, shall be equal to Trerice 860.

C. Pressure gauges at pumps shall be liquid filled Bourdon tube type with 4” dial and stainless-steel case and internals, equal to Trerice 700 Series.

D. A brass cock or bronze ball valve and a pressure snubber shall be furnished with each pressure gauge.

E. Ranges of pressure gauges shall be selected to be consistent with anticipated pressures. Range shall be approximately twice the normal system working pressure at the gauge location.

2.3 TEST PLUGS

A. Pressure-temperature test plugs for insertion of pressure gauge or thermometer shall be a brass fitting with neoprene or Nordel self-sealing insert and knurled brass cap with plastic capture tab. Fittings shall be equal to Peterson “PT”. Furnish two thermometers and two pressure gauges with integral insertion stem appropriate for use with the test plugs.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Thermometers shall be installed where shown on the drawings and also at:

B. Pressure gauges shall be installed where shown on the drawings, where required by applicable codes and also at:

C. Thermometers and gauges shall be positioned to be read with unobstructed view from the floor. Pressure-temperature test plugs shall be installed where shown, located in a position to be most readable.

D. Install thermometer wells in piping tees in the vertical position. Fill the well with oil or graphite and secure the thermometer in position

END OF SECTION 22 0519

SECTION 22 0523 – GENERAL DUTY VALVES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Valves

B. Related Sections:

   1. Section 22 0553 "Identification for Plumbing Systems" for valve tags and schedules.

1.2 SUBMITTALS

A. Product Data: For each type of valve indicated.

1.3 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance: ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.

C. Press-Fit and sweat end valves of equal construction and features are acceptable in lieu of those specified with screwed ends. Grooved pipe fittings are not acceptable.

D. Ball valves in piping which is to be insulated shall have extended shaft necks to accommodate the insulation.

E. All valve for Domestic potable water systems (cold, hot hot return, etc.) shall be “lead free” in accordance with the Federal Safe Water Act (S3874) definition and NSF/ANSI-61 approved.

F. Working pressures shall exceed those imposed by the service applied.

PART 2 - PRODUCTS

2.1 Refer to valve schedule on the Drawings for piping material and applications.

2.2 MANUFACTURERS

A. Valves shall be as specified above, or of equal construction manufactured by:

1. Apollo
2. Crane/Stockham
3. Watts
4. Flowserve
5. Bell & Gossett
6. Griswold
7. Flow Design
8. Nibco
9. Milwaukee
10. Conbraco
11. Armstrong
12. Caleffi
13. Stockham

PART 3 - EXECUTION

3.1 VALVE INSTALLATION

A. Drain valves shall be the same as for the shut-off service. Provide a ¾" hose thread adapter on the outlet of each drain valve that is not piped to a drainage point. Hose thread adapters on drain valves of potable water piping shall be fitted with a non-removable vacuum breaker.

B. Internals shall be removed and the remaining elements of sweat end valves shall be protected against heat damage during soldering or brazing

C. Valves shall be installed with the stem at or above the centerline of the pipe. Valves shall be located to be accessible for operation, servicing and/or removal.

D. Packing glands shall be tightened before placing the valves in service.

E. Provide flow measuring gauges with cocks, hoses, and connectors for balancing valves. Provide metering tool.

END OF SECTION 22 0523

SECTION 22 0529 – PIPE HANGERS, SUPPORTS, AND PENETRATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Steel pipe hangers and supports.
2. Trapeze pipe hangers.
3. Hanger Rods and Attachments.
4. Pipe Riser Supports
5. Roof Supports
6. Pipe Sleeves, Openings, Penetrations, Escutcheons, and Curb

B. Related Sections
1. 22 0004 Fire Stopping for Plumbing Systems

1.2 DEFINITIONS

A. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.3 PERFORMANCE REQUIREMENTS

A. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Steel pipe hangers and supports.
2. Thermal hanger shield inserts.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1 STEEL PIPE HANGERS

A. Hangers and supports for piping shall be equal to the Anvil catalog numbers as follows:

1. General service - clevis type - Fig. 260.

2. Uninsulated copper tubing - copper plated clevis type - Fig. CT-65 (or plastic-coated clevis, or fiberglass construction).

3. Where the length of the hanger rod between the top of the hanger and the attachment is 3" or less, clevis type hangers with rollers, Fig. 181, shall be used to allow for expansion travel

B. Hangers on insulated horizontal piping shall be oversized to surround the pipe insulation. To protect the insulation from damage or inordinate compression due to concentrated weight, the following shall be provided at each hanger:

1. Pipe 2" and smaller – Anvil Fig. 168 18 ga. sheet metal rib-lock shield with belled ends, 12" long.

2. Pipe 2-1/2" and larger – Factory fabricated assembly equal to Pipe Shields, Inc. A1000.

C. The first two hangers on piping connecting to motor driven equipment shall be fitted with a steel spring and neoprene vibration isolation section similar to Mason Industries, No. 30N.

2.2 TRAPEZE HANGERS

A. Trapeze hangers for numerous pipes run in parallel may be utilized. Horizontal support members shall be unistrut type section with pipe rollers (to allow for expansion travel) and spring and nut connectors, suspended with hanger rods and attachments similar to individual pipe hanger suspension.

2.3 HANGER RODS AND ATTACHMENTS

A. Hanger rods shall be solid steel, threaded-end or all-thread rod, of diameter listed below or matching manufacturer’s provisions. A hanger attachment device (for attachment to the structure) and locking nuts at the hanger attachment shall be provided on each hanger. Locking nuts shall be provided at each clevis hanger.

Pipe Size	Min. Rod Dia.
1" and smaller	1/4"
1-1/4" to 3"	3/8"
4" to 6"	1/2"
8"	5/8"
10”	3/4”

12”and larger 7/8”

B. Hanger rod attachment devices for attachment to the structure shall be:

1. Beam clamps for steel construction equal to Anvil Fig. 92, 93, or 94. Utilize swivel type in sloped steel construction to provide vertical support of pipe without bending hanger rods.

2.4 PIPE RISER SUPPORTS

A. Riser clamps on cold service insulated piping shall be:

1. Insulated Pipe size 1-1/2” and smaller shall be factory (Pipe Shields E1000) or shop fabricated assembly Fig. 261 with high density calcium silicate insulation and galvanized steel jacket.

2. Insulated Pipe size 2” and greater shall be factory fabricated assembly Pipe Shields, Inc. E1000 or approved equal.

3. Un-insulated copper tubing – Anvil Fig CT-121 or CT-121C

4. Un-insulated steel piping – Anvil Fig. 261.

2.5 ROOF SUPPORTS

A. Pipe supports for pipe running across the roof shall be manufactured by Advanced Support Products EcoCurb #REC-RA or approved equal, requiring no penetration of the roofing membrane. The support system shall consist of a rubber base, 12 gauge hot dipped galvanized threaded rods, nuts and washers. Furnish protective slip sheets of roofing membrane for installation under the bases.

2.6 PIPE SLEEVES, OPENINGS, PENETRATIONS, ESCUTCHEONS AND CURBS

A. Piping Wall and Floor Sleeves – Non-Fire Rated Assemblies:

1. New Piping – New or Existing Walls and Floors

a. Poured Concrete - Schedule 40 black steel pipe of 18-gauge galvanized steel
b. Assemblies other than poured concrete – schedule 40 black steel pipe or 26-gauge galvanized sheet.

2. Existing Piping – New Walls and Floors

a. Poured Concrete Floors – 18-gauge Galvanized sheet metal
b. New walls and partitions – 26-gauge Galvanized sheet metal

B. Piping Wall and Floor Sleeves – Rated Assemblies

1. Refer to specification 22 0004 for requirements.

C. Escutcheon Plates

1. Escutcheon plates shall be split-ring chromium plated pressed steel. Plates shall be sized to cover the surface penetration and sleeve. Plates shall be installed on exposed piping in finished rooms and areas where pipes penetrate walls, floors, ceilings or overhead structure.

D. GROUT

1. Description: ASTM C 1107, Grade B, non-shrink and non-metallic, dry hydraulic-cement grout.

   a. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
   b. Design Mix: 5000-psi, 28-day compressive strength.
   c. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Spacing of hangers shall be as follows:

1. Steel pipe - Vertical:
   a. At the base and 15 ft. maximum spacing unless otherwise shown.

2. Steel pipe - Horizontal:
   a. 2” size and smaller – 8 ft. intervals
   b. 2-1/2” thru 6” – 10 ft. intervals
   c. 8” and larger – 12 ft.. intervals.

3. Cast iron pipe - Vertical
   a. At the base and 15 ft. maximum spacing unless otherwise shown.

4. Cast iron pipe – Horizontal
   a. At 10 ft. intervals.
   b. Support each length of pipe not more than 18” from the joint.
   c. Support terminal ends of horizontal runs and branches and each change in direction.
   d. 5” and larger provide bracing to prevent horizontal movement in accordance with CISPI “Soil Pipe and Fittings Handbook”

5. Copper Tubing - Vertical
   a. At the base and 10 ft. maximum spacing unless otherwise shown.

6. Copper Tubing – Horizontal
   a. 1-1/4” size and smaller – 6 ft. intervals
   b. 1-1/2” thru 2” – 8 ft.. intervals
   c. 2-1/2” and larger – 10 ft. intervals

7. Plastic pipe
   a. Per manufacturer's recommendations.

B. Refer to hanger installation details on drawings for installation information supplemental to this specification section.

C. In piping systems with mechanical joint couplings, pipe hangers shall be provided on horizontal piping at normal specified intervals and, in addition, so that no pipe shall be left unsupported between any two couplings nor left unsupported whenever a change in direction takes place. Vertical piping shall be supported at normal specified intervals or every other pipe length, whichever is more frequent. The base of the riser or base fitting shall be supported.

D. Attachment of pipe hangers to the structure shall be with:

1. Provide anchoring where steel beam clamps are attached to sloping surfaces of beam flanges and where otherwise required to insure permanent attachment.

2. Side beam bracket in wood construction, secured to the wood joist with lag screws set in drilled pilot holes.

3. Unistrut channels with spring and nut rod connection may be utilized where a number of pipes are run parallel. Channel shall be attached to the structure with inserts or clamps.

4. Attachment to steel deck is prohibited. Span from steel structural members with supplementary steel shapes where direct attachment to structural members is not practical.

E. Attachment to manufactured trusses and other engineered structural members and supports shall be done in strict accordance with the structural manufacturer's recommendations. Refer to the architectural and structural drawings for type of engineered structural systems being used. Connections to these structural members shall be made with connection devices and methods approved by the structural manufacturer. Provide additional supports with supplemental steel shapes when spacing between structural members exceeds specified distances.

F. Pipe hangers shall be adjusted to proper elevation and all hanger rods set in a vertical position before pipe insulation is installed.

G. Extended legs of pipe riser clamps shall be shortened as needed to maintain concealment of the clamp within the pipe chase. Insure that adequate support is still maintained.

H. Hanger assemblies which will remain exposed on completion of the project shall be painted before installation.

I. Pipe supports manufactured by Advanced Support Products for pipe running across the roof shall be installed in accordance with the manufacturer's instructions and as detailed. Install protective slip sheets of roofing membrane under the bases to satisfy requirements of both the roofing manufacturer and the support system manufacturer.

J. Pipe supports manufactured by Pate or the approved equal shall be installed per the manufacturer's instructions and flashed into place by a certified roofing contractor.

3.2 PIPE SLEEVES

A. Pipe sleeves, floor and wall openings, water protective curbing and escutcheon plates shall be provided as described below. Pipe sleeves shall be placed in all floor slabs, poured concrete roof decks, walls and partitions, except as noted below, to allow new piping to pass thru and allow for expansion, contraction and normal movement of the pipe. Sleeves are also required for all existing piping related to the various trades in new walls, partitions, floors and roof slabs, same as for new piping.

B. Pipe sleeves shall be placed in the initial stages of construction before concrete, masonry and other general construction activity. Means shall be taken to assure that the sleeve will not move during or after construction. Beams, columns and other structural members shall not be sleeved except upon approval of the Architect.

C. Sleeves are not required in the following:

1. In floor slabs on grade.

2. In stud and gypsum board or plaster walls and partitions which are not fire rated.

3. For uninsulated pipe passing thru masonry walls and partitions and stud and gypsum board or plaster walls and partitions. Sleeves are required however, for uninsulated condenser water piping, hydronic heat pump piping, _____ for which expansion, contraction and other pipe movement can be expected.

4. In core drilled openings in solid concrete not requiring water protection. Sleeves are required, however, at core drilling thru hollow pre-cast slabs and concrete block walls, to facilitate containment of required firestopping material.

5. In large floor openings for multiple pipe and duct risers which are within a fire rated shaft, unless the opening is to be closed off with concrete or other material after pipe are set.

D. Length of wall sleeves shall be such that the sleeve ends are substantially flush with both sides of the wall or partition. Floor sleeves shall be flush with the bottom and top of the floor slab except, in mechanical rooms and other areas which might have water on the floor, sleeves shall project a minimum of 1” above finished floor. Pipe sleeves shall be sized to allow insulation to pass thru the sleeve, for insulation requiring continuous vapor barrier (domestic cold water, chilled water refrigerant, etc.). Where vapor barrier continuity is not needed, the sleeve may be sized to pass the pipe only or the insulation as well. Refer to the following paragraph for qualification and exceptions relating to firestopping.

E. Pipe sleeves which are part of firestopping assemblies shall conform to the requirements of the assembly with particular emphasis regarding size, annular space, length, passage or non-passage of insulation and the installation of the sleeves.

F. Where firestopping is not required per this section and specification 23 0004, the annular space between the sleeve, core drilling or opening and the pipe or pipe insulation shall be closed with caulking to retard the passage of smoke.

G. Where uninsulated pipes requiring no pipe sleeves pass through non-fire wall or partition, the annular space shall be closed with material and methods compatible with the wall or partition material (Type M masonry grout, drywall joint compound, plaster, etc.).

3.3 Mechanical Seals

A. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

B. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 GROUTING

A. Mix and install grout for plumbing equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

END OF SECTION 22 0529

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SECTION 22 0530- EQUIPMENT BASES AND SUPPORTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Equipment Supports

B. See Division 22 Section "Vibration Control" for vibration isolation devices.

C. See Division 22 Section "Seismic Control for Plumbing Systems".

1.2 DEFINITIONS

A. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.3 PERFORMANCE REQUIREMENTS

A. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Equipment hangers and supports.
2. Equipment bases.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1 CONCRETE BASES

A. Concrete bases and pads with anchor bolts cast-in-place. Bases shall be formed on all sides and hand troweled to a smooth, dense finish with neatly chamfered corners. Large concrete pads on grade shall be constructed with reinforcing steel or reinforcing roadway mesh.

2.2 STEEL SUPPORTS

A. Structural steel angles, beams or channels, unistrut type channels or pipe. Supports shall be fabricated into a rigid framework with welded or bolted connections and cross-bracing or sway bracing. Supports shall be set on slab with base plates, or attached to the building structure as required. Brackets for relatively lightweight equipment may be attached to the wall. Equipment shall be set on and attached to the framework.

B. Solid steel hanger rods supported from the structure above similar to pipe hangers. Provide sway bracing for equipment supported in this manner.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing materials and equipment.

B. Field Welding: Comply with AWS D1.1.

C. Concrete bases for plumbing equipment are included in the Plumbing Contract. The Plumbing Contractor shall provide exact dimensions, locations and other detail for the specific equipment provided. The Plumbing Contractor shall set anchor bolts as required for the equipment.

END OF SECTION 22 0530

SECTION 22 0553 - IDENTIFICATION FOR PLUMBING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe labels.
2. Valve tags.

1.2 SUBMITTAL

A. Product Data: For each type of product indicated.

1.3 QUALITY ASSURANCE

A. Labels, tags and markers shall comply with ANSI A13.1 for lettering size, colors and length of color field.

PART 2 - PRODUCTS

2.1 PIPE LABELS

A. Pipe markings shall be applied to all piping.

B. Labeling shall be:

1. Snap-On Type – Plastic, semi-rigid snap-on type, manufacturer’s standard pre-printed pipe markers or pressure-sensitive vinyl pipe markers.

2. Adhesive Type – Strip-type markers fastened to the bare pipe or insulation with laminated or bonded application or plastic tape not less than 1-1/2” wide. On piping and insulation 6” and greater diameter provide full band.

3. Lettering heights shall be as specified by manufacturer for indicated pipe/pipe plus insulation size.

4. Markers shall extend fully around pipe and insulation or full circle at both ends of the marker.

5. Markers shall be color coded for service.

6. Flow direction arrows provided integral with the pipe marker or separate at each marker.

7. In areas where exposure to water or high humidity is anticipated, provide washdown, fade-resistant style labels.

2.2 VALVE TAGS

A. Each shutoff valve, other than at equipment, shall be identified with a stamped tag. Valves and tagging shall be scheduled, typewritten on 8-1/2" x 11" paper, tabulating valve number, piping system, abbreviation, location of valve (room or area) and service (e.g. – south wing reheat boxes).

B. Valve tags shall be polished brass or plastic laminate with solid brass S hook. Tags shall be engraved with "P" for Plumbing and the designated number.

2.3 ACCEPTABLE MANUFACTURERS

A. Labels, markings and tags shall be manufactured by:
1. W.H. Brady
2. Seton
3. Allen
4. Industrial Safety Supply
5. McMaster-Carr

PART 3 - EXECUTION

3.1 INSTALLATION

A. Identification marking and tagging shall be applied after insulation and painting has been completed.

B. Coordinate names, abbreviations and other designations used in plumbing identification work, with corresponding designations shown, specified, or scheduled on drawings.

C. The Plumbing, Fire Suppression and HVAC Contractors shall coordinate labeling, marking and tagging to attain coordinated and consistent systems of identification.

D. Pipe markers shall be placed at 25 ft. centers in mechanical rooms and concealed spaces and at 50 ft. centers in other exposed locations.

E. Service pressure markings to be placed upstream and downstream of regulators at each pipe service label.

F. Valve tags shall be placed on each valve except those intended for isolation of individual items of equipment. Valve tag schedules shall be prepared as specified above.

END OF SECTION 22 0553

SECTION 22 0719 - PIPE INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Insulation Materials:

a. Fiberglass.
b. Flexible Elastomeric.

2. Protective Jacketing

1.2 SUBMITTALS

A. Product Data:

1. For each type of product indicated.

2. Thickness and covering table.

1.3 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

B. Thicknesses shall be in compliance with ASHRAE 90.1.

PART 2 - PRODUCTS

2.1 INSULATION GENERAL

A. Refer to insulation schedule on the Drawings for piping material and applications.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation shall be done by tradesmen specializing in insulation work in strict accordance with the manufacturer's recommendations.

B. Overlap and seal all longitudinal joints. Staples and adhesives may be used as stated above. Tape and seal cross joints. Vapor barrier shall be continuous on insulation of all cold services. Vapor barrier type mastic shall be used where needed to maintain a vapor seal.

C. Where insulation is terminated, insulation shall be beveled at 45 degrees and the beveled surface sealed with vapor barrier mastic. PVC caps over straight cut ends which have been vapor sealed may be used in lieu of beveling.

D. Mechanical joint fittings and couplings shall be considered as a part of the pipe line and shall be insulated. Bidders on the insulation work are cautioned to verify during the bidding period the extent of this work.

E. Insulation on cold service piping shall be run through floor and wall sleeves to maintain vapor barrier continuity. Insulation on other services may likewise be run continuous when sleeve size permits. Refer to Section 22 0529 for non-compressible insulation or blocking material and sheet metal saddles required at pipe hangers. Coordinate with the contractor on the furnishing, installation and detailed requirements of these. Provide insulation and vapor barrier on and around supports for pipe risers of services which require vapor seal so as to prevent sweating.

F. Re-insulate piping where existing insulation has been damaged or removed in the performance of work in this project.

G. Verify that piping has been tested before applying insulation materials and that piping surfaces are clean and dry, with foreign material removed.

H. Fittings, valves, flanges and other devices, both exposed and concealed, requiring insulation shall be covered same thickness as pipe insulation with:

1. Factory molded fitting insulation cover with PVC one-piece fitting cover.

2. Miter-cut segments of pipe insulation, held in place with adhesive and/or wire, filled with insulating cement smoothed to shape and covered with PVC one-piece fitting cover.

3. Fiberglass blanket insulation, held in place and covered with PVC one-piece fitting cover.

4. Oversized pipe insulation, where applicable, finished same as straight run pipe insulation.

I. Sanitary drainage piping receiving condensate from central air handling unit cooling coil drain pans including- floor drain sump, trap and horizontal above ground piping to the vertical stack or to the downstream horizontal piping main shall be insulated with 1" thickness.

END OF SECTION 22 0719

SECTION 22 1116 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Under-building slab and above ground domestic water pipes, tubes, fittings, and specialties inside the building.
2. Unions and Flanges.
3. Dielectric Connectors.

B. Related Sections:
1. 22 0004 Fire Stopping for Plumbing Systems
2. 22 0523 General Duty Valves
3. 22 0529 Pipe Hangers, Supports, and Penetrations
4. 22 1119 Domestic Water Piping Specialties
5. 22 1123 Domestic Water Pumps

1.2 SUBMITTALS

A. Product Data: For each type of product used.

1.3 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14 for plastic, potable domestic water piping and components. Include marking "NSF-pw" on piping.

C. Comply with NSF 61 for potable domestic water piping and components.

D. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

E. Welders shall be qualified and fully certified in accordance with ASME Boiler and Pressure Vessel Code, Section IX, Welding and Brazing Qualifications.

F. Welding procedures and testing shall comply with ANSI Standard B31.1.0 Standard Code for Pressure Piping, Power piping and The American Welding Society Welding Handbook.

G. All pressure piping systems regulated by the Ohio Pressure Piping Systems Code, Chapter 4101:8 shall conform to applicable requirements of the Code. Welders shall carry a current State of Ohio, Pressure Piping Board Certification. Each welder shall submit a copy of their

signed performance qualification record to the Engineer for approval prior to beginning work on any pressure piping system.

H. Electrical Characteristics for Plumbing Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

PART 2 - PRODUCTS

2.1 PIPING MATERIAL

A. Refer to piping schedules on the Drawings for piping materials and applications.

2.2 UNIONS AND FLANGES

A. Unions
1. Unions on copper tubing, all bronze construction 150 lb., solder ends.
2. Unions on steel pipe 2” and smaller, malleable iron with ground seat, bronze to steel, 300 lbs., screwed ends.

B. Flanges
1. Flanges on steel pipe with welded or screwed joints, 2-1/2” and larger.
2. Gaskets shall be 1/16”thickness full face compressed sheet suitable for temperature and pressure ranges of the application.
3. Mechanical joints associated with grooved end pipe are not acceptable in lieu of unions and flanges.

2.3 DIELECTRIC FITTINGS

A. A dielectric connector shall be incorporated at each connection between ferrous and copper piping. Connectors shall be:

1. Dielectric coupling with non-conductive polymer liner, Lochinvar Corp. “V-line” Dielectric fitting on services 180 degrees and less.
2. Dielectric flange with non-metallic bolt hole grommets and gasket.
3. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F .

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Pipe and tubing shall be cut and fabricated to field measurements and run parallel to normal building lines. Pipe ends shall be cut square and ends reamed to remove burrs. The pipe interior shall be cleaned of foreign matter before erection of the pipe.

C. Piping shall be installed consistent with good piping practice and installed in concealed locations, unless otherwise indicated, and except in equipment rooms and service areas. Coordinate with other trades to attain a workmanlike installation.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Piping shall be pitched for drainage. The low points shall be fitted with a ¾” drain valve (with hose thread adapter if not piped to a floor drain) except that on piping 1-1/4” and smaller where a drain valve is not shown, a drain plug is acceptable. Hose thread adapters on drain valves of potable water piping shall be fitted with non-removable vacuum breaker.

F. Piping shall be supported as specified in Section 22 0529 Pipe Hangers. Piping with mechanical joints for grooved end steel pipe shall be supported in accordance with the manufacturer’s recommendations. Pipe alignment in both the horizontal and vertical must be tightly maintained. Misalignment must be corrected to the satisfaction of the Engineer before insulation is applied and the system accepted.

G. Inform the Insulation sub-contractor during the bid period as to the extent of use of mechanical joints so that sub-contractor can price the work accurately.

H. Internals of sweat end valves shall be removed when damage or warping could occur due to applied heat of soldering. Where silver brazing is specified, solder connection of valves shall be used to reduce the danger of damage. Close open ends of piping during installation to keep interior of the pipe clean.

I. Install strainers as indicated on the drawings. Provide a nipple and ball valve in the blow down connection of each strainer 2” and larger.

J. Close open ends of piping during installation to keep interior of pipe clean.

K. Piping shall <u>not</u> be run above electrical switchgear or panelboards, nor above the access space in the immediate vicinity of the equipment, in accordance with N.E.C. Article 384.

L. Unions and flanges shall be installed at pipe connections to fixtures and equipment and as required for erection purposed.

M. Provide dielectric fitting between copper and ferrous piping.

N. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

O. Install piping to permit valve servicing.

P. Install piping adjacent to equipment and specialties to permit servicing and maintenance.

Q. Install piping free of sags and bends.

R. Install fittings for changes in direction and branch connections.

S. Install piping to allow application of insulation.

T. Select system components with pressure rating equal to or greater than system operating pressure.

U. Install escutcheons for penetrations of walls, ceilings, and floors.

V. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

3.2 FIELD QUALITY CONTROL

A. Piping Inspections:

1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
2. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

    a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
    b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

3. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

B. Piping Tests:

1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.

3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
4. Domestic water piping – hydrostatic at 125 psig for 6 hours at the low point of the system. Leaks and loss in test pressure constitute defects that must be repaired.
5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
6. Prepare reports for tests and for corrective action required.

C. Domestic water piping will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.3 TESTING

A. Piping shall be air tested at 125 psi for a minimum of 6 hours at the low point in the system before flushing.

3.4 PIPE CLEANING

A. Before placing each water piping system in operation, the piping system shall be thoroughly flushed out with clean water.

3.5 DISINFECTION OF PIPING

A. All new and existing domestic water piping shall be disinfected by a company or personnel regularly engaged in the performance of this service.

B. Fire suppression water piping supplied from a potable water system shall also be disinfected if the potable water systems, both public and private, is not protected by a double check valve assembly or reduced pressure backflow assembly.

C. Disinfection shall be performed in accordance with AWWA C651- 86 Standards. Disinfection shall be by means of a chlorine solution injected into the water system near the source. Outlets throughout the system shall be tested to prove the presence of minimum chlorine concentration. Flush out the system with clean water until the residual chlorine content is not greater than .2 parts per million or until approved by the Health Department.

D. Disinfection procedures shall be witnessed by the Architect, Engineer or other qualified representative.

END OF SECTION 22 1116

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SECTION 221119 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following domestic water piping specialties:

1. Backflow preventers.
2. Temperature-actuated water mixing valves.
3. Strainers.
4. Drain valves.
5. Water hammer arresters.

1.2 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig, unless otherwise indicated.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. NSF Compliance:

1. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic domestic water piping components.
2. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

PART 2 - PRODUCTS

2.1 BACKFLOW PREVENTERS

A. Reduced-Pressure-Principle Backflow Preventers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Ames Co.

b. Cash Acme.
c. Conbraco Industries, Inc.
d. FEBCO; SPX Valves & Controls.
e. Watts Industries, Inc.; Water Products Div.
f. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1013.
3. Body: Cast iron with interior lining complying with AWWA C550 or that is FDA approved/steel with interior lining complying with AWWA C550 or that is FDA approved/stainless steel for 2-1/2" and larger.
4. End Connections: Threaded for 2" and smaller; flanged for 2-1/2" and larger.
5. Configuration: Designed for horizontal, straight through.
6. Accessories:

a. Valves: Ball type with threaded ends on inlet and outlet of 2" and smaller; outside screw and yoke gate-type with flanged ends on inlet and outlet of 2-1/2" and larger.
b. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.
c. Valves: Ball type with threaded ends on inlet and outlet of 2" and smaller; outside screw and yoke gate-type with flanged ends on inlet and outlet of 2-1/2" and larger.

B. Backflow-Preventer Test Kits

1. Manufacturers Subject to compliance with requirements, provide products by one of the following:

a. Ames Co.
b. Cash Acme.
c. Conbraco Industries, Inc.
d. FEBCO; SPX Valves & Controls.
e. Watts Industries, Inc.; Water Products Div.
f. Zurn Plumbing Products Group; Wilkins Div.

2. Description: Factory calibrated, with gages, fittings, hoses, and carrying case with test-procedure instructions.

2.2 TEMPERATURE-ACTUATED WATER MIXING VALVES

A. Digital Hot Water Mixing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Armstrong International Inc.
b. Leonard Valve Company.
c. Powers; a Watts Industries Co.
d. Caleffi Hydronic Solutions "Legiomix.

2. Valve shall be digital of lead-free stainless steel/polymer construction.
3. Valve shall have all of the following operational capabilities:
a. +/- 2F water temperature control

b. 2F minimum inlet to outlet water temperature differential
c. Automatic shutoff of hot water flow upon cold water inlet supply failure.
d. Automatic shutoff of hot water flow in the event of a power failure
e. Programmable set point range of 81-158°F (27-70°C)
f. Programmable thermal disinfection mode
g. Programmable 1st level hi/lo temp alarm display
h. Programmable temperature error level for safety shutdown

4. Valve shall have all of the following connectivity capabilities:
   a. SPCO relay outputs which are energized during operation.
   b. LCD display which indicates set point, delivered temperature, error codes and alarm conditions.
   c. MODBUS 485 port for remote set point adjustment and remote operating temperature visibility.
   d. RS485 Serial Port for connection to a performance matched hot water monitoring system.
   e. BACnet protocol card.
5. Valve shall be compliant with ASSE Standard 1017 and CSA B125 and so certified and identified.
6. Valve shall be UL listed and identified.

B. Emergency Fixture Thermostatic Mixing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Bradley Corporation
   b. Lawler Manufacturing Company, Inc.
   c. Leonard Valve Company.
   d. Powers; a Watts Industries Co.
   e. Symmons Industries, Inc.
   f. Guardian Equipment

2. Standard: ASSE 1071.
3. Pressure Rating: 125 psig.
4. Type: Exposed-mounting, thermostatically controlled water mixing valve.
5. Material: Bronze body with corrosion-resistant interior components.
6. Connections: Union inlets and outlet.
7. Accessories: Manual temperature control, check stops on hot- and cold-water supplies, and adjustable, thermometer on outlet, temperature-control handle.
8. Tempered-Water Setting: 85 deg F .
9. Tempered-Water Design Flow Rate: 4gpm(eyewash).
10. Valve Finish: Rough bronze.
11. Piping Finish: Copper.

C. Point of Use Thermostatic Mixing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Bradley Corporation
   b. Lawler Manufacturing Company, Inc.
   c. Leonard Valve Company.
   d. Powers; a Watts Industries Co.
   e. Symmons Industries, Inc.

2. Standard: ASSE 1070.
3. Pressure Rating: 125 psig.
4. Type: Exposed-mounting, thermostatically controlled water mixing valve.
5. Material: Bronze body with corrosion-resistant interior components.
6. Connections: Union inlets and outlet.
7. Accessories: Manual temperature control, check stops on hot- and cold-water supplies, and adjustable, thermometer on outlet, temperature-control handle.
8. Tempered-Water Setting: 105 deg F **.**
9. Tempered-Water Design Flow Rate: 0.5 gpm minimum**.**
10. Valve Finish: Chrome plated.
11. Piping Finish: Copper.

2.3 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers.

1. Pressure Rating: 125 psig minimum, unless otherwise indicated.
2. Body: Bronze for 2” and smaller; cast iron with interior lining complying with AWWA C550 or FDA-approved, epoxy coating and for 2-1/2” and larger.
3. End Connections: Threaded for 1/2” and smaller; flanged for 2-1/2” and larger.
4. Screen: Stainless steel with round perforations, unless otherwise indicated.
5. Perforation Size:

   a. Strainers 2” and Smaller: 0.020 inch.
   b. Strainers 2-1/2” to 4”: 0.045 inch.

6. Drain: Factory-installed, hose-end drain valve.

2.4 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves.

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: 3/4”.
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.

7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

2.5 WATER HAMMER ARRESTERS

A. Water Hammer Arresters:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

      a. AMTROL, Inc.
      b. Josam Company.
      c. MIFAB, Inc.
      d. PPP Inc.
      e. Sioux Chief Manufacturing Company, Inc.
      f. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
      g. Tyler Pipe; Wade Div.
      h. Watts Drainage Products Inc.
      i. Zurn Plumbing Products Group; Specification Drainage Operation.

   2. Standard: ASSE 1010 or PDI-WH 201.
   3. Type: Copper tube with piston.
   4. Size: ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.

   1. Locate backflow preventers in the same room as connected equipment or system.
   2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe to floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are not acceptable for this application.
   3. Do not install bypass piping around backflow preventers.

B. Install balancing valves in locations where they can easily be adjusted.

C. Install temperature-actuated water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.

   1. Install thermometers and water regulators if specified.

D. Install Y-pattern strainers for water where shown on the drawings.

E. Install water hammer arresters on each quick closing valve in water piping according to PDI-WH 201.

F. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping and specialties.

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and prepare test reports:

1. Test each reduced-pressure-principle backflow preventer according to authorities having jurisdiction and the device's reference standard.

B. Remove and replace malfunctioning domestic water piping specialties and retest as specified above.

3.3 ADJUSTING

A. Set field-adjustable temperature set points of temperature-actuated water mixing valves.

END OF SECTION 22 1119

SECTION 221123 - DOMESTIC WATER PUMPS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following all-bronze and bronze-fitted, close-coupled, in-line, seal-less centrifugal pumps for domestic hot-water recirculation:

1.2 SUBMITTALS

A. Product Data: For each pump specified. Include performance curves with operating points plotted on curves; and rated capacities of selected models, furnished specialties, and accessories.

B. Operation and maintenance data.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. UL Compliance: Comply with UL 778 for motor-operated water pumps.

PART 2 - PRODUCTS

2.1 CLOSE-COUPLED, IN-LINE, SEALLESS CENTRIFUGAL PUMPS

A. Description: Factory-assembled and -tested, single-stage, close-coupled, in-line, seal-less centrifugal pumps as defined in HI 5.1-5.6.

1. Pump and Motor Assembly: Hermetically sealed, replaceable-cartridge-type unit with motor and impeller on common shaft and designed for installation with pump and motor shaft mounted horizontally.
2. Casing: Bronze, with threaded companion-flange connections.
3. Impeller: Corrosion-resistant material.
4. Refer to drawings.for capacities and characteristics:

B. Acceptable Manufacturers:

1. Armstrong Pumps Inc.
2. Bell & Gossett Domestic Pump; ITT Industries.
3. Grundfos Pumps Corp.
4. Taco, Inc.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with HI 1.4.

B. Install pumps with access for periodic maintenance including removal of motors, impellers, couplings, and accessories.

C. Independently support pumps and piping so the weight of piping is not supported by pumps and weight of pumps is not supported by piping.

D. Install continuous-thread hanger rods of sufficient size to support pump weight. Fabricate brackets or supports as required. Hanger and support materials are specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

E. Drawings indicate general arrangement of piping, fittings, and specialties.

F. Install piping adjacent to pumps to allow service and maintenance.

G. Connect domestic water piping to pumps. Install suction and discharge piping equal to or greater than size of pump nozzles. Refer to Division 22 Section "Domestic Water Piping."

1. Install shutoff valve and strainer on suction side of pumps and a check valve and a throttling valve on discharge side of pumps. Install valves the same size as connected piping. Refer to Division 22 Section "General-Duty Valves for Plumbing Piping" for general-duty valves for domestic water piping and Division 22 Section "Domestic Water Piping Specialties" for strainers.
2. Install test plugs for pressure gage at suction and discharge of pumps. Install at integral pressure-gage tappings where provided, or install pressure-gage connectors in suction and discharge piping around pumps. Refer to Division 22 Section "Meters and Gages for Plumbing Piping" for pressure gages and test plugs.
3. Install thermometer at suction of pumps. Refer to Division 22 Section "Meters and Gages for Plumbing Piping" for thermometer.

H. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

I. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

J. Coordinate with H.C. who will provide controls for the pump through the B.A. S.

END OF SECTION 221123

SECTION 22 1316 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following soil and waste, sanitary drainage and vent piping inside the building:

1. Pipe, tube, and fittings.
2. Special pipe fittings.

B. Related Sections:
1. 22 0004 Fire Stopping For Plumbing Systems.
2. 22 0529 Pipe Hangers, Supports and Penetrations
3. 22 1319 Sanitary Waste Piping Specialties
4. 22 1329 Sanitary Sewerage Pumps

1.2 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure, unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 10-foot head of water.
2. Pump Discharge Piping: 50 psig

1.3 SUBMITTALS

A. Product Data: For each type of product used.

B. Field quality-control inspection and test reports.

1.4 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Cast iron pipe, fittings, and standard duty no-hub couplings shall be listed by NSF International and marked with “NSF” demonstrating certification.

C. Plastic piping and components shall comply with NSF 14, "Plastics Piping Systems Components and Related Materials,". Include marking with "NSF-DWV" for plastic drain, waste, and vent piping; and "NSF-drain" for plastic drain piping.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Refer to “BUILDING DRAIN SYSTEMS SCHEDULE STORM, SANITARY, & VENT” on drawings for pipe materials.

2.2 PLENUMS

A. PVC piping shall not be used in return air plenums.

PART 3 - EXECUTION

3.1 PIPING INSTALLATIONS

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Pipe and tubing shall be cut and fabricated to field measurements and run parallel to normal building lines. Pipe ends shall be cut square and ends reamed to remove burs. The pipe interior shall be cleaned of foreign matter before erection of the pipe.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Piping shall not be run above electrical switchgear or panelboards, nor above the access space in the immediate vicinity of the equipment, in accordance with N.E.C. Article 384.

F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

G. Install piping adjacent to equipment and specialties to permit servicing and maintenance.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Select system components with pressure rating equal to or greater than system operating pressure.

K. Install escutcheons for penetrations of walls, ceilings, and floors.

L. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

M. Verify final equipment locations for roughing-in.

N. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.

O. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

P. Piping suspended 18” or more shall be provided with sway bracing as required by CISPI’s "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

Q. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

R. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

S. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:

1. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow for piping smaller than 3” and 1 percent downward in direction of flow for piping 3” and larger.
2. Vent Piping: slope down toward vertical fixture vent or toward vent stack.

T. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

U. Install PVC soil and waste drainage and vent piping according to ASTM D 2665.

V. Install underground PVC soil and waste drainage piping according to ASTM D 2321.

W. Refer to Division 22 Section "Pipe Hangers, Supports, and Penetrations" for hanger, escutcheon, and sleeve requirements.

X. Refer to Division 22 Section "Identification for Plumbing Piping and Equipment" for equipment and piping labeling requirements.

3.2 JOINT CONSTRUCTION

A. Cast-Iron, Soil-Piping Joints: Make joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

1. Gasketed Joints: Make with rubber gasket matching class of pipe and fittings.
2. Hubless Joints: Make with rubber gasket and sleeve or clamp.

B. PVC Non-pressure Piping Joints: Join piping according to ASTM D 2665.

3.3 VALVE INSTALLATION

A. Shutoff Valves: Install full-port ball valve on each sewage pump discharge.

B. Check Valves: Install swing check valve, downstream from shutoff valve, on each sewage pump discharge.

3.4 CONNECTIONS

A. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

B. Connect drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code or indicated on the drawings.
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections 2-1/2" and larger.

3.5 FIELD QUALITY CONTROL

A. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction. All pipe openings shall be covered through construction to prevent debris from entering the sanitary system.

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in the presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction.

1. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
2. Prepare reports for tests and required corrective action.

3.6 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Plug the ends of uncompleted piping at end of day and when work stops.

3.7 PROTECTION

A. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

END OF SECTION 22 1316

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SECTION 221319 - SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following sanitary drainage piping specialties:

1. Cleanouts.
2. Floor drains.
3. Roof flashing assemblies.
4. Miscellaneous sanitary drainage piping specialties.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for grease interceptors.

1.3 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 FLOOR DRAINS

A. Floor drains shall be as indicated on the drawings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Josam Company; Josam Div.
   b. MIFAB, Inc.
   c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   d. Tyler Pipe; Wade Div.
   e. Watts Drainage Products Inc.
   f. Zurn Plumbing Products Group; Specification Drainage Operation.
   g. Wade Manufacturing Company Division of Tyler Pipe

2.2 CLEANOUTS

A. Exposed Cast-Iron Cleanouts:

1. Standard: ASME A112.36.2M for cast iron for cleanout test tee.

2. Size: Same as connected drainage piping
3. Body Material: as required to match connected piping.
4. Closure: Raised-head, brass plug.
5. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

B. Cast-Iron Floor Cleanouts:

1. Manufacturer shall be the same as floor drains.
2. Standard: ASME A112.36.2M for adjustable housing cast-iron soil pipe with cast-iron ferrule threaded, adjustable housing cleanout.
3. Size: Same as connected branch.
4. Type: Heavy-duty, adjustable housing.
5. Body or Ferrule: Cast iron.
6. Clamping Device: Required.
7. Outlet Connection: Inside caulk.
8. Closure: Plastic plug.
9. Adjustable Housing Material: Cast iron with threads.
10. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
11. Frame and Cover Shape: Round.
12. Top Loading Classification: Heavy Duty.
13. Riser: ASTM A 74,[**Service**] class, cast-iron drainage pipe fitting and riser to cleanout.

C. Cast-Iron Wall Cleanouts

1. Manufacturer shall be same as floor drains.
2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Body: as required to match connected piping.
5. Closure: Countersunk drilled-and-threaded brass plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Wall Access: Round, flat, chrome-plated brass **or stainless-steel** cover plate with screw.

2.3 ROOF FLASHING ASSEMBLIES

A. Roof Flashing Assemblies:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Acorn Engineering Company; Elmdor/Stoneman Div.
   b. Thaler Metal Industries Ltd.

B. Description: Manufactured assembly made of 6.0-lb/sq. ft. (30-kg/sq. m), 0.0938-inch- (2.4-mm-) thick, lead flashing collar and skirt extending at least 8 inches (200 mm) from pipe, with galvanized-steel boot reinforcement and counterflashing fitting.

1. Open-Top Vent Cap: Without cap.

2.4 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Floor-Drain, Trap-Seal Maintenance Device:

1. Description: Device inserted into the drain body or adjustable strainer that opens to allow water to pass thru and closes to prevent sewer gases from entering the room from the drainage system.
2. Must conform to ASSE 1072 .
3. Size: Same as floor drain outlet.

B. Air-Gap Fittings:

1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
2. Body: Bronze or cast iron.
3. Inlet: Opening in top of body.
4. Outlet: Larger than inlet.
5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to 4”. Use 4” for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet for piping 4” and smaller and 100 feet for larger piping.
4. Locate at base of each vertical soil and waste stack.

B. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

D. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.
2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:

a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.

b. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.

3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring.
4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

E. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.

F. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

G. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

H. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

3.3 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221319

SECTION 22 1613 – NATURAL GAS HOUSE PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipes, tubes, and fittings.
2. Piping specialties.
3. Piping and tubing joining materials.
4. Valves.
5. Pressure regulators.

B. Related Sections
1. 22 0004 Fire Stopping for Plumbing Systems
2. 22 0529 Pipe Hangers, Supports, and Penetrations

1.2 PERFORMANCE REQUIREMENTS

A. Minimum Operating-Pressure Ratings:

1. Piping and Valves: 100 psig minimum unless otherwise indicated.
2. Service Regulators: 100 psig minimum unless otherwise indicated.

B. All gas piping work shall be in accordance with Gas Company requirements. Verify materials selected are in conformance before installation.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Welding certificates.

C. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Materials and installation shall conform to standards and requirements of the Gas Company and the Ohio Building Code including the referenced International Fuel Gas Code.

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Refer to piping schedule on the Drawings for piping material and applications.

2.2 PIPING SPECIALTIES

A. Gas Pressure Regulators:

1. Gas pressure regulator shall be self-operating spring-loaded type. Valve body shall be cast iron, 125 psi construction with screwed or flanged connections. Spring and diaphragm casings shall be aluminum. Regulator shall have an internal relief valve assembly, tapped vent connection with removable screen on the spring casing and an external pilot operator to afford a 5% maximum droop. Over-pressure protection shall be ten times the inlet pressure (or higher as may be required by the gas company).

B. Regulator shall be Sensus equal by Fisher, Sprague or Equimeter. Refer to the drawings for capacity, inlet and outlet pressures and installation detail. Transition Fittings:

1. PE Transition Fittings: Factory-fabricated fittings with PE pipe complying with ASTM D 2513, SDR 11; and steel pipe complying with ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.

2. Anodeless Service-Line Risers: Factory fabricated and leak tested.

a. Underground Portion: PE pipe complying with ASTM D 2513, SDR 11 inlet.
b. Casing: Steel pipe complying with ASTM A 53/A 53M, Schedule 40, black steel, Type E or S, Grade B, with corrosion-protective coating covering. Vent casing aboveground.
c. Aboveground Portion: PE transition fitting.
d. Outlet shall be threaded or suitable for welded connection.
e. Tracer wire connection.
f. Ultraviolet shield.
g. Stake supports with factory finish to match steel pipe casing or carrier pipe.

3. Transition Service-Line Risers: Factory fabricated and leak tested.

a. Underground Portion: PE pipe complying with ASTM D 2513, SDR 11 inlet connected to steel pipe complying with ASTM A 53/A 53M, Schedule 40, Type E or S, Grade B, with corrosion-protective coating for aboveground outlet.
b. Outlet shall be threaded or suitable for welded connection.
c. Bridging sleeve over mechanical coupling.
d. Factory-connected anode.
e. Tracer wire connection.
f. Ultraviolet shield.
g. Stake supports with factory finish to match steel pipe casing or carrier pipe.

2.3 VALVES

A. General

1. Exterior valve shall comply with ASME B16.33.
2. Interior valves shall comply with ASME B16.44.
3. Refer to schedule on drawings for valve information.

2.4 DIELECTRIC FITTINGS

A. A dielectric connector shall be incorporated at each connection between ferrous and copper piping. Connectors shall be:

1. Dielectric coupling with non-conductive polymer liner, Lochinvar Corp. “V-line” Dielectric fitting on services 180 degrees and less.
2. Dielectric flange with non-metallic bolt hole grommets and gasket.
3. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F .

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Pipe and tubing shall be cut and fabricated to field measurements and run parallel to normal building lines. Pipe ends shall be cut square and ends reamed to remove burrs. The pipe interior shall be cleaned of foreign matter before erection of the pipe.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Piping shall not be run above electrical switchgear or panelboards, nor above the access space in the immediate vicinity of the equipment, in accordance with N.E.C. Article 384.

F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

G. Install piping adjacent to equipment and specialties to permit servicing and maintenance.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Select system components with pressure rating equal to or greater than system operating pressure.

K. Install escutcheons for penetrations of walls, ceilings, and floors.

L. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

M. Verify final equipment locations for roughing-in.

N. Outdoor Piping
1. Comply with the International Fuel Gas Code for installation and purging of natural-gas piping.

2. Comply with requirements in Division 22 Section "Identification for Plumbing Piping and Equipment" for piping and valve identification. Install detectable warning tape directly above gas piping, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3. Install a single, highly molecular weight polyethylene (HMWPE) 14 AWG conductor, insulated tracer wire along run of natural gas piping. Wire shall have yellow insulation. Terminate wire above grade at each end of piping in a NEMA-3R weatherproof junction box. ASTM D-1248 for use polyethylene piping and UL 83 for conductor.

4. Install underground, natural-gas piping buried at least 36 inches below finished grade. Comply with requirements in Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.

5. If natural-gas piping is installed less than 36 inches below finished grade, install it in containment conduit.

6. Install underground, PE, natural-gas piping according to ASTM D 2774.

7. Steel Piping with Protective Coating:
   a. Apply joint cover kits to pipe after joining to cover, seal, and protect joints.
   b. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.
   c. Replace pipe having damaged PE coating with new pipe.

8. Install fittings for changes in direction and branch connections.

9. Exterior-Wall Pipe Penetrations: Seal penetrations using steel or cast-iron pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

10. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

11. Piping installed above ground and outdoors shall be painted to protect it from corrosion. Paint shall be gray color.

12. Refer to Division 22 Section "Identification for Plumbing Piping and Equipment" for equipment and piping labeling requirements.

O. Indoor Piping Installation

1. Valves, unions and threaded joints are not permitted in inaccessible locations. Valves shall not be located in ceiling air plenums and or other air plenums or ducts.

2. Comply with Gas Company for installation and purging of natural-gas piping.

3. A shutoff valve and dirt and moisture leg with screwed end cap shall be provided on the pipe drop to each item of equipment.

4. Gas pressure regulators shall be installed in accordance with the manufacturer's instructions. Provide valved gauges upstream and downstream of the regulator. Provide pilot regulator piping and miscellaneous valves, devices and piping to complete the installation. Pressure gauges are specified in Division 22 Section "Meters and Gages.

5. Vent piping shall be extended individually from each regulator and gas venting device to outside the building in an approved location.

6. Piping installed above ground and outdoors shall be painted to protect it from corrosion.

7. Unions and flanges shall be installed at pipe connections to fixtures and equipment and as required for erection purposed.

8. Refer to Division 22 Section "Pipe Hangers, Supports, and Penetrations" for hanger, escutcheon, and sleeve requirements.

9. Refer to Division 22 Section "Identification for Plumbing Piping and Equipment" for equipment and piping labeling requirements.

3.1 PIPING JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints:

1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
2. Cut threads full and clean using sharp dyes.
3. Ream threaded pipe ends to remove burs and restore full inside diameter of pipe.
4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Welded Joints:

1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
2. Bevel plain ends of steel pipe.
3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

E. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.

1. Plain-End Pipe and Fittings: Use butt fusion.
2. Plain-End Pipe and Socket Fittings: Use socket fusion.

3.1 VALVE INSTALLATION

A. Install manual gas shutoff valve for each gas appliance.

B. Install regulator with maintenance space adequate for servicing and testing.

3.2 CONNECTIONS

A. Connect to utility's gas service according to utility's procedures and requirements.

B. Install natural-gas piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.

C. Install piping adjacent to appliances to allow service and maintenance of appliances.

D. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.

E. Dirt Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.3 FIELD QUALITY CONTROL

A. Test, inspect, and purge natural gas according to the International Fuel Gas Code and authorities having jurisdiction. Test pressure shall be 3 psi or 1.5 times the working pressure whichever is greater.

B. Natural-gas piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION 22 1613

SECTION 22 3436 –GAS-FIRED STORAGE WATER HEATERS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following fuel-fired water heaters:
   1. Commercial, power-burner, storage, gas water heaters.
   2. Water heater accessories.

1.2 SUBMITTALS

A. Product Data: For each type and size of water heater indicated. Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Operation and maintenance data.

D. Warranty.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. ASHRAE/IESNA 90.1-2010 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2010.

C. ASME Compliance: Where ASME-code construction is indicated, fabricate and label commercial water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

D. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9" for all components that will be in contact with potable water.

1.4 WARRANTY

A. Special Warranty: Manufacturer’s standard form in which manufacturer agrees to repair or replace components of fuel-fired water heaters that fail in materials or workmanship within specified warranty period.

   1. Failures include, but are not limited to, the following:

      a. Structural failures including storage tank and supports.

b. Faulty operation of controls.
c. Deterioration of metals, metal finishes, and other materials beyond normal use.

2. Warranty Period: From date of Substantial Completion:

a. Commercial, Gas Water Heaters: 10 years.

PART 2 - PRODUCTS

2.1 COMMERCIAL, GAS WATER HEATERS

A. Commercial, Power-Burner, Storage, Gas Water Heaters: Comply with NSI Z21.10.3/CSA 4.3.

1. Storage-Tank Construction: Non-ASME-code 444 stainless steel with 150-psig working-pressure rating.

a. Tappings: Threaded ends according to ASME B1.20.1 Factory fabricated of materials compatible with tank. Attach tappings to tank before testing.

b. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank finishes, including extending finish into and through tank fittings and outlets.

2. Factory-Installed, Storage-Tank Appurtenances:

a. Drain Valve: Corrosion-resistant metal complying with ASSE 1005.
b. Insulation: Comply with ASHRAE/IESNA 90.1. Surround entire storage tank except connections and controls.
c. Jacket: Steel with enameled finish.
d. Combination Temperature and Pressure Relief Valves: ANSI Z21.22/CSA 4.4. Include one or more relief valves with total relieving capacity at least as great as heat input and include pressure setting less than water heater working-pressure rating. Select one relief valve with sensing element that extends into storage tank.

3. Burner: Comply with UL 795 for power-burner water heaters and for natural-gas fuel.

a. Automatic Ignition: ANSI Z21.20, electric, automatic, gas-ignition system.

4. Temperature Control: Adjustable thermostat.
5. Safety Controls: Automatic, high-temperature-limit and low-water cutoff devices or systems.
6. Special Requirements: NSF 5 construction.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

a. A. O. Smith, Water Products Company American Water Heaters, Inc.
b. Lochinvar, Inc.
c. American Water Heaters.

2.2 WATER HEATER ACCESSORIES

A. Gas Shutoff Valves: ANSI Z21.15/CGA 9.1, manually operated. Furnish for installation in piping.

B. Gas Pressure Regulators: ANSI Z21.18, appliance type. Include pressure rating, capacity, and pressure differential required between gas supply and water heater.

C. Gas Automatic Valves: ANSI Z21.21, appliance, electrically operated, on-off automatic valve.

D. Water Heater Mounting Brackets: Water heater manufacturer's factory-fabricated steel bracket for wall mounting and capable of supporting water heater and water.

E. Drain Pans: Corrosion-resistant metal with raised edge. Provide dimensions not less than base of water heater and include drain outlet not less than 3/4".

F. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1-2004.

PART 3 - EXECUTION

3.1 WATER HEATER INSTALLATION

A. Install commercial water heaters on concrete bases.

B. Install water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

C. Install gas water heaters according to NFPA 54.

1. Install gas shutoff valves on gas supplies to gas water heaters without shutoff valves.
2. Install gas pressure regulators on gas supplies to gas water heaters without gas pressure regulators if gas pressure regulators are required to reduce gas pressure at burner.
3. Install automatic gas valves on gas supplies to gas water heaters, if required for operation of safety control.

D. Install combination temperature and pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial, water-heater, relief-valve outlet, with drain piping same as domestic water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

E. Install vacuum relief valves in cold water line to water heater.

F. Install water heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for water heaters that do not have tank drains.

G. Install thermometer on outlet piping of water heaters.

H. Install piping-type heat traps on inlet and outlet piping of water heater storage tanks without integral or fitting-type heat traps.

I. Fill water heaters with water.

3.2 CONNECTIONS

A. Install piping adjacent to water heaters to allow service and maintenance. Arrange piping for easy removal of water heaters.

B. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

C. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections:

1. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, confirm proper operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Remove and replace water heaters that do not pass tests and inspections and retest as specified above.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain commercial water heaters. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 22 3436

SECTION 22 4200 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Faucets for lavatories, showers and sinks.
2. Flushometers.
3. Toilet seats.
4. Protective shielding guards.
5. Water closets.
6. Individual showers.
7. Service sinks.

1.2 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.

C. FRP: Fiberglass-reinforced plastic.

D. PMMA: Polymethyl methacrylate (acrylic) plastic.

E. PVC: Polyvinyl chloride plastic.

F. Solid Surface: Nonporous, homogeneous, cast-polymer-plastic material with heat-, impact-, scratch-, and stain-resistance qualities.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Regulatory Requirements: Comply with requirements in ICC/ANSI A117.1, "Accessible and Usable Buildings and Facilities"**;** Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act" for plumbing fixtures for people with disabilities and Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.

C. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

D. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.

E. Comply with the following applicable standards and other requirements specified for plumbing fixtures:

1. Stainless-Steel Residential Sinks: ASME A112.19.3.
2. Vitreous-China Fixtures: ASME A112.19.2M.
3. Water-Closet, Flushometer Tank Trim: ASSE 1037.

F. Comply with the following applicable standards and other requirements specified for lavatory and sink faucets:

1. Backflow Protection Devices for Faucets with Side Spray: ASME A112.18.3M.
2. Backflow Protection Devices for Faucets with Hose-Thread Outlet: ASME A112.18.3M.
3. Diverter Valves for Faucets with Hose Spray: ASSE 1025.
4. Faucets: ASME A112.18.1.
5. Hose-Connection Vacuum Breakers: ASSE 1011.
6. Hose-Coupling Threads: ASME B1.20.7.
7. Integral, Atmospheric Vacuum Breakers: ASSE 1001.
8. NSF Potable-Water Materials: NSF 61.
9. Pipe Threads: ASME B1.20.1.
10. Sensor-Actuated Faucets and Electrical Devices: UL 1951.
11. Supply Fittings: ASME A112.18.1.
12. Brass Waste Fittings: ASME A112.18.2.

G. Comply with the following applicable standards and other requirements specified for shower valves:

1. Backflow Protection Devices for Hand-Held Showers: ASME A112.18.3M.
2. Combination, Pressure-Equalizing and Thermostatic-Control Antiscald Faucets: ASSE 1016.
3. Faucets: ASME A112.18.1.
4. Hand-Held Showers: ASSE 1014.
5. High-Temperature-Limit Controls for Thermal-Shock-Preventing Devices: ASTM F 445.
6. Hose-Coupling Threads: ASME B1.20.7.
7. Manual-Control Antiscald Faucets: ASTM F 444.
8. Pipe Threads: ASME B1.20.1.
9. Pressure-Equalizing-Control Antiscald Faucets: ASTM F 444 and ASSE 1016.
10. Sensor-Actuated Faucets and Electrical Devices: UL 1951.
11. Thermostatic-Control Antiscald Faucets: ASTM F 444 and ASSE 1016.

H. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:

1. Atmospheric Vacuum Breakers: ASSE 1001.
2. Brass and Copper Supplies: ASME A112.18.1.
3. Manual-Operation Flushometers: ASSE 1037.
4. Brass Waste Fittings: ASME A112.18.2.

I. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Flexible Water Connectors: ASME A112.18.6.
2. Hose-Coupling Threads: ASME B1.20.7.
3. Pipe Threads: ASME B1.20.1.
4. Plastic Toilet Seats: ANSI Z124.5.
5. Supply and Drain Protective Shielding Guards: ICC A117.1.

PART 2 - PRODUCTS

2.1 Fixtures and Trim

A. Refer to the notes/schedule on the drawings for fixture and associate trim specifications.

B. All waste and supply trim exposed to view shall be chrome-plated brass.

C. Toilet Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Bemis Manufacturing Company.
b. Centoco Manufacturing Corp.
c. Church Seats.
d. Kohler Co.
e. Olsonite Corp.
f. Beneke Div, Sanderson Plumbing Products, Inc..
g. Sperzel.

2. Description: Toilet seat for water-closet-type fixture.

a. Material: Molded, solid plastic with antimicrobial agent.
b. Configuration: Open front without cover.
c. Size: Elongated.
d. Hinge Type: self-sustaining check.
e. Class: Heavy-duty commercial.
f. Color: White.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.

B. Install fixtures level and plumb according to roughing-in drawings.

C. Attach supplies to supports or substrate within pipe spaces behind fixtures to prevent loose piping fitting piping thru walls. Install -supply stop on each water supply to each fixture connected to water distribution piping. Install stops in locations where they can be easily reached for operation.

D. Install flushometer valves for accessible water closets with handle mounted on wide side of room/compartment. Install other actuators in locations that are easy for people with disabilities to reach.

E. Install toilet seats on water closets.

F. Install escutcheons at piping wall and ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings.

G. Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Sealants are specified in Division 07 Section "Joint Sealants."

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Verify that installed plumbing fixtures are categories and types specified for locations where installed.

B. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.

C. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.

D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

3.4 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 224200

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DIVISION 23 HEATING, VENTILATING AND AIR-CONDITIONING (HVAC)

23 0000 General Requirements for HVAC Systems

23 0001 Basic HVAC Requirements
23 0002 HVAC Work in Existing Buildings
23 0004 Firestopping for HVAC Systems

23 0500 Common Work Results for HVAC

23 0513 Electrical Requirements for HVAC Equipment
23 0529 Pipe Hangers Supports, & Penetrations
23 0548 Vibration Control
23 0553 Identification for HVAC Systems
23 0593 Testing, Adjusting and Balancing

23 0700 HVAC Insulation

23 0713 Duct Insulation
23 0719 Pipe Insulation

23 0900 Instrumentation and Control for HVAC

23 0913 Instruments and Control Devices
23 0914 Control Wiring and Cabling
23 0923 Direct Digital Control System

23 2000 HVAC Piping and Pumps

23 2113 Hydronic Piping
23 2300 Refrigerant Piping

23 3000 HVAC Air Distribution

23 3113 Ductwork
23 3300 Air Duct Accessories
23 3400 Fans
23 3713 Diffusers, Registers and Grilles

23 5000 Central Heating Equipment

23 5100 Breechings, Chimneys and Stacks
23 5523 Gas-Fired Radiant Heaters
23 5533 Fuel-Fired Unit Heaters

23 7000 Central HVAC Equipment

23 7413 Packaged, Outdoor, Air Handling Units

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SECTION 23 0001 – BASIC HVAC REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes the following:

1. General Requirements
2. Definitions
3. Scope of Work
4. Drawings and Specifications
5. Reference Standards
6. Allowances, Unit Prices and Alternates
7. Site Visit
8. Permits, Regulations and Inspections
9. Project Management and Coordination
10. Temporary Utilities
11. Workmanship
12. Protection
13. Painting
14. Cleaning
15. Miscellaneous Equipment Connections
16. Equipment Selection
17. Shop Drawings
18. Final Inspection and Punch List
19. Operation and Maintenance Manuals
20. Record Drawings
21. Warranties
22. Project Closeout
23. Operation and Adjustment of Equipment
24. Operating Demonstration and Instruction

1.2 GENERAL REQUIREMENTS

A. All provisions of Division 00 Front End Documents and Division 01 General Requirements apply to work specified in this Division.

B. Specification provisions of other relevant Divisions shall apply where applicable work is required to be performed under this HVAC work.

C. A complete and functional HVAC system installation shall be provided under this Division. Should overlap of work among the trades become evident, this shall be called to the attention of the Architect. In such event, none of the trades or their suppliers shall assume that he is relieved of the work which is specified under his branch until instructions in writing are received from the Architect.

D. The Mechanical and Electrical drawings and specifications assign work (labor and/or materials to be provided by the General, Plumbing, Fire Suppression, HVAC or Electrical Contractor or their sub-contractors. Understanding that the contractors for mechanical and electrical work are sub-contractors to the (General) Contractor, such assignments are not intended to restrict the Contractor in assignment of work among the sub-contractor to accommodate trade agreements and practices or the normal conduct of the construction work.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.4 SCOPE OF WORK

A. The scope of the HVAC work includes furnishing, installing, testing and warranty of all HVAC work shown on the HVAC drawings and specified herein, including Division 00, Division 01, Division 23 and applicable provisions of other relevant Divisions.

1.5 DRAWINGS AND SPECIFICATIONS

A. The drawings indicate the general arrangement of the work and are to be followed insofar as possible. The word “proved,” as used, shall mean “furnish and install.” If significant deviations from the layout are necessitated by field conditions, detailed layouts of the proposed departures shall be submitted to the Architect for approval before proceeding with the work.

B. Make all necessary field measurements to insure correct fitting. Coordinate work with all other trades in such a manner as to cause a minimum of conflict or delay.

C. The drawings and specifications shall be carefully studied during the course of bidding and construction. Any errors, omissions or discrepancies encountered shall be referred immediately to the Architect for interpretation or correction, so that misunderstandings at a later date may be avoided. The contract drawings are not intended to show every vertical or horizontal offset which may be necessary to complete the systems. Having ductwork, pipe and fittings fabricated and delivered in advance of making actual measurements shall bet be sufficiently in advance as

to not cause extra work, or unduly delay the work. Coordinate work in advance with all other trades and report immediately any difficulties which can be anticipated.

D. The Architect/Engineer shall reserve the right to make minor adjustment in locations of system runs and components where he considers such adjustments desirable in the interest of concealing work or presenting a better appearance where exposed. Any such changes shall be anticipated and requested sufficiently in advance as to not cause extra work, or unduly delay the work. Coordinate work in advance with all other trades and report immediately any difficulties.

E. Equipment, ductwork or piping shall not be installed or run above electrical switchgear or panelboards, nor in or above the access space in the immediate vicinity of the electrical switchgear/panelboards, in accordance with NEC Article 384.

F. Where any system runs and components are so placed as to cause or contribute to a conflict, it shall be readjusted at the expense of the contractor causing such conflict. The Architect's decision shall be final in regard to the arrangement of ductwork, piping, etc., where conflict arises.

G. Provides offsets in system runs, additional fittings, necessary drains and minor valves, traps, dampers and devices required to complete the installation, or for the proper operation of the system. Each Contractor shall exercise due and particular caution to determine that all parts of the work are made quickly and easily accessible.

H. Should overlap of work among the trades become evident, this shall be called to the attention of the Architect. In such event, none of the trades or their suppliers shall assume that he is relieved of the work which is specified under his branch until instructions in writing are received from the Architect.

1.6 REFERENCE STANDARDS

A. Where standards (NFPA, NEC, ADTM, UL, etc.) are referenced in the specifications or on the drawings, the latest edition is to be used except, however, where the authority having jurisdiction has not yet adopted the latest edition, the edition so recognized shall be used.

1.7 ALLOWANCES, UNIT PRICES AND ALTERNATES

A. Refer to Sections 012100 Allowances, 012200 Unit Prices and 012300 Alternates.

1.8 SITE VISIT

A. Refer to Section 017300 Execution.

B. Each bidder shall visit the project site to understand the existing conditions and compare the conditions with information shown on the drawings. Report immediately to the Architect any issues or discrepancies which are discovered that affect the bid. Changes to contract price will not be considered for site condition issues that are readily apparent from a thorough site review.

1.9 PERMITS, REGULATIONS AND INSPECTION

A. Work must conform to applicable local, state and federal laws, ordinances and regulations. Where drawings or specifications exceed code requirements, the drawing and specifications shall govern. Install no work contrary to minimum legal standards.

B. Except where the permit application is made by the Architect or the Engineer, the HVAC contractor shall be responsible to file for and obtain all required permits from the governing inspection agencies for the HVAC work. Where the Architect or Engineer is the Architect or Engineer of record, they will furnish sealed and signed drawings and specifications required by the permit authorities.

C. Include payment of all permit and inspection fees applicable to the work in this Division.

D. All work shall be subject to inspection and approval of Federal, State and local agencies as may be appropriate as well as the Architect and Engineer.

E. Furnish for the Owner certificates of approval from the governing inspection agencies as a condition for final payment.

1.10 PROJECT MANAGEMENT AND COORDINATION

A. Refer to Section 013100 Project Management and Coordination.

1.11 TEMPORARY UTILITIES

A. Refer to Section 015000 – Temporary Facilities and Controls for division of responsibilities for temporary utilities.

B. The use of the permanent HVAC system for temporary heating and ventilation during the latter stages of construction shall be allowed. Expedite completion of system as practicable to this end. Maintain the system during this period. Provide and maintain temporary air filters to protect coils and ducts. Replace temporary filters with the specified filters (clean) when the systems are placed on permanent duty. Air filters specified for the systems and units, including specified spare filters, are not to be used for temporary service.

C. Cover all return duct openings with temporary filter media when recirculating air. Stop fans during heavy dust generating operations. Before turning the system over to the Owner, the Contractor shall clean duct interiors and interior surfaces and components with the air handling equipment if dirt, dust and debris have accumulated on these surfaces.

D. Warranty periods on equipment, materials and system shall commence upon Owner acceptance of the building or system. Temporary heat use shall not jeopardize or alter the warranty requirements.

1.12 WORKMANSHIP

A. Refer to Section 014000 Quality Requirements.

B. Materials and equipment shall be installed and supported in a first-class and workmanlike manner by mechanics skilled in their particular trades. Workmanship shall be first-class in all respects, and the Architect shall have the right to stop the work if highest quality workmanship is not maintained.

C. HVAC work shall be performed by licensed HVAC Contractors in accordance with requirements of the jurisdiction.

1.13 PROTECTION

A. Each Contractor shall be entirely responsible for all material and equipment furnished in connection with his work. Special care shall be taken to properly protect all parts thereof from theft, damage or deterioration during the entire construction period in such a manner as may be necessary, or as directed by the Architect.

B. The Owner's property and the property of other contractors shall be scrupulously respected at all times. Provide plastic sheeting, drop cloths or similar barriers where dust and debris is generated, to protect adjacent areas.

C. Contractor shall protect all equipment and materials from detrimental effects of weather or construction activity. All items shall be stored and secured in a protected location away from the daily work area. Equipment or materials shall be placed on raised skids to protect from surface moisture. Where appropriate, provide plastic sheeting or similar vapor barrier underneath the stored products to reduce the effects of ground moisture or curing concrete on the local humidity levels. Where unfinished ferrous products or finished ferrous products with raw edges are stored, provide local, dry heat to maintain ambient relative humidity levels below 65% RH to prevent rust.

D. All equipment shall retain the original packaging until required to be removed for installation or operation. Open ends of ducts, piping, conduit, etc. shall be capped or sealed and ventilation openings into equipment shall be wrapped and sealed in plastic sheeting to prevent dust or dirt entry both when stored and after installation but still open to the effects of construction activity. Stored items as well as installed equipment shall be covered with plastic sheeting at all times until placed in service or until dust generating activity in the area has ceased.

1.14 PAINTING

A. In addition to any painting specified for various individual items of equipment, the following painting shall be included in Division 23:

1. Ferrous metal which is not factory or shop painted or galvanized and which remains exposed to view in the finished areas of the building / building including finished areas, mechanical rooms, storage rooms, and other unfinished areas shall be given a prime coat of paint.

2. Ferrous metal installed outside the building which is not factory or shop painted or galvanized shall be given a prime coat of paint.

3. Equipment and materials which have been factory or shop coated (prime or finished painted or galvanized), on which the finish has been damaged or has deteriorated, shall be cleaned and refinished equal to its original condition. The entire surface shall be repainted if a uniform appearance cannot be accomplished by touch-up.

4. Inside of ducts, behind grilles and registers, shall be painted flat black to eliminate the viewing of shiny surfaces.

B. Paint, surface preparation and application shall conform to applicable portions of the Painting section of Division 09 Finishes. All rust must be removed before application of paint.

C. Finish painting is included in the General Contract except where otherwise required under remodeling work. Refer to the “Cutting and Patching” paragraph in this Section for finishing requirements.

1.15 CLEANING

A. Debris, dust, dirt, etc shall be removed daily, particular attention shall be paid to areas that the Owner is continuing to occupy or use; any mess created in corridors, stairwells and egress paths that are maintained during construction shall be cleaned immediately.

B. The Owners dumpsters and trash receptacles shall not be used. If a dumpster is required, it shall be provided by the contractor and located where approved by the Owner. Coordinate dumpster requirements with other contractors.

C. Before turning an area back over to the Owner, thoroughly clean the space to leave the area in a similar condition before the start of the project where finishes are to remain. The contractor shall also clean duct interiors and interior components of new or existing air handling system equipment if dirt, dust or debris have generated in the course of work have accumulated on these surfaces.

D. Before placing each system in operation, the equipment shall be thoroughly cleaned; cleaning shall be in accordance with equipment manufacturer's recommendations.

E. Refer to appropriate Sections for cleaning of other equipment and systems for normal operation.

1.16 MISCELLANEOUS EQUIPMENT CONNETIONS

A. Certain categories of fixtures and equipment, including kitchen equipment, sterilizers, washers, laundry and laboratory equipment, require piping connections and duct connections as shown on the drawings. Equipment will be furnished and set in places by the equipment supplier.

B. Make all final connections to these fixture and equipment, as indicated and in accordance with the manufacturer’s recommendations. All piping connections shall be valved and final connections made with unions.

C. All steam supplies shall be dripped immediately ahead of the valves. Automatic valves, where required, will generally be furnished with the equipment but installed by the HVAC Contractor. Return traps shall be furnished by this Contractor in accordance with details shown on the

drawings. Steam pressure reducers and relief valves, where required, shall be furnished by this HVAC Contractor.

D. Supply piping and devices connecting to equipment, where exposed to view in the finished space, shall be chrome plated and insulation shall be omitted.

E. Roughing-in drawings shall be obtained for the various fixtures and items of equipment as the time approaches when such information is required; allow a reasonable period, from the time of notice to obtain this information.

F. Connections to equipment shall be in accordance with the manufacturer's installation guidelines. Any additional accessories recommended by the manufacturer such as gauges, shut-off valves, unions at connection points, etc., shall be provided by this Contractor.

1.17 EQUIPMENT SELECTION

A. Materials and equipment furnished under this contract shall be in strict accordance with the specifications and drawings and shall be new and of best grade and quality. When two or more articles of the same material or equipment are required, they shall be of the same manufacturer.

B. The selection of materials and equipment to be furnished under this contract shall be governed by the following:

1. Where trade names, brands, or manufacturers of equipment or materials are listed in the specifications, the exact equipment listed shall be furnished. Where more than one name is used, the Contractor shall have the option of selecting between any one of the several specified. All products shall be first quality line of manufacturer's listed.

2. Where the words "or approved equal: appear after a manufacturer's name, specific approval must be obtained from the Architect during the bidding period in sufficient time to be included in an addendum. The same shall apply for equipment and materials not named in the specifications, where approval is sought.

3. Where the words "equal to" appear, followed by a manufacturer's name and sometimes a model or series designation, such designation is intended to establish a model or series designation, such designation is intended to establish quality level and standard features. Equal equipment by other manufacturers will be acceptable, subject to the Engineer's approval.

C. Substitute equipment of equal quality and capacity will be considered when the listing of such is included as a separate item of the bid. State the deduction or addition in cost to that of the specified product.

D. Before bidding equipment, and again in the preparation of shop drawings the Contractor and his supplier shall verify that adequate space is available for entry and installation of the item of equipment, including associated piping and accessories. Also verify that adequate space is available for servicing of the equipment.

E. If extensive changes in pipe, duct or equipment layout or electrical wiring and equipment are brought about by the use of equipment which is not compatible with the layout shown on the drawings, necessary changes shall be deemed to be included in the contract.

1.18 SHOP DRAWINGS

A. Refer to Section 016000 Product Requirements.

B. One set of shop drawings, in electronic format (.pdf), with descriptive information shall be assembled by each Contractor of equipment and materials furnished in his contract, and submitted to the Architect and/or Engineer for review as stated in Division 01. These shall be submitted as soon as practicable and before special equipment is manufactured and before installation.

C. Shop drawings for equipment fixtures, devices and materials shall be labeled and identified same as on the Contract Documents. Failure to do so may be cause for rejection of shop drawings.

D. The review of shop drawings by the Architect or Engineer shall not relieve the Contactor from responsibility for errors in the shop drawings. Deviations from specifications and drawing requirements shall be called to the Engineer's attention in a separate clearly stated notification at the time of submittal for the Engineer's review.

E. Shop drawings for the following HVAC equipment and materials shall be submitted EDIT:

1. Pipe, fittings and joining methods for the various systems.
2. Firestopping systems for pipe penetrations.
3. Pipe Hangers and Supports.
4. Valves.
5. Expansion Fittings, Joints and Guides.
6. Flexible Connectors.
7. Meters and Gauges.
8. Vibration Isolators.
9. Pipe Insulation.
10. Equipment and Breeching Insulation.
11. Ductwork Insulation.
12. Ductwork and Sealing Systems.
13. Air Duct Accessories.
14. Gas/Oil-Fired Unit Heaters.
15. Gas-Fired Radiant Heaters.
16. Refrigerant piping schematic and components.
17. Rooftop Heating and Cooling Units.
18. Fan-Coil Units.
19. Unit Heaters.
20. Fans.
21. Roof Ventilators.
22. Air Filters.
23. Specialty exhaust system equipment and components.
24. Fire Dampers.
25. Sound Attenuators.

26. Air Control Terminal Units.
27. Diffusers, Registers and Grilles.
28. Louvers.
29. Temperature Controls System.
30. Pressure piping system welder performance qualification record per the Ohio Pressure Piping Systems Code, Chapter 4101:8.

1.19 FINAL INSPECION AND PUNCH LIST

A. Refer to Section 017700 Closeout Procedures.

1.20 OPERATION AND MAINTENANCE MANUALS

A. Refer to Section 017823 Operation and Maintenance Data.

B. Two copies each of operating and maintenance manuals shall be assembled for the HVAC work by the Contractors.

C. All shop drawing and installation, maintenance and operating instruction pamphlets or brochures, wiring diagrams, parts list and other information, along with warranties, shall be obtained from each manufacturer of the principal items of equipment. Air and water balance reports shall also be included. In addition, the Contractor shall prepare a chart listing all items of equipment which are furnished under his contract and indicating the nature of maintenance required, the recommended frequency of checking these points and the type of lubricating media or replacement material required.

D. These shall be combined into a single electronic file in .PDF format. An index and tabbed sheets to separate the sections shall be included. These shall be submitted to the Architect or Engineer for review. Upon approval, manuals shall be turned over to the Owner.

1.21 RECORD DRAWINGS

A. Refer to Section 017839 Project Record Drawings.

B. Each Contractor shall maintain a separate set of prints of the contract documents and shall show all changes or variations, in a manner to be clearly discernible, which are made during construction. Upon completion of the work, these drawing shall be turned over to the Architect.

1.22 WARRANTIES

A. Refer to Section 017700 Closeout Procedures.

B. This Contractor shall warrant all workmanship, equipment and material entering into this contact for a period of one year of date of final acceptance or date of beneficial use, as agreed to between Contractor and Architect. Any materials or equipment proving to be defective during this warranty period shall be made good by this Contractor without expense to the Owner.

C. This provision is intended specifically to cover deficiencies in contract completion or performance which are discovered after systems are placed in operation. Also included shall be supplementary assistance in balancing, adjusting or providing operating instructions as the need develops, and replacing overload heater elements in starters where necessary to keep systems in operation. Heater element sizes shall not exceed the motor manufacturer's recommendations.

D. This provision shall not be construed to include maintenance items such as replacing filters, re-tightening or repacking glands, greasing, oiling belt tightening and cleaning strainers after these have been done for final close-out.

E. Provisions of this warranty shall be considered supplementary to warranty provisions under General Conditions.

F. Extended warranties shall be provided where indicated in the equipment specification sections.

1.23 PROJECT CLOSEOUT

A. Refer to Section 017700 Closeout Procedures.

1.24 OPERATION AND ADJUSTMENT OF EQUIPMENT

A. As each piping system and air distribution system is put into operation, all items of equipment included therein shall be adjusted to proper working order. This shall include balancing air and water systems, adjusting fan speeds, belts, pulleys, tightening packing glands, and adjusting all operating equipment.

B. Caution: Verify that all bearings are lubricated, all motors are operating in the right direction, and correct overload heater elements are provided on all motors. Do not depend wholly on the electrician's judgment in these matters. Follow specific instructions in regard to lubrication. Do not oil or grease presealed ball bearings unless upon manufacturer's specific instructions.

C. Test relief valves, air vents and regulating valves to insure proper operation.

1.25 OPERATING DEMONSTRATION AND INSTRUCTIONS

A. Refer to Section 017900 Demonstration and Training as well as individual Division 23 Sections for requirements.

B. The Contractor shall set the various systems into operation and demonstrate to the Owner and Architect that the systems function properly and that the requirements of the Contract are fulfilled.

C. The Contractor shall provide the Owner's representatives with detailed explanations of operation and maintenance of equipment and systems. A thorough review of the operating and maintenance manuals shall be included in these instructional meetings.

D. A minimum of 16 hours shall be allowed for instructions to personnel selected by the Owner. Instructions shall include not less than the following:

1. Show locations of items of equipment and their purpose.
2. Review binder containing instructions and equipment and systems data.
3. Coordinate written and verbal instructions so that personnel understand each.
4. Separate instructions shall be given by manufacturer's representatives for the temperature control systems.

PART 2 - PRODUCTS – NOT APPLICABLE

PART 3 - EXECUTION – NOT APPLICABLE

END OF SECTION 23 0001

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SECTION 23 0002 – HVAC WORK IN EXISTING BUILDINGS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes the following:
   1. General Requirements for Renovation Work
      a. Inspection of Existing Building
      b. Asbestos Material
      c. Work Hours
      d. Tobacco Products
   2. Execution
      a. Barriers and Signage
      b. Storage of Tools and Materials
      c. Protection of Existing Building and Equipment
      d. Confined Spaces
      e. Noise, Fumes, and Dust Control
      f. Soldering, Welding, and Cutting
      g. Removals, Disposal, and Reuse
      h. Draining, Flush, and Refill of Piping Systems
      i. Continuity of Systems
      j. Wall, Floor, and Roof Openings – Existing Construction

1.2 GENERAL REQUIREMENTS FOR RENOVATION WORK

A. Refer to Article 1 Specification requirements and notes on the drawings where provided for requirements related to renovation work.

B. Meet with the Owner, Architect and Engineer before demolition or construction begins to establish procedures for work effort in the existing building. Provide names and phone numbers and establish emergency contact information where work is performed. Provide security information requested by the Owner for all personnel who will be working on site. Educate all construction personnel in regard to the project requirements and procedures.

C. Coordinate effort with other contractors involved in the renovation project to minimize the disruption, phasing of work, share cleaning responsibilities, etc.

1.3 INSPECTION OF EXISTING BUILDING

A. Each bidder shall inspect the existing building in the early time frame of the bidding period. Conditions shall be compared with information shown on the drawings. Report to the Architect/Engineer any significant discrepancies which may be discovered in a timely fashion so that direction may be provided in an addendum. After the contract is signed, no allowance

will be made for failure to have made a thorough inspection.

1.4 ASBESTOS MATERIAL

A. Abatement, removal or encapsulation of existing materials containing asbestos is not included in the Contract. Necessary work of this nature will be arranged by the Owner to be done outside of this construction and remodeling project buy a company regularly engaged in asbestos abatement. Such work will be scheduled and performed in advance of work in the construction and remodeling project.

B. If, in the performance of the mechanical work, materials are observed which are suspected to contain asbestos, the Contractor shall immediately inform the Architect / Engineer who in turn will notify the Owner. Work that would expose workers to the inhalation of asbestos particles shall be terminated. Work may be resumed only after a determination has been made and unsafe materials have been removed or encapsulated and the area declared safe.

1.5 WORK HOURS

A. Work hours for construction shall be as defined in Section 01150 – Project Phasing or other specification sections or drawing notes.

B. Where allowed, contractors may work normal hours except after hours is required for operations that are noisy, generate obnoxious fumes or dust, require shut down of ventilation systems, etc. The Owner reserves the right to stop normal hour work where the Owner deems the effort to be disruptive to their ongoing operations.

C. Any work that creates hazards in or requires closure of corridors, exit pathways or stairwells work in corridors must be performed after hours when the building is not occupied.

D. All occupied areas, corridors exit pathways and stairwells must be left clean, lighted (including emergency egress and exit signage) usable and safe at the end of each work shift.

E. Access to the work area shall be coordinated with the Owner; follow all security protocols for parking, sign in, key control, etc. established by the Owner.

1.6 TOBACCO PRODUCTS

A. Smoking or chewing tobacco products are expressly prohibited to be used within the building and on the premises except where specifically permitted by the Owner or in construction company trailers or vehicles where permitted by the construction company.

PART 2 - PRODUCTS- NOT APPLICABLE

PART 3 - EXECUTION

3.1 BARRIERS AND SIGNAGE

A. Barriers and signage shall be provided as appropriate to identify work areas and to prevent unauthorized entry by non-construction personnel. Refer to appropriate Division 1 specification requirements and notes on the drawings where provided.

B. All barriers and signs should be high visibility type and be maintained at all times.

3.2 STORAGE OF TOOLS AND MATERIALS

A. Store all site material and tools in the active job site area or on-site areas, to be coordinated with Owner. Specific storage areas are not provided except where otherwise noted for material and tools.

B. Storage is specifically prohibited in means of egress paths and stairwells.

C. The contractor is responsible for the security of tools, equipment, and materials.

D. On-site storage areas should be in locked trailers.

3.3 PROTECTION OF EXISTING BUILDING AND EQUIPMENT

A. The Owners' property and the property of other contractors shall be respected at all times. Provide drop clothes, visqueen plastic sheeting or other suitable barriers where dust and debris is generated. Tape or zipper ends of barriers for sealing purposes.

B. Provide 55-gallon drums or smaller buckets as appropriate and use funnels when draining liquid systems.

C. Provide plywood sheets for heavy duty for protection of walls, floors or Owner equipment or systems that are remaining in place near demolition or new installation work where there is possible damage from heavy material or equipment.

D. Provide ram board floor protection in occupied areas adjacent to construction areas.

3.4 CONFINED SPACES

A. Notify the Owner when performing work in confined spaces. Provide a written procedure for approval and obtain approval from the Owner when so requested.

B. All work in confined spaces shall be done in accordance with OSHA regulations.

3.5 NOISE, FUME, AND DUST CONTROL

A. Provide barriers and ventilation as required to limit the effect from construction generated noise fume and dust control on spaces that continue to be occupied by the Owner. Refer to protection of building and equipment paragraph above. In addition to the basic protection, provide additional visqueen barriers to limit airborne migration of dust and fumes. Provide supplemental portable fans to exhaust air to the outside of the building where appropriate. Use of the Owners' ventilation systems to induce positive or negative pressure is prohibited unless authorized by the Owner. Shut off ventilation systems serving the area where use of these systems can induce fumes or dust into return or exhaust ducts. Where systems need to remain operational for occupied areas, arrange to temporarily shutoff portions of the system in the work area. Provide taped visqueen covers on HVAC air supply and exhaust devices to limit migration. Coordinate all efforts requiring modification or shutdown of ventilation systems with the Owner. Contractor shut down of these systems is prohibited without Owner permission.

B. Fire Alarm System Coordination – Arrange with the Owner when required to shut off fire alarm system devices and/or smoke detectors to perform work. With the Owners' prior approval. Cover smoke detectors where needed to prevent false alarms due to dust or fumes generated. Minimize outages and coordinate efforts to limit the effect due to false alarms.

C. Ventilation – Where significant dust or fume generating work, welding, or cutting operations are required for removal or new work, provide fume removal equipment with telescoping arms to locally capture the fumes. Fume exhaust shall be directed outside or adequately filtered and recirculated.

D. Daily Ventilation – Areas shall be thoroughly ventilated after completion of the work daily to remove residual odors and fumes before occupancy occurs the next day.

E. Cleaning – Provide walk off sticky construction pads at entrances to construction site and vacuum cleaners and other equipment to clean and restore conditions.

3.6 SOLDERING, WELDING, AND CUTTING

A. For soldering, welding, or cutting operations, provide insulated, fire rated curtains or barriers and blankets to isolate cover and protect remaining systems and materials, furniture, furnishings, floors, walls, ceilings, etc.

B. Refer to noise, fumes, and dust control provisions in the previous paragraph.

C. Obtain burn approval from the Owner before commencing any soldering or welding effort. Coordinate outages of fire alarm systems as noted in the previous paragraph.

D. Provide a Fire Watch at each welding location. Fire Watch personnel shall be dedicated for the sole purpose of fire prevention during welding operations. All Fire Watch personnel shall be properly trained and equipped, including fire extinguisher, fire blanket and communication equipment for assistance request.

E. Provide a fire extinguisher at every soldering or welding location.

3.7 REMOVALS, DISPOSAL, AND REUSE

A. Refer to the drawings for the scope of remodeling in the existing building.

B. General – Cooperate with the General Contractor regarding all removal and remodeling work. Each Contractor shall remove existing utilities and equipment which is associated with their trade, and which will be superfluous when the new work is installed and made operational.

C. Protection – In areas of minor work where the space is not completely vacated, temporarily move portable equipment and furnishings within the space as required to complete the work. Coordinate this activity with Owner. Protect the Owner's property by providing adequate dust covers and temporary plastic film barriers to contain dust. Provide filters on return/exhaust grilles and ductwork. Existing materials and finishes are to be protected and restored to match adjacent finishes. Remove barriers and return equipment and furniture upon completion of the work.

D. Ceiling Removals – The H.C. shall remove, store and reinstall lay-in ceiling tile and grid as required to perform work in areas where such removal and re-installation is not to be done by the General Contractor. Damaged tile and/or grid shall be replaced with new matching tile and/or grid.

E. Supports & Hanger Removals – Where piping, ductwork, equipment, and other materials are noted to be removed the removal shall include all hangers and supports for these items. Remaining active piping, ductwork and equipment shall be re-supported as required. New supports shall utilize approved and recognized materials and methods and be installed in accordance with the drawings.

F. Removals – Extraneous ductwork, piping, wiring, or equipment which is or becomes accessible shall be removed and stubs shall be capped at the first active duct or pipe encountered. Piping that is and remains inaccessible shall be abandoned. Ends of abandoned pipe shall be capped so as to be concealed by finished surfaces. Upon completion of the work, no abandoned pipe, valve, or stub shall extend through finished floors, walls, or ceilings.
   1. Wall Removals –
      a. Recessed devices – Devices to be abandoned in existing walls which are to remain shall be covered by suitable blank cover plates to match other devices cover plates or painted to match wall color.
      b. Surface Mounted Devices - Where removals are completely removed from the face of wall, patch and finish wall consistent with adjacent finish. Surface mounted devices to be removed shall have surface repaired and finished to match adjacent existing or new architectural finishes.
   2. Roof Removals – Devices, services, supports and equipment removed from the roof shall leave the roof consistent with the existing or new roof. Patch the roof decking per the Patching section. The Contractor shall engage a roofing contractor to patch roofing consistent with the roof warranty.
   3. Floor Removals – Devices removed from concrete floors shall be patched and finished according to the patching section.

G. Rerouting of Services – Where it is necessary to reroute a section of active piping or ductwork, the rerouted section shall be installed before removing the existing to minimize system down time. Rerouted sections shall be insulated as required for new work. Patch insulation on existing piping which has been damaged or removed in this work.

H. Service Disruption – If any existing equipment or devices to remain in service in adjacent spaces are made inactive by removal of devices, wiring, piping or ductwork within the area of work shall be re-fed as required to make devices or equipment operational.

I. Material & Equipment Removal & Reuse – Materials and equipment which are removed shall not be reused within the scope of this project unless specifically noted to be relocated or reused. Items noted in the drawings shall be turned over to the Owner and placed where directed on the premises. All material and equipment which the Owner does not wish to retain shall become the property of the Contractor responsible for removal and shall be removed from the premises and properly disposed.

J. Disposals – The Contractor is responsible for the proper disposal of removed materials from the construction site. Provide dumpsters as required in locations coordinated with the Owner. Disposal of materials regulated by EPA shall be done in strict accordance with latest requirements. Provide documentation to the Owner that disposal was properly executed.

K. Damaged Services & Insulation – Existing piping and ductwork to remain with damaged insulation encountered in area of work shall have damaged insulation removed and replaced with new. Insulation thickness shall match new thicknesses indicated on drawings. Work to be performed on a time and material basis as encountered. Services damaged during construction shall be replaced at the expense of the Contractor.

L. Openings & Patching – Openings left where existing equipment, ductwork, piping and supports are to be removed in existing walls and ceilings to remain shall be patched using materials to match the existing construction, which may include fire stopping of rated walls and ceilings. Refer to Section 3.10 for patching methods.

3.8 DRAINING, FLUSHING, AND REFILL OF PIPING SYSTEMS

A. Existing liquid systems shall be drained as required before removal or connection of new piping extensions.

B. Draining of the system shall be the responsibility of the contractor. Provide threaded connections, etc. to direct fluids to drainage points. Water systems may be drained to sanitary systems or where permitted, to storm systems. Verify any chemical treatment, inhibitors or freeze protection additives in the existing systems and obtain a permit from the local sewer authority before disposing.

C. Provide drums or containers to accept other than water drainage and remove from the premises and properly dispose. Provide visqueen to protect Owners' property when opening pipes, even where piping has been drained to prevent damage from residual liquid that remains in the pipe.

D. After new piping is connected and tested, flush and clean all existing piping that has been drained and new piping as specified in Section 23 0001, Basic HVAC Requirements. Provide full port, 0.75" ball valves with hose connectors as described to facilitate flushing operations.

E. Inspect and clean any new or existing strainers at coils, heat exchangers, etc. that may become clogged due to debris that may dislodge from interior pipe surfaces due to the draining, flushing and detergent cleaning operations.

F. During refilling and startup operations, vent all air from the system at high points. This air venting effort shall extend beyond the refill and initial startup where flow blockage due to air binding occurs.

3.9 CONTINUITY OF SYSTEMS

A. Coordination –
   1. Work shall be planned and executed without the occupation of the Owner. Continuity of systems is not required or is required for designated areas only until the Owner reoccupies the building spaces as coordinated.

B. Sequence of Operations – Submit, on request, a written step-by-step sequence of operations proposed to accomplish the work. The outline shall include tentative dates, times of day for disruption, downtime, and restoration services. Submit the outline sufficiently in advance of the proposed work to allow the Architect or Engineer to review the information with the Owner. Upon approval, final planning and the work shall be done in close coordination with the Owner.

C. Shutdown of system and work undertaken during shutdowns shall be bid as being done during normal working hours. If the Owner should require such work be performed outside of normal working hours, reimbursement shall be made for premium time expenses only.

3.10 WALL, FLOOR, AND ROOF OPENINGS – EXISTING CONSTRUCTION

A. Refer to Division 1 – General Requirements for information regarding cutting and patching.

B. Coordination – Plan the work well ahead of the general construction. Where pipes and ducts are to pass thru new walls, partitions, floors, roof or ceilings, place sleeves in these elements or arrange with the General Contractor to provide openings where sleeves are not practical. Where sleeves or openings have not been installed, cut holes and patch as required for the installation of this work, or pay other trades for doing this work when so directed by the Architect. Any damage caused to the building shall be repaired or rectified.

C. Cutting – Where pipes and ducts are to pass through, above or behind existing walls, partitions, floors, roof, or ceiling, cutting, patching, and refinishing of same shall be included in this contract. Core drilling and saw cutting shall be utilized.

D. Structural Support – Provide steel angle or channel lintels to span openings which are cut in existing jointed masonry wall where the opening span exceeds 16 inches. Provide framing around roof openings for required support of the roof deck. Consult with a structural engineer to provide adequate size and shapes for loading.

E. Roofing Work – The HVAC Contractor shall engage a Roofing Contractor on a subcontractor basis for roofing and roof insulation work necessitated by his work. The Roofing Contractor shall be certified for installation and repair of the roofing system to maintain the existing roofing warranty.

F. Patching & Refinishing – All material, methods and procedures used in patching and refinishing shall be in accordance with applicable provisions of specifications governing the various trades. The final appearance and integrity of the patched and refinished areas must meet the approval if

the Architect. Wall, floor, and ceiling refinishing must extend to logical termination lines (entire ceiling of the room repainted, for instance), if an acceptable appearance cannot be attained by finishing a partial area.

1. CMU Walls – Grout small penetrations closed. Tooth in new blocking for holes large than one CMU.
2. Brick Masonry Walls – Tooth in with existing brick if possible, or new brick and mortar to match color and finish pattern.
3. Gypsum Board Walls & Ceilings – Replace with new gypsum board and finish to match existing or new condition, respectively.
4. Structural Metal Roof/Floor Decking – Replace with new decking, same as existing size. Insulation thickness and roofing materials to match existing roof system.
5. Concrete Floors & Walls – Grout penetrations closed, or place new concrete and rebar as required for large openings.
6. Wood floors & Walls – Patch consistent with type of wood.

END OF SECTION 23 0002

SECTION 23 0004 – FIRESTOPPING FOR HVAC SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes through-penetration firestop systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items.

B. Related Sections:

1. 23 0529 Pipe Hangers, Supports, and Penetrations

1.2 PERFORMANCE REQUIREMENTS

A. General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.

B. Rated Systems: Firestopping assemblies shall be tested and rated in accordance with ASTM E814 (ANSI/UL 1479) Fire Tests of Through-Penetration Fire Stops (minimum positive pressure of .01 inches of water column) and E119 (ANSI/UL 263) Fire Tests of Building Construction and Materials Time-Temperature Curve. Firestopping shall provide an “F” fire rating equal to that of the construction being penetrated. Firestop systems shall meet all requirements of the Ohio Building Code.

C. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.

1. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.
2. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

D. For through-penetration firestop systems exposed to view or above ceilings in air return plenums, provide products with flame-spread and smoke-developed indexes of less than 25 and 50, respectively, as determined per ASTM E 84.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For each through-penetration firestop system, submit documentation, including illustrations, from a qualified testing and inspecting agency, showing each type of construction condition penetrated, relationships to adjoining construction, and type of penetrating item. Shop drawings shall be certified to ASTM E814 (ANSI/UL 1479).

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Firestopping materials shall be manufactured and/or supplied by:

1. Hilti, Inc.
2. Specified Technologies Inc.
3. 3M; Fire Protection Products Division.

2.2 FIRESTOPPING

A. Materials shall be in the form of caulk, putty, sealant, intumescent material, wrap strip, fire blocking, ceramic wool and other materials required for the UL listed assemblies. Where required, these shall be installed in conjunction with sleeves and materials for fill and damming.

PART 3 - EXECUTION

3.1 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

A. General: Installation of all materials and assemblies shall be in accordance with UL assembly drawings and the manufacturer’s instructions.

B. Installation shall be done by an experienced installer who is certified, licensed or otherwise qualified by the firestopping manufacturer as having the necessary training and experience.

C. Provide firestop system for every pipe or duct at penetration of all fire resistance rated walls and horizontal assemblies.

1. Firestop system is not required around flanges of fire dampers; dampers shall be installed per the manufacturers UL listed installation requirements. Where ducts penetrate fire rated assemblies and fire dampers are not indicated, the penetration shall be protected by an approved penetration firestop system installed as tested in accordance with ASTM E814 (ANSI/UL 1479).

2. For rated new construction horizontal assemblies, provide cast-in-place combination pre-set floor sleeve equal to Hilti CP 680.

D. Provide rigid supports for ducts or pipes on both sides of the fire resistance rated wall or assembly where required as part of the fire stop assembly.

E. Coordinate opening size and additional framing requirement with the General Contractor for each opening to meet the firestop installation requirements.

F. Annular space of penetrations of nonfire-resistant-rated floor, floor/ceiling assemblies, or the ceiling membrane of a nonfire-resistant rated roof/ceiling assembly shall be sealed with a firestopping system to resist the free passage of flame and products of combustion.

G. Smoke Barriers:
   1. Penetrations shall be sealed with a firestopping system to prevent the passage of smoke.

H. Smoke Resistive Partitions:
   1. Penetrations shall be sealed with a caulking material to prevent the passage of smoke. Non-rated smoke partitions do not require a fire stopping system.

END OF SECTION 23 0004

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SECTION 23 0513 - ELECTRICAL REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general requirements for electrical work for HVAC equipment including single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation and other electrical equipment, devices, fuses, wire, conduit and installation methods.

1.2 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.

B. Refer to the Mechanical drawings and also the Electrical drawings for requirements related to each trade. Coordinate all aspects of electrical components and wiring to complete the systems.

1.3 QUALITY ASSURANCE

A. Equipment, devices shall be designed, constructed and installed in accordance with applicable standards of NEMA and the National Electric Code. Equipment shall be tested and listed by UL or other approved agency and installed in accordance with all instructions included as part of such listing.

B. Electrical equipment, devices, fuses, wire, conduit and methods shall comply with applicable provisions of Division 26 - Electrical.

PART 2 - PRODUCTS

2.1 MOTORS

A. General duty motors shall be induction type 1750 rpm NEMA Design "B" with copper windings, Class B or F insulation, and motor enclosure to suit the application. Service factor shall be 1.15 minimum.

B. Two-speed motors shall be two-winding type with six leads unless otherwise specified.

C. Motors for other than general duty application shall be furnished to suit the application and operating environment.

D. Premium efficiency motors shall be equal to Century “E + 3”, General Electric “Energy Saver Premium Efficiency”, Baldor “Super E Premium Efficient” or Reliance “Premium Energy Efficient” series. Motor efficiencies shall be tested and conform to NEMA Standard Publication MG-1 and IEEE 112 Test Method B.

E. Motors used with variable frequency controllers shall be rated for inverter service in accordance with NEMA Standard Publication MG-1, Part 31, designed to handle 1600V at a 0.1 micro-second rise time and include Class F or H insulation, but with a Class B temperature rise. Motors shall be equipped with a maintenance free, conductive micro fiber, shaft grounding ring with a minimum of two rows of circumferential micro fibers to discharge electrical shaft currents within the motor and/or its bearings.

F. Electronically Commutated Motors – Fans
1. Motor enclosures: Open Drip Proof, Totally Enclosed Fan Cooled, Totally Enclosed Air Over, Totally Enclosed Non-Vented
2. Electronic commutation type motor (ECM) specifically designed for fan applications. AC induction type motors are not acceptable. Examples of unacceptable motors are: Shaded Pole, Permanent Split Capacitor (PSC), Split Phase, Capacitor Start and 3 phase induction type motors.
3. Motors are permanently lubricated, heavy duty ball bearing type to match with the equipment load and pre-wired to the specific voltage and phase.
4. Internal motor circuitry to convert AC power supplied to the fan to DC power to operate the motor or integrated variable frequency drive.
5. Motor shall be speed controllable down to 20% of full speed (80% turndown). Speed shall be controlled by either a potentiometer dial mounted at the motor or by a 0-10 VDC signal.
6. Motors can achieve up to 95% efficiency, model and horsepower dependent.

G. Motor sizes shown on the drawings are to be considered minimum. Motors furnished shall be sized so as to not operate in the service factor range. Motors for direct driven pumps and fans shall be selected so as to not operate in the service factor range at any point on the curve.

H. The HVAC Contractor and equipment suppliers shall compare the electrical power requirements of the intended equipment with power feeders to the equipment shown on the Electrical drawings. Verify adequacy and compatibility of voltage, phase, wiring, capacity, number and size of conductors (versus equipment connection points), fusing and other information on the electrical and mechanical drawings to that required for the equipment. If the selected equipment requires revision of the electrical, added cost must be borne by the HVAC Contractor.

2.2 STARTERS

A. Magnetic starters shall comply with provisions of Division 26 - Electrical Specifications and shall be NEMA construction (IEC rated not acceptable) with thermal overload element on each phase, 115 volt control voltage and hand-off-automatic switch, where appropriate. An integral control transformer shall be incorporated in the starter for each motor of 200 volt and greater. A single control transformer is acceptable for multiple motor packaged equipment, however, when

such is the manufacturer's standard. Duplex type units (pumps, compressors, etc.) are not included in this exception. A control transformer shall be provided in each starter to insure standby operating capability.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Motor connections of factory assembled equipment shall be made with flexible conduit except for plug-in electric cord connections.

B. All power wiring shall be run in conduit. Control wiring shall be run in conduit except where open wiring is permitted in other applicable specification sections.

C. Fuses shall be furnished and installed in fuse clips of equipment and switches provided by the Mechanical Contractors.

D. If a non-basis of design manufacturer is provided by the HVAC contractor and the specific unit has a powered component with a MCA and/or MOCP greater than the basis of design, the HVAC contractor shall be responsible to provide all required electrical changes required to power the non-basis of design unit. The HVAC contractor shall coordinate with the Electrical Contractor any variances in the MCA and/or MOCP of the units provided.

END OF SECTION 23 0513

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SECTION 23 0529 – PIPE HANGERS, SUPPORTS, AND PENETRATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Steel pipe hangers and supports.
2. Trapeze pipe hangers.
3. Hanger Rods and Attachments.
4. Pipe Riser Supports
5. Roof Supports
6. Pipe Sleeves, Openings, Penetrations, Escutcheons, and Curbs

B. Refer to Division 23 Section “Ductwork” for duct hangers and supports.

C. Related sections

1. 23 0004 Fire Stopping for HVAC Systems

1.2 DEFINITIONS

A. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.3 PERFORMANCE REQUIREMENTS

A. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.

B. Design seismic-restraint hangers and supports for piping and obtain approval from authorities having jurisdiction.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Steel pipe hangers and supports.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1 STEEL PIPE HANGERS

A. Hangers and supports for piping shall be equal to the Anvil catalog numbers as follows:

1. General Service – clevis type – Anvil Fig. 260.

2. Uninsulated Copper Tubing - copper plated clevis type – Anvil Fig. CT-65 (or plastic coated clevis).

3. Where the length of the hanger rod between the top of the hanger and the attachment is 3" or less, clevis type hangers with rollers, Anvil Fig. 181, shall be used to allow for expansion travel.

B. Hangers on insulated horizontal piping shall be oversized to surround the pipe insulation. To protect the insulation from damage or inordinate compression due to concentrated weight, the following shall be provided at each hanger:

1. Pipe 2" and smaller – Anvil Fig. 168 18 ga. sheet metal rib-lock shield with belled ends, 12" long.

2. Pipe 2-1/2" and larger – Factory fabricated assembly equal to Pipe Shields, Inc. A1000.

2.2 TRAPEZE HANGERS

A. Trapeze hangers for numerous pipes run in parallel may be utilized. Horizontal support members shall be unistrut type section with pipe rollers (to allow for expansion travel) and spring and nut connectors, suspended with hanger rods and attachments similar to individual pipe hanger suspension.

2.3 HANGER RODS AND ATTACHMENTS

A. Hanger rods shall be solid steel, threaded-end or all-thread rod, of diameter listed below. A hanger attachment device (for attachment to the structure) and locking nuts at the hanger attachment shall be provided on each hanger. Locking nuts shall be provided at each clevis hanger.

B. Pipe Hanger Rod Size Schedule

Pipe Size	Min. Rod Dia.
1" and smaller	1/4"
1-1/4" to 3"	3/8"
4” to 6”	1/2”
8”	5/8”
10”	3/4”
12”	7/8”
14” to 16”	1”
18” to 20”	1-1/4”

C. Hanger rod attachment devices for attachment to the structure shall be:

1. After-set steel expansion type concrete inserts.

2. Beam clamps for steel construction equal to Anvil Fig. 92, 93, or 94. Utilize swivel type in sloped steel construction to provide vertical support of pipe without bending hanger rods.

3. Side beam bracket for wood construction equal to Anvil Fig. 206.

2.4 PIPE RISERS SUPPORTS

1. Insulated Pipe size 1-1/2” and smaller shall be factory (Pipe Shields E1000) or shop fabricated assembly Anvil Fig. 261 with high density calcium silicate insulation and galvanized steel jacket.

2. Insulated Pipe size 2” and greater shall be factory fabricated assembly Pipe Shields, Inc. E1000 or approved equal.

3. Un-insulated copper tubing – Anvil Fig CT-121 or CT-121C

4. Un-insulated steel piping – Anvil Fig. 261.

2.5 ROOF SUPPORTS

A. Pipe supports for pipe running across the roof shall be manufactured by Advanced Support Products #REC-SA or approved equal, requiring no penetration of the roofing membrane. The support system shall consist of round injection molded polypropylene bases, 12 gauge hot dipped galvanized Unistrut framing and adjustable hot dipped galvanized or cadmium plated hangers and cadmium plated hanger rods as detailed. Furnish protective slip sheets of roofing membrane for installation under the bases.

2.6 PIPE SLEEVES, OPENINGS, PENETRATIONS, ESCUTCHEONS AND CURBS

A. Piping Wall and Floor Sleeves – Non-Fire Rated Assemblies:

1. New Piping – New or Existing Walls and Floors
   a. Poured Concrete - Schedule 40 black steel pipe of 18-gauge galvanized steel
   b. Assemblies other than poured concrete – schedule 40 black steel pipe or 26-gauge galvanized sheet.
2. Existing Piping – New Walls and Floors
   a. Poured Concrete Floors – 18-gauge Galvanized sheet metal
   b. New walls and partitions – 26-gauge Galvanized sheet metal

B. Piping Wall and Floor Sleeves – Rated Assemblies

1. Refer to specification 23 0004 for requirements.

C. Exterior, Concrete Walls Below Grade

1. Cast iron pipe or Schedule 40 galvanized steel pipe in exterior walls below grade, with intermediate wall stop and anchor collar set in place before concrete pouring. Sleeve shall be a part of the sealing assembly. When the wall opening is core drilled the wall sleeve may be omitted. A mechanically compressed rubber sealing assembly equal to Thunderline Corp. “Link-Seal” shall be placed in the annular space between pipe and sleeve or core drilling.

D. Roof Deck or Waterproof Floor Membrane Penetrations

1. J.R. Smith 1720, or equal, riser sleeve with clamping ring and auxiliary pipe sleeve extending 4” above finished floor or 8’ above finished roof. Waterproofing membrane for roof and floor construction shall be secured by the clamping ring. These are to be used in areas having special membrane waterproofing in or on the floor slab and at roof decks.

2. Concrete curbs may be formed and poured around multiple pipe risers in rooms with waterproofing floor membrane, in lieu of the Smith 1720 riser sleeve and clamping ring. Curbs shall be 4” wide x 4” high with chamfered corners. Membrane and curbing shall be arranged to maintain the integrity of the membrane. Pipe sleeves shall be as described for normal areas or extended to the top level of the curb where the concrete is full depth throughout the curbed area.

3. Piping and conduits extending through the roof may be fitted with a manufactured pipe curb weatherproofing assembly equal to Sigrist Pipe Chase Housing or approved equal as an alternative to riser sleeves with clamping rings specified above. Provide 14” roof curb and all required piping exit seals.

E. Escutcheon Plates

1. Escutcheon plates shall be split-ring chromium plated pressed steel. Plates shall be sized to cover the surface penetration and sleeve. Plates shall be installed on exposed piping in finished rooms and areas where pipes penetrate walls, floors, ceilings or overhead structure.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Spacing of hangers shall be as follows:

1. Steel pipe - Horizontal:
   a. 2” and smaller – 8 ft. intervals
   b. 2-1/2” thru 6” – 10 ft. intervals
   c. 8” and larger – 12 ft. intervals.

2. Copper Tubing – Horizontal
   a. 1-1/4” and smaller – 6 ft. intervals
   b. 1-1/2” – 2” – 8 ft. intervals
   c. 2-1/2” and larger – 10 ft. intervals

B. Refer to hanger installation details on drawings for installation information supplemental to this specification section.

C. Attachment of pipe hangers to the structure shall be with:

1. After-set concrete inserts, in 4" minimum depth concrete, set in drilled holes. Powder actuated driven fasteners are not permitted.

2. Provide anchoring where steel beam clamps are attached to sloping surfaces of beam flanges and where otherwise required to insure permanent attachment.

3. Attachment to steel deck is prohibited. Span from steel structural members with supplementary steel shapes where direct attachment to structural members is not practical. This does not apply to steel deck with concrete slab poured deck. Refer to notes 1 and 2 above.

D. Pipe hangers shall be adjusted to proper elevation and all hanger rods set in a vertical position before pipe insulation is installed.

E. Extended legs of pipe riser clamps shall be shortened as needed to maintain concealment of the clamp within the pipe chase. Insure that adequate support is still maintained.

F. Hanger assemblies which will remain exposed on completion of the project shall be painted before installation.

G. Pipe supports manufactured by Advanced Support Products or the approved equal for pipe running across the roof shall be installed in accordance with the manufacturer's instructions and as detailed. Install protective slip sheets of roofing membrane under the bases to satisfy requirements of both the roofing manufacturer and the support system manufacturer.

H. Pipe supports manufactured by Pate or the approved equal shall be installed per the manufacturer's instructions and flashed into place by a certified roofing contractor.

3.2 PIPE SLEEVES

A. Pipe sleeves shall be placed in the initial stages of construction before concrete, masonry and other general construction activity. Means shall be taken to assure that the sleeve will not move during or after construction. Beams, columns and other structural members shall not be sleeved except upon approval of the Architect.

B. Sleeves are not required in the following:

1. In floor slabs on grade.

2. In stud and gypsum board or plaster walls and partitions which are not fire rated.

3. For uninsulated pipe passing thru masonry walls and partitions and stud and gypsum board or plaster walls and partitions. Sleeves are required however, for uninsulated condenser water piping, and hydronic heat pump piping, for which expansion, contraction and other pipe movement can be expected.

4. In core drilled openings in solid concrete not requiring water protection. Sleeves are required, however, at core drilling thru hollow pre-cast slabs and concrete block walls, to facilitate containment of required firestopping material.

5. In large floor openings for multiple pipe and duct risers which are within a fire rated shaft, unless the opening is to be closed off with concrete or other material after pipe are set.

C. Length of wall sleeves shall be such that the sleeve ends are substantially flush with both sides of the wall or partition. Floor sleeves shall be flush with the bottom and top of the floor slab except, in mechanical rooms and other areas which might have water on the floor, sleeves shall project a minimum of 1" above finished floor. Pipe sleeves shall be sized to allow insulation to pass thru the sleeve, for insulation requiring continuous vapor barrier (domestic cold water, chilled water refrigerant, etc.). Where vapor barrier continuity is not needed, the sleeve may be sized to pass the pipe only or the insulation as well. Refer to the following paragraph for qualification and exceptions relating to firestopping.

D. Pipe sleeves which are part of firestopping assemblies shall conform to the requirements of the assembly with particular emphasis regarding size, annular space, length, passage or non-passage of insulation and the installation of the sleeves.

E. Where firestopping is not required per this section and specification 23 0004, the annular space between the sleeve, core drilling or opening and the pipe or pipe insulation shall be closed with caulking to retard the passage of smoke.

F. Where uninsulated pipes requiring no pipe sleeves pass through non-fire wall or partition, the annular space shall be closed with material and methods compatible with the wall or partition material (Type M masonry grout, drywall joint compound, plaster, etc.).

END OF SECTION 23 0529

SECTION 23 0548 - VIBRATION CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Vibration Isolators

1.2 SUBMITTALS

A. Product Data: For each product indicated.

B. Shop Drawings: Indicate inertia bases and locate vibration isolators.

PART 2 - PRODUCTS

2.1 VIBRATION ISOLATORS

A. Open Spring Isolator

1. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection. Color code springs for load carrying capacity.
2. Spring Mounts: Provide with leveling devices, 0.25 inch neoprene sound pads and zinc chromate plated hardware.
3. Mason Industries Series “SLFH”

B. Housed Spring Isolators

1. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection. Color code springs for load carrying capacity.
2. Spring Mounts: Provide with leveling devices, 0.25 inch neoprene sound pads and zinc chromate plated hardware.
3. Restraint Housing: Cast steel housing with non-adjustable neoprene sponge inserts
4. Mason Industries Series “C”.

C. Neoprene Mounts

1. Mount: Double deflection neoprene with a minimum static deflection of 0.35”. All metal surfaces shall be neoprene covered to prevent corrosion and have friction pads both top and bottom.
2. Mason Industries Series “ND”

D. Neoprene Pad Isolators

1. Pad shall be 1” thick sandwich type consisting of a 0.5” cork center with 0.25” neoprene waffle pad top and bottom.
2. Mason Industries Series “NK”.

E. Spring Hanger

1. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection. Color code springs for load carrying capacity.
2. Housings: Neoprene in shear or double deflection LDS rubber upper and lower elements.
3. Mason Industries Series “30N”

F. Neoprene in Shear Hanger

1. Element: Double deflection LDS rubber isolator color coded for load carrying capacity.
2. Mason Industries Series “HD”.

G. Concrete Inertia Base

1. Forms: Rectangular concrete pouring forms including minimum 0.5” bars welded in place on 6” centers running both ways.
2. Templates: Forms shall be furnished with steel templates to hold the anchor bolt sleeves and anchor bolts while concrete is being poured.
3. Springs: Springs shall be as specified in Open Springs above.
4. Mason Industries Series “K” or “BMK”

2.2 MANUFACTURERS

A. Mason Industries.

B. Kinetics Noise Control

C. Amber Booth

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Isolators installed outside shall be furnished weather protected with springs PVC coated and other ferrous parts hot dip galvanized or cadmium plated.

B. Isolators for chillers, cooling towers, boilers and other equipment with significant water capacity shall be equipped with vertical limit stops.

3.2 INSTALLATION

A. Follow manufacturer's instructions in setting and adjusting isolators. Insure that no direct hard surface to surface contact occurs. Fasten device to floor as recommended by the isolation supplier.

B. Where electrical connections are to be made to equipment mounted on isolators, inform the Electrical Contractor to connect to the equipment with flexible conduits.

C. See Specification Section 23 0529 Pipe Hangers and Supports for spring hanger locations and hanger installation requirements.

D. Adjust isolators after piping system is at operating weight.

E. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

F. Adjust active height of spring isolators.

G. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION 23 0548

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SECTION 23 0553 - IDENTIFICATION FOR HVAC SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Equipment Labels.
2. Pipe Labels.
3. Warning Markers.
4. Valve Tags.
5. Duct Labels.
6. Controls Equipment Labels.

1.2 SUBMITTAL

A. Product Data: For each type of product indicated.

1.3 QUALITY ASSURANCE

A. Labels, tags and markers shall comply with ANSI A13.1 for lettering size, colors and length of color field.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Each item or major equipment shall be labeled. This shall include split-systems, radiant heaters, fans, rooftop units, tanks and other similar equipment.

B. Labeling shall be:

1. Permanently attached engraved brass or plastic laminated signs with 1” high lettering. Signs on exterior equipments shall be brass.

2. In addition to the labeling attached to each VAV terminal unit, provide a colored sticker on the ceiling grid below each VAV to mark it’s location.

2.2 PIPE LABELS

A. Pipe markings shall be applied to all piping.

B. Labeling shall be:

1. Plastic semi-rigid snap-on type, manufacturer's standard pre-printed color coded pipe markers extending fully around the pipe and insulation or pressure-sensitive vinyl pipe markers similar to above.

2. On piping and insulation 6" and greater diameter, full band as specified above or strip-type markers fastened to the pipe or insulation with laminated or bonded application or by color-coded plastic tape not less than 1-1/2" wide, full circle at both ends of the marker.

C. Identification markings shall include service (e.g. hot, chilled, steam) and arrows indicating direction of fluid flow provided integral with the pipe marker or separate at each marker.

2.3 WARNING MARKERS

A. Underground line marker tape shall be permanent bright-colored, plastic with continuous identification lettering. Tape over service lines that cannot be detected by a metal detector shall be multi-ply with an aluminum foil core.

2.4 VALVE TAGS

A. Each shutoff valve, other than at equipment, shall be identified with a stamped tag. Valves and tagging shall be scheduled, typewritten on 8-1/2" x 11" paper, tabulating valve number, piping system, abbreviation, location of valve (room or area) and service (e.g. – south wing reheat boxes).

B. Valve tags shall be polished brass or plastic laminate with solid brass S hook. Tags shall be engraved with "H" for HVAC and the designated number.

2.5 DUCT LABELS

A. Duct markings shall be applied to all ductwork.

B. Identification markings shall include service (e.g. supply, return, exhaust, outside air) and direction of air flow provided integral with duct marker or separate at each marker.

C. Duct markings shall be laminated plastic color-coded pressure sensitive vinyl tape, 2-1/2" width, 3 mil minimum thickness.

2.6 CONTROLS EQUIPMENT LABELS

A. Each controls device or major controls equipment shall be labeled to match controls drawings. This shall include thermostats, switches, sensors, controllers, panels and other similar equipment.

1. Equipment labels - Self-Adhesive, Engraved, Laminated Phenolic Label: Adhesive backed, with black letters on a white background. Minimum letter height shall be 3/8 inch.

2. Device labels - Marker Tape: Self-laminating, clear polyester, 3/8” high tape with black lettering.

B.

2.7 ACCEPTABLE MANUFACTURERS

A. Labels, markings and tags shall be manufactured by:
1. W.H. Brady
2. Seton
3. Allen
4. Industrial Safety Supply

PART 3 - EXECUTION

3.1 INSTALLATION

A. Identification marking and tagging shall be applied after insulation and painting has been completed.

B. Coordinate names, abbreviations and other designations used in mechanical identification work, with corresponding designations shown, specified or scheduled on drawings.

C. The Plumbing, Fire Suppression and HVAC Contractors shall coordinate labeling, marking and tagging to attain coordinated and consistent systems of identification.

D. Equipment labeling shall consist of unit designation as shown on the drawings. Exhaust labeling shall also indicate service of room or area of service.

E. Pipe and duct markers shall be placed at 25 ft. centers in mechanical rooms and concealed spaces and at 50 ft. centers in other exposed locations.

F. Refer to appropriate sections of this specification for installation of underground line marker tape.

G. Valve tags shall be placed on each valve except those intended for isolation of individual items of equipment. Valve tag schedules shall be prepared as specified above.

END OF SECTION 23 0553

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SECTION 23 0593 - TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes TAB to produce design objectives for the following:

1. Air Systems:

    a. Constant-volume air systems.
    b. Variable-air-volume systems.
    c. Multizone systems.

2. Hydronic Piping Systems:

    a. Constant-flow systems.
    b. Variable-flow systems.

3. HVAC equipment quantitative-performance settings.
4. Kitchen hood airflow balancing.
5. Existing systems TAB.
6. Verifying that automatic control devices are functioning properly.
7. Reporting results of activities and procedures specified in this Section.

1.2 SUBMITTALS

A. Certified TAB Reports: Submit two copies of reports prepared, as specified in this Section, on approved forms certified by TAB firm.

1.3 QUALITY ASSURANCE

A. TAB Firm Qualifications: Engage a TAB firm certified by AABC or NEBB.

B. Certification of TAB Reports: Certify TAB field data reports. This certification includes the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
2. Certify that TAB team complied with approved TAB plan and the procedures specified and referenced in this Specification.

C. TAB Report Forms: Use standard forms from AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems." NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems." SMACNA's TABB "HVAC Systems - Testing, Adjusting, and Balancing."

D. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1.

E. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1.

1.4 PROJECT CONDITIONS

A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

B. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.5 COORDINATION

A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist TAB activities.

B. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

1. Verify that balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.

B. Examine approved submittal data of HVAC systems and equipment.

C. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Sections have been performed.

D. Examine system and equipment test reports.

E. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and

fittings, and manual volume dampers, are properly installed, and that their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

F. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.

G. Examine HVAC equipment to ensure that clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

H. Examine terminal units, such as variable-air-volume boxes, to verify that they are accessible and their controls are connected and functioning.

I. Examine strainers for clean screens and proper perforations.

J. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.

K. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

L. Examine system pumps to ensure absence of entrained air in the suction piping.

M. Examine equipment for installation and for properly operating safety interlocks and controls.

N. Examine automatic temperature system components to verify the following:

1. Dampers, valves, and other controlled devices are operated by the intended controller.
2. Dampers and valves are in the position indicated by the controller.
3. Integrity of valves and dampers for free and full operation and for tightness of fully closed and fully open positions. This includes dampers in multizone units, mixing boxes, and variable-air-volume terminals.
4. Automatic modulating and shutoff valves, including two-way valves and three-way mixing and diverting valves, are properly connected.
5. Sequence of operation for control modes is according to the Contract Documents.
6. Controller set points are set at indicated values.
7. Interlocked systems are operating.
8. Changeover from heating to cooling mode occurs according to indicated values.

O. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures.

B. Complete system readiness checks and prepare system readiness reports. Verify the following:

1. Permanent electrical power wiring is complete.
2. Hydronic systems are filled, clean, and free of air.
3. Automatic temperature-control systems are operational.

4. Equipment and duct access doors are securely closed.
5. Balance, smoke, and fire dampers are open.
6. Isolating and balancing valves are open and control valves are operational.
7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
8. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" SMACNA's TABB "HVAC Systems - Testing, Adjusting, and Balancing" and this Section.

1. Comply with requirements in ASHRAE 62.1-2004, Section 7.2.2 - "Air Balancing."

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to insulation Specifications for this Project.

C. Mark equipment and balancing device settings with paint or other suitable, permanent identification material, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. For variable-air-volume systems, develop a plan to simulate diversity.

D. Determine the best locations in main and branch ducts for accurate duct airflow measurements.

E. Check airflow patterns from the outside-air louvers and dampers and the return- and exhaust-air dampers, through the supply-fan discharge and mixing dampers.

F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

G. Verify that motor starters are equipped with properly sized thermal protection.

H. Check dampers for proper position to achieve desired airflow path.

I. Check for airflow blockages.

J. Check condensate drains for proper connections and functioning.

K. Check for proper sealing of air-handling unit components.

L. Check for proper sealing of air duct system.

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure fan static pressures to determine actual static pressure as follows:

    a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.
    b. Measure static pressure directly at the fan outlet or through the flexible connection.
    c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.
    d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

2. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.

    a. Simulate dirty filter operation and record the point at which maintenance personnel must change filters.

3. Measure static pressures entering and leaving other devices such as sound traps, heat recovery equipment, and air washers, under final balanced conditions.
4. Compare design data with installed conditions to determine variations in design static pressures versus actual static pressures. Compare actual system effect factors with calculated system effect factors to identify where variations occur. Recommend corrective action to align design and actual conditions.
5. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan-speed changes.
6. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full cooling, full heating, economizer, and any other operating modes to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.

1. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved.

a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.

2. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

C. Measure terminal outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.

D. Adjust terminal outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using volume dampers rather than extractors and the dampers at air terminals.

1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 PROCEDURES FOR VARIABLE-AIR-VOLUME SYSTEMS

A. Compensating for Diversity: When the total airflow of all terminal units is more than the indicated airflow of the fan, place a selected number of terminal units at a maximum set-point airflow condition until the total airflow of the terminal units equals the indicated airflow of the fan. Select the reduced airflow terminal units so they are distributed evenly among the branch ducts.

B. Pressure-Independent, Variable-Air-Volume Systems: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:

1. Set outside-air dampers at minimum, and return- and exhaust-air dampers at a position that simulates full-cooling load.
2. Select the terminal unit that is most critical to the supply-fan airflow and static pressure. Measure static pressure. Adjust system static pressure so the entering static pressure for the critical terminal unit is not less than the sum of terminal-unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal-unit discharge system losses.
3. Measure total system airflow. Adjust to within indicated airflow.
4. Set terminal units at maximum airflow and adjust controller or regulator to deliver the designed maximum airflow. Use terminal-unit manufacturer's written instructions to make this adjustment. When total airflow is correct, balance the air outlets downstream from terminal units as described for constant-volume air systems.
5. Set terminal units at minimum airflow and adjust controller or regulator to deliver the designed minimum airflow. Check air outlets for a proportional reduction in airflow as described for constant-volume air systems.

a. If air outlets are out of balance at minimum airflow, report the condition but leave outlets balanced for maximum airflow.

6. Remeasure the return airflow to the fan while operating at maximum return airflow and minimum outside airflow. Adjust the fan and balance the return-air ducts and inlets as described for constant-volume air systems.
7. Measure static pressure at the most critical terminal unit and adjust the static-pressure controller at the main supply-air sensing station to ensure that adequate static pressure is maintained at the most critical unit.
8. Record the final fan performance data.

C. Pressure-Dependent, Variable-Air-Volume Systems without Diversity: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:

1. Balance systems similar to constant-volume air systems.
2. Set terminal units and supply fan at full-airflow condition.
3. Adjust inlet dampers of each terminal unit to indicated airflow and verify operation of the static-pressure controller. When total airflow is correct, balance the air outlets downstream from terminal units as described for constant-volume air systems.
4. Readjust fan airflow for final maximum readings.
5. Measure operating static pressure at the sensor that controls the supply fan, if one is installed, and verify operation of the static-pressure controller.
6. Set supply fan at minimum airflow if minimum airflow is indicated. Measure static pressure to verify that it is being maintained by the controller.
7. Set terminal units at minimum airflow and adjust controller or regulator to deliver the designed minimum airflow. Check air outlets for a proportional reduction in airflow as described for constant-volume air systems.

    a. If air outlets are out of balance at minimum airflow, report the condition but leave the outlets balanced for maximum airflow.

8. Measure the return airflow to the fan while operating at maximum return airflow and minimum outside airflow. Adjust the fan and balance the return-air ducts and inlets as described for constant-volume air systems.

D. Pressure-Dependent, Variable-Air-Volume Systems with Diversity: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:

1. Set system at maximum indicated airflow by setting the required number of terminal units at minimum airflow. Select the reduced airflow terminal units so they are distributed evenly among the branch ducts.
2. Adjust supply fan to maximum indicated airflow with the variable-airflow controller set at maximum airflow.
3. Set terminal units at full-airflow condition.
4. Adjust terminal units starting at the supply-fan end of the system and continuing progressively to the end of the system. Adjust inlet dampers of each terminal unit to indicated airflow. When total airflow is correct, balance the air outlets downstream from terminal units as described for constant-volume air systems.
5. Adjust terminal units for minimum airflow.
6. Measure static pressure at the sensor.
7. Measure the return airflow to the fan while operating at maximum return airflow and minimum outside airflow. Adjust the fan and balance the return-air ducts and inlets as described for constant-volume air systems.

3.7 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer, model, and serial numbers.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass for the controller to prove proper operation. Record observations, including controller manufacturer, model and serial numbers, and nameplate data.

3.8 PROCEDURES FOR CONDENSING UNITS

A. Verify proper rotation of fans.

B. Measure entering- and leaving-air temperatures.

C. Record compressor data.

3.9 PROCEDURES FOR HEAT-TRANSFER COILS

A. Water Coils: Measure the following data for each coil:

1. Entering- and leaving-water temperature.
2. Water flow rate.
3. Water pressure drop.
4. Dry-bulb temperature of entering and leaving air.
5. Wet-bulb temperature of entering and leaving air for cooling coils.
6. Airflow.
7. Air pressure drop.

B. Electric-Heating Coils: Measure the following data for each coil:

1. Nameplate data.
2. Airflow.
3. Entering- and leaving-air temperature at full load.
4. Voltage and amperage input of each phase at full load and at each incremental stage.
5. Calculated kilowatt at full load.
6. Fuse or circuit-breaker rating for overload protection.

C. Refrigerant Coils: Measure the following data for each coil:

1. Dry-bulb temperature of entering and leaving air.
2. Wet-bulb temperature of entering and leaving air.

3. Airflow.
4. Air pressure drop.
5. Refrigerant suction pressure and temperature.

3.10 PROCEDURES FOR TEMPERATURE MEASUREMENTS

A. During TAB, report the need for adjustment in temperature regulation within the automatic temperature-control system.

B. Measure indoor wet- and dry-bulb temperatures every other hour for a period of two successive eight-hour days, in each separately controlled zone, to prove correctness of final temperature settings. Measure when the building or zone is occupied.

C. Measure outside-air, wet- and dry-bulb temperatures.

3.11 PROCEDURES FOR TESTING, ADJUSTING, AND BALANCING EXISTING SYSTEMS

A. Perform a preconstruction inspection of existing equipment that is to remain and be reused.

1. Measure and record the operating speed, airflow, and static pressure of each fan.
2. Measure motor voltage and amperage. Compare the values to motor nameplate information.
3. Check the refrigerant charge.
4. Check the condition of filters.
5. Check the condition of coils.
6. Check the operation of the drain pan and condensate drain trap.
7. Check bearings and other lubricated parts for proper lubrication.
8. Report on the operating condition of the equipment and the results of the measurements taken. Report deficiencies.

B. Before performing testing and balancing of existing systems, inspect existing equipment that is to remain and be reused to verify that existing equipment has been cleaned and refurbished.

1. New filters are installed.
2. Coils are clean and fins combed.
3. Drain pans are clean.
4. Fans are clean.
5. Bearings and other parts are properly lubricated.
6. Deficiencies noted in the preconstruction report are corrected.

C. Perform testing and balancing of existing systems to the extent that existing systems are affected by the renovation work.

1. Compare the indicated airflow of the renovated work to the measured fan airflows and determine the new fan, speed, filter, and coil face velocity.
2. Verify that the indicated airflows of the renovated work result in filter and coil face velocities and fan speeds that are within the acceptable limits defined by equipment manufacturer.

3. If calculations increase or decrease the airflow and water flow rates by more than 5 percent, make equipment adjustments to achieve the calculated airflow and water flow rates. If 5 percent or less, equipment adjustments are not required.
4. Air balance each air outlet.

3.12 TEMPERATURE-CONTROL VERIFICATION

A. Verify that controllers are calibrated and commissioned.

B. Check transmitter and controller locations and note conditions that would adversely affect control functions.

C. Record controller settings and note variances between set points and actual measurements.

D. Check the operation of limiting controllers (i.e., high- and low-temperature controllers).

E. Check free travel and proper operation of control devices such as damper and valve operators.

F. Check the sequence of operation of control devices. Note air pressures and device positions and correlate with airflow and water flow measurements. Note the speed of response to input changes.

G. Check the interaction of electrically operated switch transducers.

H. Check the interaction of interlock and lockout systems.

I. Check main control supply-air pressure and observe compressor and dryer operations.

J. Record voltages of power supply and controller output. Determine whether the system operates on a grounded or nongrounded power supply.

K. Note operation of electric actuators using spring return for proper fail-safe operations.

3.13 TOLERANCES

A. Set HVAC system airflow and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus 5 to plus 10 percent.
2. Air Outlets and Inlets: 0 to minus 10 percent.
3. Heating-Water Flow Rate: 0 to minus 10 percent.
4. Cooling-Water Flow Rate: 0 to minus 5 percent.

3.14 FINAL REPORT

A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in three-ring binder, tabulated and divided into sections by tested and balanced systems.

B. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.

1. Include a list of instruments used for procedures, along with proof of calibration.

C. Final Report Contents: In addition to certified field report data, include the following:

1. Pump curves.
2. Fan curves.
3. Manufacturers' test data.
4. Field test reports prepared by system and equipment installers.
5. Other information relative to equipment performance, but do not include Shop Drawings and Product Data.

D. General Report Data: In addition to form titles and entries, include the following data in the final report, as applicable:

1. Title page.
2. Name and address of TAB firm.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB firm who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer, type size, and fittings.
14. Notes to explain why certain final data in the body of reports varies from indicated values.
15. Test conditions for fans and pump performance forms including the following:

    a. Settings for outside-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Face and bypass damper settings at coils.
    e. Fan drive settings including settings and percentage of maximum pitch diameter.
    f. Inlet vane settings for variable-air-volume systems.
    g. Settings for supply-air, static-pressure controller.
    h. Other system operating conditions that affect performance.

END OF SECTION 23 0593

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SECTION 23 0713 - DUCT INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Insulation Materials:

a. Fiberglass.

2. Protective Jacketing

1.2 SUBMITTALS

A. Product Data:

1. For each type of product indicated.

2. Thickness and covering table.

1.3 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

PART 2 - PRODUCTS

2.1 GENERAL

A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

2.2 INSULATION MATERIALS

A. Refer to 'Ductwork Insulation Schedule'.

2.3 PROTECTIVE METAL JACKETING

A. Protective jacketing shall be:

1. 0.016" Aluminum

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation shall be done by tradesmen specializing in insulation work in strict accordance with manufacturer's recommendations.

B. Ductwork shall be sealed prior to installation of insulation.

C. Insulation shall be marked with manufacturer, "R-Value", and flame spread and smoke development.

D. Blanket insulation shall be wrapped tight to the duct. Insulation shall be secured to ducts 20" wide and greater with weld pins and fasteners, 18" on center maximum. Adhesive shall be applied to the duct as an aid to installation and adhesion. Vapor barrier jacket shall be lapped, stapled and sealed with adhesive and 3" wide FSK pressure sensitive tape.

E. Board insulation with factory applied jacket shall be secured to the duct with weld pins and fasteners, 12" on center maximum. Vapor barrier jacket shall be lapped, stapled and sealed with adhesive and 3" wide ASJ pressure sensitive tape.

F. Ductwork which is internally lined with acoustical insulation, flexible ductwork with factory applied insulation and fiberglass ductwork need not be further insulated. Required internal lining is shown on the drawings. Refer to Section 23 3113 Ductwork and coordinate with the various trades.

G. Equipment and devices in supply ductwork which could potentially condense moisture shall be insulated. This includes but is not limited to duct coils, reheat box coils, air control dampers and valves, fire dampers, smoke dampers, final filter housings, etc.

H. Reinsulate existing ductwork where existing insulation has been damaged or removed in the performance of work in this project.

I. All exposed insulation shall be painted to match base material colors.

END OF SECTION 23 0719

SECTION 23 0719 - PIPE INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Insulation Materials:

a. Fiberglass.
b. Flexible Elastomeric.

2. Protective Jacketing

1.2 SUBMITTALS

A. Product Data:

1. For each type of product indicated.

2. Thickness and covering table.

1.3 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

B. Thicknesses shall be in compliance with most current version of ASHRAE 90.1.

PART 2 - PRODUCTS

2.1 INSULATION GENERAL

A. Products shall not contain asbestos, lead, mercury, or mercury compounds.

B. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

C. Stainless Steel Pipe Insulation Products
1. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C871.
2. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C795.

D. Refer to “Pipe Hanger Detail” on drawings for required hanger components.

2.2 INSULATION MATERIALS

A. Refer to ‘Pipe Insulation Schedule’ on drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation shall be done by tradesmen specializing in insulation work in strict accordance with manufacturer's recommendations.

B. Overlap and seal all longitudinal joints. Staples and adhesive may be used as stated above. Tape and seal cross joints. Vapor barrier shall be continuous on insulation of all cold services. Vapor barrier type mastic shall be used w here needed to maintain a vapor seal.

C. Where insulation is terminated, insulation shall be beveled at 45° and the beveled surface sealed with vapor barrier mastic. PVC caps over straight cut ends which have been vapor sealed may be used in lieu of beveling.

D. Mechanical joint fittings and couplings shall be considered as a part of the pipe line and shall be insulated. Bidders on the insulation work are cautioned to verify during the bidding period the extent of this work.

E. Insulation shall be run continuous through wall penetrations. Insulation on cold service piping shall be run through floor and wall sleeves to maintain vapor barrier continuity. Insulation on other services may likewise be run continuous when sleeve size permits. Refer to the Piping Material and Methods Section for special considerations which must be given at fire-rated wall and floor penetrations. Refer to Section 230529 - Pipe Hangers and Supports for non-compressible insulation or blocking material and sheet metal saddles required at pipe hangers. Coordinate with the piping contractor on the furnishing, installation and detailed requirements of these. Provide insulation and vapor barrier on and around supports for pipe risers of services which require vapor seal so as to prevent sweating.

F. Vertical pipe supports shall attach directly to pipe. Insulate support and all other surfaces with flexible closed cell insulation, same thickness as system insulation on cold service pipes to prevent condensation.

G. Re-insulate piping where existing insulation has been damaged or removed in the performance of work in this project.

H. Verify that piping has been tested before applying insulation materials and that piping surfaces are clean and dry, with foreign material removed.

I. Fittings, valves, flanges and other devices, both exposed and concealed, requiring insulation shall be covered same thickness as pipe insulation with:

1. Factory molded fitting insulation cover with PVC one-piece fitting cover.

2. Miter-cut segments of pipe insulation, held in place with adhesive and/or wire, filled with insulating cement smoothed to shape and covered with PVC one-piece fitting cover.

3. Fiberglass blanket insulation, held in place and covered with PVC one-piece fitting cover.

4. Oversized pipe insulation, where applicable, finished same as straight run pipe insulation.

J. Insulation is to be omitted on:
1. Hot water valves, devices, specialties and related items, 2” size and smaller, except as stated in below.
2. Hot water piping in cabinetry of fan coil units, unit ventilators, unit heaters, convectors and thru-wall A.C. units.
3. Hot water piping between the coil and control valve when the control valve is located within 4 feet of the coil and the pipe size is 1” or less.
4. Steam traps and associated unions.
5. Blow-down piping and safety relief valve discharge piping.

K. Exterior refrigerant piping shall be provided with a weather protective aluminum jacket.

L. Refrigerant piping shall be insulated per ‘Pipe Insulation Schedule’.

END OF SECTION 23 0719

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SECTION 23 0913 - INSTRUMENTS AND CONTROL DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes instruments and control devices for HVAC Direct Digital Control (DDC) systems and components.

1. Electronic Sensors
    a. Thermistor Temperature Sensors & Transmitters
    b. Humidity Sensors
    c. Pressure Transmitters & Transducers
2. Status Sensors
3. Detection Equipment
4. Thermostats
5. Humidistats
6. Actuators
7. Control Valves
8. Dampers

B. Related Sections:

1. Section 23 0914 – Control Wiring and Cabling
2. Section 23 0923 – Direct Digital Control System
3. Section 23 0950 – Variable Frequency Motor Controllers

1.2 SUBMITTALS

A. Product Data: For each control component indicated.

B. Shop Drawings:

1. Each component shall be labeled for proposed usage and its corresponding item tag per the control drawing, diagram and sequence of operation submittal.
2. Damper schedule.
3. Valve schedule.

C. Operation and maintenance data.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Where a list of manufacturers is not provided, products offered by the controls system contractor or their preferred vendor may be incorporated, subject to compliance with the specification.

B. Where a list of manufacturers is provided under components below, the product shall be selected only from the list of manufacturers provided.

2.2 CONTROL SYSTEM COMPONENTS

A. Refer to Section 23 0923 “Direct Digital Control System” for manufacturers and specifications for the DDC system, including operator workstation, distributed controllers, network requirements, accessories, control software and graphic requirements.

B. Refer to Section 23 0914 “Control Wiring and Cabling” for power wiring, control cabling, transformers, fusing power distribution cabinets and power line filtering for the DDC system.

C. Control system components specified in this Section include sensors, detection equipment, indicators, thermostats, humidistats, air flow measuring stations, meters, actuators, control valves and dampers.

2.3 SENSORS AND TRANSMITTERS

A. Binary Temperature Devices

1. Low Voltage space thermostat shall be 24V, bimetal-operated type with either adjustable or fixed anticipation heater. Provide subbase with manual or automatic switching as required to perform the specified functions.
   a. Concealed Set Point adjustment
   b. 55 Deg F to 85 deg F setpoint range
   c. 2 Deg F maximum differential
   d. Vented ABS plastic cover
   e. Single or Multi-stage or modulating as required.

2. Line Voltage space thermostat shall be bimetal-actuated, open contact or bellows actuated. Provide subbase with manual or automatic switching as required to perform the specified functions.
   a. Enclosed snap-switch type, or equivalent solid-state type
   b. Heat anticipator
   c. UL Listed for electrical rating
   d. Concealed Set Point adjustment
   e. 55 Deg F to 85 Deg F setpoint range
   f. 1 Deg F maximum differential
   g. Vented ABS plastic cover
   h. Single or Multi-stage or modulating as required.

3. Low-Limit Thermostats. Low limit airstream thermostats shall be UL listed, vapor pressure type with an element 20-foot minimum length. Element shall cover the face of the coil at 1-foot centers and shall respond to the lowest temperature sensed by any 1-foot section. When one low limit stat cannot meet this requirement, provide multiple thermostats.
   a. Low Limit Thermostat shall be manually reset.
   b. Provided with one (1) set of normally closed contacts wired directly to the fan circuit.
   c. Provide with one (1) set of normally open contacts to provide an alarm to the DDC system.

B. Temperature Sensors

1. General

   a. Temperature sensors shall be thermistors or Resistance Temperature Device (RTD) and be suitable for the application. Where feasible, provide the same sensor type throughout the project. Avoid using transmitters unless necessary and approved by the engineer.

   b. Precision thermistors may be used in applications below 200 deg F. Sensor accuracy over the application range shall be 0.36 Deg F or less between 32 to 150 Deg F.

   c. Provide RTD sensors with platinum elements compatible with the digital controllers. Encapsulate sensors in epoxy, series 300 stainless steel, anodized aluminum, or copper. Temperature sensor accuracy shall be 0.1 percent (1 ohm) of expected ohms (1000 ohms) at 32 degress F. Temperature sensor stability error over five years shall not exceed 0.25 degree F cumulative. Direct connection of RTD’s to digital controllers without transmitters is preferred. When RTDs are connected directly, lead resistance error shall be less than 0.25 degrees F. The total error for a RTD circuit shall not exceed 0.5 degrees F.

   d. Provide matched temperature sensors for differential temperature measurement.

2. Duct Sensors

   a. Duct sensors shall be single point or averaging as shown. Averaging sensors shall be a minimum of 1.5m (5 feet) in length per 1m (10 sq ft) of duct cross section.

   b. Mixed air and Discharge air sensors shall be averaging type.

3. Immersion Sensors

   a. Immersion sensors shall be provided with a separable stainless steel well. Pressure rating of well is to be consistent with the system pressure in which it is to be installed. The well must withstand the flow velocities in the pipe.

4. Space Sensors

   a. Space sensors shall be equipped with a setpoint adjustment, occupancy mode override switch, display, and communication port. Sensor cover shall be rectangular high impact ABS plastic in a neutral color.

5. Outdoor Sensors

   a. Outdoor temperature sensors shall be platinum type and have a minimum accuracy of +/- 0.5 degrees F from -40 degrees F to 140 degrees F, and measuring range from -20 degrees F to 120 degrees F. Outdoor temperature sensor shall be within a ventilated enclosure that protects the sensor from thermal building mass biasing, solar radiation and precipitation without affecting performance.

C. Humidity Sensors

1. Duct and room sensors shall have a sensing range of 10% to 90%. Accuracy shall be +/- 3% of range.

2. Duct sensors shall be provided with a sampling chamber.

3. Outdoor air humidity sensors shall have a sensing range of 0% to 100% RH. Accuracy shall be +/- 5% of range. They shall be suitable for ambient conditions of -40 degrees F to 170 degrees F. Outdoor humidity sensor shall be within a ventilated enclosure that protects the sensor from thermal building mass biasing, solar radiation and precipitation without affecting performance.

4. Humidity sensors drift shall not exceed 1% of full scale per year.

D. Flow Switches

1. Flow-proving switches shall be either paddle or differential pressure type.

2. Paddle type switches (water service only) shall be UL Listed, SPDT snap-acting with pilot duty rating (125 VA minimum). Adjustable sensitivity with NEMA enclosure suitable for location.

3. Differential pressure type switches (air or water service) shall be UL Listed, SPDT snap-acting, pilot duty rated (125 VA minimum), NEMA enclosure suitable for location, with scale range and differential suitable for intended application, or as specified.

E. Relays

1. Control relays shall be UL Listed plug-in type with dust cover and LED “energized” indicator. Contact rating, configuration, and coil voltage shall be suitable for the application.

2. Time delay relays shall be UL listed solid-state plug-in type with adjustable time delay. Dalay shall be adjustable +/- 200% (minimum) from setpoint shown on plans. Contact

rating, configuration, and coil voltage shall be suitable for the application. Provide NEMA enclosure suitable for location when not installed in local control panel.

F. Override Timers

1. Override timers shall be electronic or spring-wound line voltage UL Listed, with contact rating and configuration as required by the application. Provide 0 to 6 hour calibrated dial for spring-wound type or LCD display for electronic type unless otherwise specified. Timer shall be suitable for flush mounting on control panel face and or wall as shown.

2. Push button with D.O. and lighted button

G. Current Transformers

1. AC current transformers shall be UL/CSA recognized and completely encased (except for terminals) in approved plastic material.

2. Transformers shall be available in various current ratios and shall be selected for +/- 1% accuracy at 5 A full scale output.

3. Transformers shall be split-core type for installation on new or existing wiring.

H. Voltage Transmitters

1. AC voltage transmitter shall be self-powered single loop (two-wire) type , 4 to 20 mA output with zero and span adjustment.

2. Ranges shall include 100 to 130 VAC, 200 to 250 VAC, 250 to 300 VAC, and 400 to 600 VAC full-scale, adjustable, with 1% +/- full-scale accuracy with 500 ohm maximum burden.

3. Transmitters shall be UL/CSA recognized at 600 VAC rating and meet or exceed ANSI/ISA S50.1 requirements.

I. Voltage Transformers

1. AC voltage transformers shall be UL/CSA recognized, 600 VAC rated, complete with built-in fuse protection.

2. Transformers shall be suitable for ambient temperatures of 40 to 130 degrees F, and shall provide +/- 0.5% accuracy at 24 VAC and a 5VA load.

3. Windings (except for terminals) shall be completely enclosed with metal or plastic material.

J. Surge and Transient Protection

1. Provide each digital controller with surge and transient power protection. Surge and transient protection shall consist of the following devices, installed externally to the controllers.

2. Power Line Surge Protection

   a. Provide surge suppressors on the incoming power at each controller or grouped terminal controllers. Surge suppressors shall be rated in accordance with UL 1449, have a fault indicating light, and conform to the following.
      1) The device shall be a transient voltage surge suppressor, hard-wire type individual equipment protector for 120 VAC/1 phase/2 wire plus ground.
      2) The device shall react within 5 nanoseconds and automatically reset.
      3) The voltage protection threshold, line to neutral, shall be no more than 211 volts.
      4) The devices shall have an independent secondary stage equal to or greater than the primary stage joule rating.
      5) The primary suppression system components shall be pure silicon avalanche diodes.
      6) The secondary suppression system components shall be silicon avalanche diodes or metal oxide varistors.
      7) The device shall have an indication light to indicate the protection components are functioning.
      8) All system functions of the transient suppression system shall be individually fused and not short circuit the AC power line at any time.
      9) The device shall have an EMI/RFI noise filter with a minimum attenuation of 13dB at 100 kHz to 300 MHz.
      10) The device shall comply with IEEE C62.41, Class “B” requirements and shall be tested according to IEEE C62.45.
      11) The device shall be capable of operating between -20 degrees F and +122 degrees F.

3. Telephone and Communications Line Surge Protection

   a. Provide surge and transient protection for DDC controllers and DDC network related devices connected to phone and network communication lines, in accordance with the following:
      1) The device shall provide continuous, non-interrupting protection, and shall automatically reset after safely eliminating transient surges.
      2) The protection shall react within 5 nanoseconds using only solid-state silicon avalanche technology.
      3) The device shall be installed at the distance recommended by its manufacturer.

4. Controller Input/Output Protection

   a. Provide controller inputs and outputs with surge protection via optical isolation, metal oxide varistors (MOV), or silicon avalanche devices. Fuses are not permitted for surge protection.

K. Current Switches

1. Current-operated switches shall be self-powered, solid-state with adjustable trip current. The switches shall be selected to match the current of the application and output requirements of the DDC system.

L. Water Flow Meters

1. Water flow meters shall be insertion electromagnetic type which provide current and voltage analog output for a flow rate, a high-resolution frequency output drive to peripheral devices, a scalable pulse output for totalization, and a master alarm signal.

2. Materials: Wetted metal components shall be 316 Stainless Steel. Sensor head shall be XAREC.

3. Liquid temperature range: 15 deg F to 250 deg F.

4. Ambient Temperature range: -20 deg F to 150 deg F.

5. Max. Operating pressure: 400 psi.

6. Pressure Drop: 0.1 psi at 12 ft/sec in 3” pipe, decreasing as line size increases.

7. Accuracy shall be +/- 1% of reading from 2 – 20 ft/sec, and +/- 0.02 ft/sec below 2 ft/sec.

8. Analog Output – One (1) 4-20 ma, and one (1) 0-10 V or 0-5 V.

9. Frequency Output – 0-15 V peak pluse, 0-500 Hz.

10. Scalable Output – Isolated solid-state dry contact, rated at 30 V at 1.2 A, pulse duration 0.5, 1, 2 or 6 seconds.

11. Electronics Enclosure – Weathertight NEMA 4 aluminum enclosure.

12. Onicon Model FT-3400 series or approved equal.

M. Pressure Transducers

1. Transducers shall have a linear output signal. Zero and span shall be field-adjustable.

2. Transducer sensing elements shall withstand continuous operating conditions of positive or negative pressure 50% greater than the calibrated span without damage.

3. Water pressure transducer shall have stainless steel diaphragm construction, proof pressure of 150 psi minimum. Transducer shall be complete with 1 – 5 Vdc or 4 to 20 mA output, required mounting brackets, and block and bleed valves.

4. Water differential pressure transducer shall have stainless steel diaphragm construction, proof pressure of 150 psi minimum. Over-range limit (differential pressure) and

maximum static pressure shall be 300 psi. Transducer shall be complete with 1 – 5 Vdc or 4 to 20 mA output, required mounting brackets, and five-valve manifold.

5. Air velocity pressure sensors shall use differential pressure to determine airflow rate and have repeatability within 1% of reading and an accuracy of +/- 5% of range. The velocity range shall be from 0 to 3250 FPM.

N. Differential pressure type switches (air or water service) shall be UL Listed, SPDT snap-acting, pilot duty rated (125 VA minimum), NEMA 1 enclosure, with scale range and differential suitable for intended application.

O. AIR FLOW MEASURING STATIONS

1. The probe assembly shall consist of one or more electronic air flow measuring units capable of continuously monitoring airflow. Each probe shall contain multiple electronic flow sensors and be thermal dispersion type. They shall be mounted in an array format to produce a true velocity profile. The sensors shall operate over a 350 to 7500 fpm velocity range and the velocity measured by each sensor shall output a signal directly proportional to flow to the supporting electronics. The output signal shall be fully isolated. The signal transmitter shall be an electronic device capable of receiving airflow probe signals over the probe interconnecting cables, linearizing each signal and them summing and averaging them. Finally, the signals shall be converted to a 4 to 20 MA output signal for automatic transmission to any suitable remote input and/or recording device. A 24 volt AC power supply is required for each transmitter. The control panel shall be provided with integral diagnostics including on-line zero and on-line sensor verification. It shall have an integral reference standard for field calibration of transmitter output. The output span shall be adjustable from a minimum 0 to 1000 to a maximum 7500 fpm. The transmitter assembly shall be housed in a metal enclosure having a hinged door and lock. This unit shall not require recalibration. System accuracy shall be +/- 2% of rate plus +/- 0.55 of full scale.

2. Each supply and return fan shall have an independent air flow measurement station. Multiple fan arrays shall sum flow of each fan to report a total fan array air flow.

3. The outdoor air intake damper shall have an independent air flow measuring station.

4. Air flow measuring station shall be manufactured by:

a. Ebtron Gold Series
b. Paragon Controls
c. Air Monitor
d. Tek-Air
e. Kurz

P. Antifreeze tapes shall be self-regulating plastic insulated resistance cables, having a heating density as recommended by the manufacturer for the application. Heat tape shall have an outer braid of tinned-copper and an outer jacket of modified polyolefin. Install in strict accordance with the manufacturer's recommendations, including wrapping with insulating tape. Furnish a relay under control of an outdoor thermostat to energize the tape when the outdoor temperature drops below 34 degrees F. Wire into the 120-volt outlet with is provided under the electrical

contract for this purpose. Provide a pilot light on the inside wall near the exit door which indicates that the heat tape is energized. Provide where indicated on the drawings.

a. Manufacturers:
   1) Raychem (XL-TRACE)
   2) Easy Heat
   3) Or approved equal.

2.4 DETECTION EQUIPMENT

A. Carbon Monoxide Detectors: Single or multichannel, dual-level detectors using solid-state plug-in sensors with a 3-year minimum life; suitable over a temperature range of 32 to 104°F; with 2 factory-calibrated alarm levels at 50 and 100 ppm.

B. Carbon Dioxide Sensor and Transmitter: solid-state non-dispersive infrared (NDIR) sensors

1.	Temperature range:	32 to 122°F.
2.	Measuring range:	0-2000 ppm
3.	Accuracy:	5% + or – or 75 ppm max.
4.	Calibration:	required for span only (automatic zero adjustment)
5.	Digital display:	4 digit LED
6.	Output:	0-10 VDC, 4-20 mA, selectable
7.	Alarm relay:	1000 ppm, field adjustable from 700-1300 ppm
8.	Enclosure:	High impact plastic enclosure, white approx. 5”W x 2.5”H x 2”D
9.	Duct mounted models:	Sampling inlet/outlet ports, filter, tubing, mounting hardware
10.	Calibration kit:	Canister of gas, regulator and digital calibration readout

C. Occupancy Sensor: Passive infrared, with time delay, daylight sensor lockout, sensitivity control, and 180-degree field of view with vertical sensing adjustment; for flush mounting.

D. NO_2 & CO Gas Detection System:

1. System shall be complete with digital transmitters and a multi-channel controller.
2. Transmitters:
   a. Rugged PVC enclosure with hinged door
   b. 24V DC power
   c. Auto reset thermal fuse
   d. LED indicator for power, alarm and fault
   e. RS 485 communication bus to the central controller
   f. Electrochemical sensors
   g. CETCI model DST-ECO Carbon Monoxide transmitter, 0-200 ppm (fan start at 25 ppm, alarm at 100 ppm, adj.)
   h. DST-END transmitter for Nitrogen Dioxide, 0-10 ppm (fan start at .7 ppm, alarm at 1.5 ppm, adj.)
   i. Equal to Critical Environmental Technologies DST-W Digital Transmitter
3. Multichannel Controller:
   a. Field programmable, 8 analog transmitter capacity via RS485 communication to remote digital transmitters
   b. BacNet output module
   c. Eight SPDT relays

d. Audible alarm with silence button with remote combination 103 dB horn/4" diameter strobe light
e. 24 V power supply
f. Automatic reset thermal fuse
g. Two line LCD display readings
h. UL certified
i. Equal to Critical Environmental Technologies PDC Multi-Channel Controller.

4. Provide all power and communication cabling required in conduit. Utilize eight SPDT relays to hard wire fan actuation. Monitor on DDC system via BACnet communication.
5. Calibration kit: Canister of gas, regulator and digital calibration readout.

E. Refrigerant Gas Detection Equipment System:
1. Provide a stationary refrigerant gas leak detection system designed to alarm at a specified level of refrigerant gas in monitoring areas. The instrument shall be a wall mounted device with onboard sensor, using a pump to draw aspirated samples through tubing to the sensor, from the areas where refrigerant gases are most likely to concentrate. The instrument shall be capable of sampling from an area and report data specific to each monitored channel. The refrigerant gas monitor shall meet the following specifications:
2. Coverage: single sensor onboard
3. Sensor type: Non-dispersive infrared (NDIR) sensor)
4. Gases detected: HFC, HFO, HCFC, CFC
   a. The detector shall have an on-board gas library containing calibration data for >50 refrigerant gases, configurable to select a specific refrigerant for optimized accuracy of measurement
5. Accuracy: ±1 ppm ±10% of reading from 0-1,000 ppm (±10 ppm ±15% of reading from 0-1,000 ppm for R-11, R-21, R-32, R-113)
6. Response time: T90 = 5 seconds plus sample transport time
7. Sample transport time: 19 seconds per 100 ft
8. Minimum detectable level: One part per million (1 ppm)
9. Automated zero-point calibration: The instrument shall periodically sample clean air and automatically perform a zero-point calibration
10. Number of channels: 1
11. Operating Temperature: 32°-122°F / 0°-50°C
12. Ambient Humidity: 5% to 90% RH (non-condensing).
13. Sampling Mode: sequential per channel
14. Pump rate: 6 liters per minute
15. Monitoring distance: 1,200 ft max. for combined length of sample and exhaust tubing (each channel)
16. User interface: Display screen and keypad; gas reading simultaneously displayed per channel for all channels a. Optional: Remote Display
17. Alarms: 3 levels
18. Power Status Indicator: Green LED
19. Alarm Status Indicator: Red LED, audible alarm, Modbus register, relay, display screen
20. Fault Status Indication: Yellow LED, Modbus register diagnostics, relay
21. Alarm reset: user selectable to be either manual or automatic.
22. Power: 100 to 240 VAC, 50/60 Hz, 20 W
23. Communications:
24. Modbus RTU: Baud rate 9,600 or 19,200, configurable
    a. 4 x SPDT relays: low alarm, medium alarm, high alarm, fault
    b. Optional: dual channel analog output; 4-20mA
    c. Optional: BACnet

25. Certification: UL 61010-1, CAN/CA 22.2 No. 61010-1; EN61010-1, EN61326, EN14624; CE Mark
26. Manufacturer: Bacharach, SenTech, MSA Chillgard.
27. Warranty: One (1) year.

F. Manufacturers:

1. Brasch
2. ACME
3. Critical Environment Technologies

2.5 ACTUATORS

A. Electronic Actuators: Direct-coupled type designed for minimum 60,000 full-stroke cycles at rated torque.

1. Manufacturers: Belimo Aircontrols (USA), Inc.

2. Listing: Actuators shall have ISO 9001 quality certification and be UL listed under standard 873.

3. Characteristics: Actuators shall be fully modulating/proportional, pulse width, floating/tri-state or two-position as required and be factory or field selectable. Each actuator shall have visual position indicators. Proportional actuators shall accept a 0-10VDC or 0-20mA input signal with 2-10VDC and 4-20mA operating range, respectively. Actuators shall be capable of operating on 24, 120 or 230VAC or 24VDC and Class 2 wiring as required by the application. Power consumption shall not exceed 10VA for 120V actuators and 8 watts for DC actuators. Actuators shall be capable of being mechanically and electrically parallel to increase torque if required

4. Fail-Safe Operation: Mechanical, spring-return mechanism shall be provided on all dampers and valves except where noted otherwise. Provide external, manual gear release on non-spring return actuators.

5. Valves: Size for torque required for valve close off at maximum pump differential pressure plus 25% safety factor.

6. Dampers: Size for running torque calculated as follows:

a. Parallel-Blade Damper with Edge Seals: 7 inch-lb/sq. ft. of damper.
b. Opposed-Blade Damper with Edge Seals: 5 inch-lb/sq. ft. of damper.
c. Parallel-Blade Damper without Edge Seals: 4 inch-lb/sq. ft. of damper.
d. Opposed-Blade Damper without Edge Seals: 3 inch-lb/sq. ft. of damper.
e. Dampers with 2- to 3-Inch w.g. (of Pressure Drop or Face Velocities of 1000 to 2500 fpm: Increase running torque by 1.5.
f. Dampers with 3- to 4-Inch w.g. of Pressure Drop or Face Velocities of 2500 to 3000 fpm: Increase running torque by 2.0.
g. Coupling: V-bolt and V-shaped, toothed cradle.

7. Overload Protection: Electronic overload or digital rotation-sensing circuitry.

8. Run Time: 12 seconds open, 5 seconds closed.

2.6 CONTROL VALVES

A. Control Valves: Factory fabricated, of type, body material, and pressure class based on fluid system, maximum pressure and temperature rating of piping system, unless otherwise indicated.

B. Valves shall be equipped with a manual positioner to allow positioning of the valve in the absence of power.

C. Sizing – Hydronic system control valves shall be sized as follows:
1. Two-Position: Line Size
2. Two or Three Way Modulating: 10 ft.hd. water pressure drop or as otherwise noted on the plans.

D. Ball Valves 2” and smaller

1. Body:
   a. Cast Bronze or Brass
   b. ANSI B16.5 Class 150
   c. Threaded or soldered pipe connection

2. Trim:
   a. Stem: Stainless Steel
   b. Ball: Stainless with an equal percentage flow characteristic or modified equal percentage flow characteristic for 2-way, linear for 3-way.

3. Bonnet
   a. Brass
   b. Packing: Reinforced Teflon or carbon filled Teflon and EPDM O-Ring.
   c. Seat: Reinforced Teflon or carbon filled Teflon.

E. Butterfly Valves 2.5” – 12”

1. Body:
   a. Cast Iron with extended neck or flange and insulation clearance.
   b. Flanged with full lugged connections.
2. Trim:
   a. Stem: Stainless Steel
   b. Disc: Stainless Steel, Nickel Plated Ductile Iron, or Ductile Iron coated with Nylon 11, equal percentage flow characteristics or modified equal percentage flow characteristics, bubble tight shut off.
   c. Seat: EPDM

F. Globe Valve 2” and Smaller

1. Body
   a. ANSI B16.5 Class 125 and 250
   b. Cast Bronze or Brass
   c. Threaded (FNPT), union sweat, or flared connections

2. Bonnet
   a. Brass
   b. Packing: Self-adjusting Ethylene Propylene Rubber (EPR) ring pack u-cups, spring loaded PTFE and Elastomer v-rings, or spring loaded Teflon cone.

3. Brass Trim
   a. Stem: Stainless Steel
   b. Plug: Brass, equal percentage flow characteristic or modified equal percentage flow characteristic.
   c. Replaceable Seat: Brass against molded Elastrometric disc, or bronze.

4. Stainless Steel Trim (Steam Applications)
   a. Stem: Stainless Steel
   b. Plug: Brass, equal percentage flow characteristic or modified equal percentage flow characteristic.
   c. Replaceable Seat: Stainless Steel.

G. Globe Valves 2.5” and Larger

1. Body
   a. ANSI B16.5 Class 125 and 250
   b. Cast Iron with black lacquer finish
   c. Flanged Connections

2. Bonnet
   a. Brass
   b. Packing: Ethylene Propylene Terpolymer (EPT) ring packs, EDPM O-ring, or spring loaded Teflon cone.

3. Trim
   a. Stem: 316 Stainless Steel
   b. Plug: Brass, equal percentage flow characteristic or modified equal percentage flow characteristic.
   c. Replaceable Seat: bronze.

H. Pressure-Independent Characterized Control Valves (PIV)

1. Body
   a. Brass rated at no less than 360 psi at 250 deg F.

2. Bonnet
   a. Brass
   b. Packing: Reinforced Teflon or carbon filled Teflon and EPDM O-ring.

3. Trim
   a. Stem: Brass or Stainless Steel
   b. Ball: Plated brass or Stainless Steel, equal percentage flow characteristic or modified equal percentage flow characteristic for 2-way, linear for 3-way.
   c. Disc: Thrust-bearing Teflon disc with double O-ring design.
   d. Seat: Reinforced Teflon or carbon filled Teflon with EPDM O-rings

e. Packing: EPDM O-ring.

I. Close-off Pressure Rating: Valve actuator and trim shall be furnished to provide the following minimum close-off pressure ratings.

1. Water Valves:
   a. Two-Way: 150% of total system pump head.
   b. Three -Way: 300% of pressure differential between ports A and B at design flow rate or 100% of total system pump head.

2.7 DAMPERS

A. Dampers: AMCA-rated, parallel and opposed blade design as required by the application.

B. Outside air and relief air dampers (exposed to outside air) shall be severe cold option design with the following features:

1. Frame: Extruded aluminum, 4” x 0.08” thickness with polystyrofoam insulation.
2. Blades: Extruded aluminum, double wall profile with expanded polyurethane foam insulation filled cores and thermally broken. Insulation factor of R-2.29
3. Seals: Blade and frame edge seals are extruded silicon, secured in an integral slot.
4. Bearings: Celcon inner bearing fixed to a 7/16” aluminum hexagonal blade pin, rotating within a polycarbonate outer bearing without metal-to-metal or metal-to-plastic bearing contact.
5. Linkage: Hardware mounted within the frame, aluminum and zinc plated steel construction.
6. Operating temperature: -40 to 155°F.
7. Leakage: 4.9 cfm/sq. ft. at 4” w.g., maximum

C. Return and other control dampers not exposed to outside air shall be constructed with the following features:

1. Frame: Extruded aluminum, 5” x 0.125” thickness.
2. Blades: Extruded aluminum, airfoil profile.
3. Seals: Blade seals shall be extruded EPDM. Frame seals shall be extruded TPE thermoplastic, secured in an integral slot.
4. Bearings: Molded synthetic
5. Linkage: Hardware mounted within the frame, aluminum and zinc plated steel construction.
6. Operating temperature: -72 to 275°F.
7. Leakage: 3 cfm/sq. ft. at 1.0” w.g. max.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify location of wall mounted sensors with drawings and room details before installation. Install devices to match rough in height of light switches provided by the Electrical Contractor, Coordinate location and placement with other wall mounted devices, cabinets, etc.

B. Room temperature sensors shall be installed on concealed metal junction boxes properly supported by the wall framing.

C. Install averaging elements in ducts and plenums in a serpentine pattern.

D. Low limit sensors shall be installed in a serpentine manner horizontally across the coil. Each bend shall be supported with a capillary clip. Provide 1 foot of sensing element for each 1 square foot of coil area.

E. All pipe mounted sensors shall be installed in wells. Install all liquid temperature sensors with heat-conducting fluid in thermal wells.

F. Install outdoor air temperature/humidity/enthalpy sensors on a north wall with a sun shield.

G. Local control panels shall be provided for the equipment being controlled. The panel shall be mounted in the mechanical room with the equipment it serves. Mount panels on wall or independent support structure. Do not mount on equipment.

H. Install guards on room temperature sensors and or thermostats in the following locations:

1. Entrances.
2. Public areas, such as lobbies.
3. Gymnasiums & Weight Rooms.
4. Corridors.
5. Racquet Ball Courts
6. Where indicated on drawings.

I. Automatic dampers shall be furnished by the control’s subcontractor, installed by the HVAC Contractor in accordance with Section 23 3300 "Air Duct Accessories."

J. Install damper motors on outside of duct in warm areas, not in locations exposed to outdoor temperatures.

K. Damper linkages shall be through frame hardware; linkage attachments to blades are not acceptable.

L. Damper jack shafting is not permitted, provide an actuator for each damper section.

M. Identification of Hardware And Wiring:

a. All wiring and cabling, including that within factory-fabricated panels, shall be labeled at each end within 2” of termination, with the DDC address or termination number.

b. Permanently label or code each point/object of field terminal strips to show the instrument or item served.

c. Identify control panels with minimum ½" letters on laminated plastic nameplates.

d. Identify all other control components with permanent labels. All plug-in components shall be labeled such that removal of the component does not remove the label.

e. Identify room sensors relating to terminal units or valves with adhesive stickers.

f. All identifiers shall match the naming convention on the drawings and within the DDC graphics.

3.2 SCHEDULES

A. Control Valves

System Type	Valve Type(s) (Per 2.6)	Fail Position
AHU Chilled Water Coil – 2" & Smaller	Ball, Globe	Closed
AHU Chilled Water Coil – 2.5" & Larger	Globe	Closed
AHU Hot Water Coil – 2" & Smaller	Ball , Globe	Open
AHU Hot Water Coil – 2.5" & Larger	Globe	Open
VAV Terminal Unit	Ball, PIV	In-Position
Unit Ventilators Chilled Water Coil	Ball, PIV	Closed
Unit Ventilators Hot Water Coil	Ball , PIV	Open
Unit Heaters	Ball , PIV	In-Position
Finned Tube	Ball , PIV	In-Position
Convectors	Ball , PIV	In-Position
Duct Mounted Heating Coils – 2" & Smaller	Ball, Globe	Open

Duct Mounted Heating Coils – 2.5" & Larger	Globe	Open
Chiller Isolation	Ball, Butterfly	Closed
Chiller Modulating Control – 2" & Smaller	Ball, Globe	Closed
Chiller Modulating Control – 2.5" & Larger	Globe	Closed
Boiler Isolation	Ball, Butterfly	Closed
Minimum Flow Bypass – 2" & Smaller	Ball, Globe	Open
Minimum Flow Bypass – 2.5" & Larger	Globe	Open

B. Damper Actuators

System Type	**Fail Position**
Outside Air	Closed
Exhaust Air	Closed
Return Air	Open
Supply Air	Open
Storm Shelters	Open

END OF SECTION 23 0913

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SECTION 23 0914 – CONTROL WIRING AND CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes control wiring, both line and low voltage, transformers, power distribution, fusing and panels, power filtering and communication cabling which is required to perform the automatic control functions described.

B. Related Sections:

1. 23 0913 Instruments and Control Devices
2. 23 0923 Direct Digital Control System

1.2 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Wiring, both line and low voltage, shall comply with NEC and shall be subject to approval by the local code enforcing authorities.

C. Wire, conduit and installation methods shall conform to applicable provisions of Division 26 - Electrical except that wiring smaller than No. 12 and conduit smaller than 3/4” are permitted as appropriate for the application.

D. Communication cabling shall conform to applicable provisions of Division 27- Section “Communications Horizontal Cabling”.

E. All wiring and cabling insulation in air return plenums shall not exceed maximum flame spread rating of 25 and smoke development rating of 50 as established by NFPA 255 test methods.

PART 2 - PRODUCTS

A. Power Supplies: Transformers with Class 2 current-limiting type or overcurrent protection; limit connected loads to 80 percent of rated capacity. DC power supply shall match output current and voltage requirements and be full-wave rectifier type with the following:

1. Output ripple of 5.0 mV maximum peak to peak.
2. Combined 1 percent line and load regulation with 100-mic.sec. response time for 50 percent load changes.
3. Built-in overvoltage and overcurrent protection and be able to withstand 150 percent overload for at least 3 seconds without failure.

B. Power Line Filtering: Provide internal or external transient voltage and surge suppression for workstations or controllers with the following:

1. Minimum dielectric strength of 1000 V.
2. Maximum response time of 10 nanoseconds.
3. Minimum transverse-mode noise attenuation of 65 dB.
4. Minimum common-mode noise attenuation of 150 dB at 40 to 100 Hz.

C. Power distribution, fusing and panels:

1. Power distribution transformers, fuses, termination strips etc. shall be organized in NEMA 1 enclosure panels. Panels shall be 16 gauge steel construction, with removable front cover and various size removable knockouts, arranged for surface mounting and polyester powder coat finish inside and outside, UL listed. Arrange and bundle wiring inside of panels neatly with cable ties. Panel and internal devices shall be permanently marked to correspond to power wiring diagram shop drawings provided in the operating and maintenance manual.

D. Cabling:

1. Provide CAT 5E Ethernet fiber optic cabling to interconnect major controllers and work station computer or Web server to establish the primary network configuration as determined by the direct digital control system architecture. Provide excess cabling at each connection for servicing by looping cable near the panel.
2. Secondary LON or BacNet MS/TP bus wiring to secondary controllers such as unitary controllers serving VAV boxes shall be as required by the communication protocol.
3. All cabling insulation shall be approved and labeled for use in air plenums where installed in these locations.

PART 3 - EXECUTION

3.1 ELECTRICAL POWER SUPPLIES

A. The Electrical Contractor will provide a power source to motors through his starters only. Where power sources are required beyond these starters, or beyond sources explicitly shown on the electrical drawings, these shall be provided by the Controls Contractor. Where auxiliary contacts are required on starters to perform the required functions, these too shall be provided by the Controls Contractor, where not provided under the Electrical Contract. Auxiliary relays maybe provided in lieu of auxiliary contacts.

B. Circuits serving control panels, transformers for low voltage service, and other control equipment and devices shall be independent and used for no other purpose. These shall originate from the nearest appropriate emergency electrical panel. Circuit wiring from the electrical panel shall be included in this contract. These circuits shall be clearly identified at the panels.

3.2 ELECTRICAL WIRING AND CONNECTION INSTALLATION

A. Install all work in accordance with the following:
   1. All wiring to be ran in a neat, workmanlike manner. All wiring to be tie wrapped or in conduit as per specifications. Wiring or conduit to be ran parallel or at right angles to building structure. Install all wiring free of sags. Bundle wiring together that follows a common path.
   2. All conduit, plenum wiring, and panels shall be supported directly from the building structure with beam clamps and bridle ring. Do not support from pipe, pipe hangers, threaded rod, ductwork, ductwork strapping or other conduit.
   3. Do not lay conduit or plenum wiring on acoustic ceiling tiles, grid members or uninsulated water piping. Conduit and wiring should be installed in such a way as to not interfere with removing ceiling tiles for above ceiling access.
   4. Do not run wiring near lighting ballasts or other high voltage devices that could cause interference.
   5. All line voltage wiring must be kept separate from low voltage wiring. Line and low voltage wiring may not be run in the same conduit. Line and low voltage wiring must be kept separate in control panels.
   6. Label all wire jackets at control panel/controller and at device with tag as shown on wiring details and flow diagrams.
   7. Observe proper polarity as shown on wiring diagrams when connecting 24VAC power and ground controllers and other devices. Note that all transformer secondary grounds must be tied to chassis ground as shown in wiring diagrams unless otherwise noted.
   8. Coordinate with General Contractor and all trades to perform rough-ins for temperature control sensors and devices.
   9. Coordinate with General Contractor and all trades to confirm mounting locations for temperature control panels.
   10. Completely seal all duct, unit and wall penetrations. Avoid ceiling penetrations if at all possible. Completely seal any ceiling penetrations that are absolutely necessary.
   11. All network communication wires shall be labeled at each controller with the designation or the controller that the communication wire originates from and terminates to
   12. Verify network communications and correct any issues.
   13. Clean all construction debris from inside temperature control panels before operation.

B. Install raceways, boxes, and cabinets according to Division 26 Section "Raceway and Boxes for Electrical Systems."

C. Install building wire and cable according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables." All line voltage wiring and low voltage wiring (except as stated below) shall be run in conduit. Low voltage wiring concealed above accessible ceilings and in hollow walls for drops to thermostats may be run without conduit. Open wiring dropping into walls shall be run in conduit. Thermostats shall be installed on a single gang box and conduit shall be installed to extend into the plenum. Open wiring shall be bundled and supported at 3 ft. maximum intervals with a system of J-hooks or equivalent means. Open wiring in air plenums shall be rated for such use and so labeled.

D. Install electronic and fiber-optic cables according to Division 27 Section "Communications Horizontal Cabling."

   1. Conceal cable, except in mechanical rooms and areas where other conduit and piping are exposed.

2. Install exposed cable in raceway.
3. Cabling concealed above accessible ceilings may be run without conduit. Cabling dropping into walls shall be run in conduit. Wall mounted sensors shall be installed on a single gang box and conduit shall be installed to extend to above an accessible ceiling location. Install concealed cable in raceway.
4. Bundle and harness multiconductor instrument cable in place of single cables where several cables follow a common path.
5. Fasten flexible conductors, bridging cabinets and doors, along hinge side; protect against abrasion. Tie and support conductors.
6. Number-code or color-code conductors for future identification and service of control system, except local individual room control cables.
7. Install wire and cable with sufficient slack and flexible connections to allow for vibration of piping and equipment.

END OF SECTION 23 0914

SECTION 23 0923 – DIRECT DIGITAL CONTROL SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. A complete system of computer based, direct digital automatic temperature controls shall be installed under this contract as required to accomplish the sequence of control for various items of equipment and systems indicated on the drawings and as specified in Division 23.

B. Direct Digital Controls (DDC) upgrade for the existing building controls is part of the scope of work. Refer drawings for systems sequence of operations. Controllers, system architecture, communication cabling and network, software, graphics, etc. shall be seamlessly integrated as part of the new system.

C. This Section includes Direct Digital Control (DDC) components, including operator work station, controller/server, equipment specific and generic controllers, I/O interface, software and graphics.

D. See Sections 23 0913 “Instruments and Control Devices”, Section 23 0914 “Control Wiring and Cabling” and Section 23 0993 “Sequence of Operations for Controls” for requirements that relate to this Section.

1.2 SUBMITTALS

A. Product Data: For all hardware and software.

B. Shop Drawings:

1. Schematic air and fluid flow control diagrams.
2. Sequence of operations descriptions and points list.
3. Power, wiring diagrams.
4. DDC System Hardware components, including controllers, actuators, sensors, valves, dampers, cabinet enclosures, wiring, misc. controls devices, etc.
5. Control System Software
6. Graphics – Screen examples specific to the project for:
    a. Air handling units
    b. Packaged Rooftop Units
    c. Fan Coil/Blower Coil Units
    d. Fans
    e. VAV Air Terminal Units
    f. Heating hot water system
    g. Chilled water system.
    h. Condenser water systems

C. Software and firmware operational documentation.

D. Operation and maintenance data.

1.3 QUALITY ASSURANCE

A. Each control subcontractor must be an authorized temperature control contractor in the business of installing and servicing direct digital temperature control systems for over five (5) years. The bidder must have installed and successfully completed at least ten (10) DDC systems of similar size using the same hardware that is proposed.

B. Subcontractor installation and service office must be located within 75 miles (90 minute travel time maximum) of the building site.

C. Design and installation of the digital control system shall be performed by employees trained and certified by the equipment supplier. Electrical power work other than low voltage shall be performed by licensed electricians.

D. The temperature controls subcontractor shall provide all necessary engineering support for a complete and functional system, including but not limited to engineering, programming, installation, supervision, commissioning and troubleshooting.

E. Refer to 23 0801 Mechanical Systems Commissioning.

F. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 2 - PRODUCTS

2.1 CONTROL SYSTEM

A. Contractors:
1. Honeywell International Inc Authorized Controls Integrator (ACI) (local authorized contractors only, branch office is not acceptable)
2. Schneider Electric (TAC, Invensys) – I/A Series
3. BuildingLogiX
4. Distech Controls

B. Complete DDC system shall consist of operator workstation, sensors, indicators, actuators, final control elements, interface equipment, wiring, cabling, power supplies and power distribution, other apparatus, accessories, software and graphics connected to distributed controllers operating in multiuser, multitasking environment on token-passing network and programmed to control mechanical systems as specified here and in related Division 23 Sections.

2.2 LICENSING AGREEMENT AND OPEN PROTOCOL

A. A true Open Licensing Agreement shall be provided and executed with the Owner to permit total and open access to the system for servicing and software revisions by other qualified servicing contractors.

B. The supplied system must incorporate open protocol with the ability to access all data using Java base Web enabled browsers without requiring proprietary operator interface and configuration programs.

C. An Open DataBase Connectivity (ODBC) or Structured Query Language (SQL) compliant server database is required for all system database parameter storage. This data shall reside on a server. Proprietary database and user interface programs are not acceptable (except for unitary controllers as noted below).

D. The supplied computer software shall employ object-oriented technology (OOT) for representation of all data and control devices within the system. In addition, adherence to industry standards including ANSI / ASHRAE™ Standard 135-1995, BACnet and LonMark to assure interoperability between all present and future system components is required.

E. Proprietary programming shall not be utilized. In addition, all required programming software and graphics shall be embedded in the server or controllers without the need for external software to execute queries or revisions. All graphics shall reside in the server. Remote access via LAN or Web shall not require external software to provide complete access to all data, graphics, alarms, programming, etc.

2.3 DDC ARCHITECTURE

A. DDC system shall be complete with an Operators Workstation/Server, Configurable Controllers, Unitary Controllers, required I/O modules for controller expansion, communication cards in controlled devices such as chillers, variable frequency drives (furnished with the equipment, coordinate card requirements), arranged for a completely integrated building automation system network.

B. Physical connection of BACnet network controllers shall be via Ethernet/Ethernet IP using the Owner’s Local Area Network (LAN).

C. Where data drops are not shown for the Configurable Controllers or Operator Station/Server, the temperature control subcontractor shall be responsible to provide the IP data drop to each network controller location for controller connectivity. Installation shall be subcontracted to the division 27 technology contractor; coordinate connection requirements. In addition, provide an additional IP data drop to each controller, or group of controllers to provide local access to data acquisition for the HVAC service technician.

D. All components and controllers supplied under this contract shall be true “peer-to-peer” communicating devices. Components or controllers requiring “polling” by a host to pass data shall not be acceptable.

E. A hierarchical topology is required to assure reasonable system response times and to manage the flow and sharing of data without unduly burdening the customer’s internal Intranet network.

Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed 5 seconds for network connected user interfaces. Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed 60 seconds for remote or dial-up connected user interfaces.

F. DDC system accessibility over the LAN or the Internet shall be user name and password protected. Provide separate user name/password for multiple level hierarchy to restrict access to appropriate personnel at the different levels (view, programming, etc.). The system must be set up to have at least 3 access levels: guest, user and administrator. Guest privileges shall be limited to view only. Users shall be able to make setpoint and schedule changes. Administrators shall have all privileges as users in addition to being able to assign passwords.

2.4 OPERATOR WORKSTATION/SERVER

A. An operator workstation/server shall be provided to effectively program, manage and access DDC information from all of the controllers. Interface shall utilize dynamic color graphics of each mechanical system, building floor plan, and control device depicted by point-and-click graphics.

B. All DDC information shall be accessible through the server over the LAN as well as over the Internet via Ethernet IP.

C. Operator Workstation/Server Computer: Equal to Dell Studio XPS 630.

D. Minimum Requirements (or equivalent):
1. Processor: Intel Core 2 Duo.
2. Ports/Jacks: (6) USB 2.0, (2) IEEE 1394a, headphone, microphone, 19-1 media reader, (1) RJ-45, 2.1 audio, S video in/out, S/PDIF optical
3. Random-Access Memory: 2GB Dual Channel DDR2 SDRAM.
4. Monitor: 20” wide screen, WSXGA resolution, 5ms pixel display rate, 720p high definition display flat panel.
5. Graphics: Intel GMA 3100
6. Hard-Disk Drive: 160 GB.
7. 48X combo optical drive.
8. Communications: Integrated Gigabit Ethernet (10/100/1000Base-T), internal WiFi 802.1 a/b/g/n Draft 2.0
9. 10W Stereo Speakers
10. Operating System: Microsoft Windows
11. Keyboard.
12. Mouse: Three button, optical.
13. Six outlet surge protector.
14. Printer: Laser jet type, B&W, 8Mb RAM equal to HP LaserJet 1022
15. Workstation desk and chair will be provided with loose furnishings by others.

E. The server shall provide integrated control, supervision, data logging, alarming, scheduling and network management functions. The controller/server provides the Internet connectivity and Web serving capabilities, presenting real time information in Web based, rich graphical displays for the system. Application control programs to provide: Calendar functions, Scheduling, Trending, Alarm monitoring and routing, and Time synchronization.

F. Proprietary programming shall not be utilized. In addition, all required programming software shall be embedded in the server or controllers without the need for external software to execute queries or revisions. All graphics shall reside in the server. Remote access via LAN or Web shall not require external software to provide complete access to all data, graphics, alarms, programming, etc.

G. The server shall support standard Web browser access via the Intranet/Internet.

H. Provide and maintain an Audit Log that tracks defined activities on the system. Provide the ability to specify a buffer size for the log and the ability to archive log based on time or when the log has reached a user-defined buffer size. Archive the log locally. For each log entry, provide the following data: Time and date, User ID, Change or activity: i.e., Change setpoint, add or delete objects, commands, etc.

I. The controller/server shall have the ability to automatically backup its database. The database shall be backed up based on a user-defined time interval. Copies of the current database and the most recently saved database shall be stored in the server. The age of the most recently saved database is dependent on the user-defined database save interval. The controller/server database shall be formatted to allow for user viewing and editing, if desired.

2.5 CONFIGURABLE CONTROLLERS/SERVERS

A. Individual configurable controllers shall be provided for each central HVAC equipment or system (AH unit, boiler, chiller, etc.). Distributed HVAC equipment, such as air control box terminals, fan coils, unit heaters, etc may utilize local, unit specific controllers.

B. Controllers shall be capable of functioning in either a standalone capacity or integrated into the building network.

C. Controllers shall be fully configurable type with both control and server capabilities including integrated control and management of external devices, supervision, data logging, alarming, scheduling, network management functions, Internet connectivity, web serving. The controller shall include software technology capable of integrating a variety of devices, interoperable networks and protocols such as LonWorks, BACnet, ModBus, etc into a seamless operating platform.

D. The controllers shall be expandable by the use of input/output I/O modules to provide additional points beyond resident points provided on the controller module.

E. Each configurable controller shall include the following minimum hardware features. Where required for functionality provide additional communication cards, memory cards or I/O modules: Two (2) Ethernet Port -10/100 Mbps, One (1) RS-232 port, One (1) RS-485 ports (BACnet MS/TP), LON Tunnel service, BACnet driver (Ethernet and Ethernet IP), One LONWorks Interface Port with driver – 78KB FTT-10A, Power Supply 24V power supply module, Battery Backup, 64 Mb flash memory for long term data backup and 64 Mb RAM.

F. I/O modules shall connect to the controller with a single multi pin plug, powered through the controller with a minimum of eight (8) universal inputs, four (4) analog outputs and four (4)

relay outputs, Form A contacts. Do not exceed maximum I/O modules recommended by the manufacturer.

G. The controller/server must be capable of operation over a temperature range of 0 to 50°C and storage temperatures of between 0 and 70°C. The controller/server must be capable of operation over a humidity range of 5 to 95% RH, non-condensing.

H. The controller/server shall support standard Web browser access via the Intranet/Internet.

I. Where acting as a server, provide and maintain an Audit Log that tracks all activities performed on the controller/server. Provide the ability to specify a buffer size for the log and the ability to archive log based on time or when the log has reached it's user-defined buffer size. Provide the ability to archive the log locally (to the controller/server), to another controller/server on the network, or to a server. For each log entry, provide the following data: Time and date, User ID, Change or activity: i.e., Change setpoint, add or delete objects, commands, etc.

J. The controller/server shall have the ability to automatically backup its database. The database shall be backed up based on a user-defined time interval. Copies of the current database and, at the most recently saved database shall be stored in the controller/server. The age of the most recently saved database is dependent on the user-defined database save interval. The controller/server database shall be stored, at a minimum, in XML format to allow for user viewing and editing, if desired. Other formats are acceptable as well, as long as XML format is supported.

K. Controllers shall be fully programmable with "drag and drop" graphic representations of control algorithms and easy to use "wizards" that automate controller configurations.

L. Controllers shall be "Native" BACnet devices with interoperable native BACnet, IP, LON and MS/TP communication support.

M. Each controller with I/O modules shall include input/output capabilities with, as a minimum, sufficient universal inputs, digital inputs, universal outputs and digital outputs to perform the required function and include an additional spare two (2) universal inputs, (2) analog outputs and two (2) relay outputs for future upgrade capability (spare points are not required for unitary controllers).

2.6 UNITARY CONTROLLERS

A. Controller designed specifically for VAV reheat air terminal units, fan coil, unit heater, etc., shall be used for each distributed HVAC equipment item. Local controllers shall be capable of functioning in a standalone capacity but shall be integrated into the building network.

B. Use of a dedicated network with a proprietary communication protocol that is compatible for integration into the configurable controllers is acceptable provided the unitary controllers use true peer to peer communication for all devices, the communication network uses simple non polarity sensitive twisted pair wiring and the network provides for interoperability between devices and controllers such as Echelon LonWorks is acceptable.

C. For VAV reheat air terminal units:

1. The controller shall include, where required, a digital communication to:
2. The remote, space temperature and/or humidity wall sensor,
    a. The remote wall sensor shall include a communication jack for connecting a laptop to the terminal unit controller for air/water balance purposes.
3. Velocity pressure pneumatic input via polyethylene tubing for supply air flow reading,
4. Supply air flow sensor,
5. Flow balancing software (damper adjustment, set point monitoring and adjustment, flow validation and calibration, sequence/calibration/control set point logs)
    a. Terminal unit supply air temperature sensor
6. Damper actuator shall be separate from the VAV reheat box controller; integrated controller/actuator devices are not acceptable.
7. Integral controller/damper actuator is acceptable.

D. Controllers used for remote temperature and humidity sensing, adjustment and override such as VAV air terminal unit controllers and fan coil units shall include S-link communication via two wire, unshielded cable (non polarity sensitive) to provide power and communication interface for remote sensors.

2.7 CONTROLLER ENCLOSURE AND LISTING

A. Controllers shall be placed within enclosures that conform to NEMA-1 construction and shall further meet UL 94-5V flammability ratings for plenum application use.

B. Each controller shall be UL-916 listed and meet FCC Part 15 Class A.

2.8 GUI DISPLAY FRAMES

A. System Access – The system must be set up to have at least 3 access levels: guest, user and administrator. Guest privileges shall be limited to view only. Users shall be able to make setpoint and schedule changes. Administrators shall have all privileges as users in addition to being able to assign passwords.

B. Each Air Handling Unit heating water system and cooling system shall have a minimum of 5 graphic screens available from the tree view.
1. Diagrammatic – One diagrammatic screen shall display the airflow pattern with all dampers, coils and fans shown in their correct schematic location and dynamic data for all input values shown. This main graphic screen shall show the control devices in mechanical flow diagram format with directional arrows to indicate normal flow arrangement. These screens shall be available to anyone with access to the system, and therefore shall be view only.
2. Text Screen – Text screen shall display text information with the following primary categories:
    a. Occupied status
    b. Unit status
    c. Temperatures,
    d. Heating, cooling mode
    e. Economizer,
    f. Static pressure & setpoints
    g. Supply, return and exhaust fan status including setpoints.

3. A loop tuning screen shall also be furnished for each control loop, so that people with the appropriate access can change loop tuning parameters from PCs without needing individual programming tools.
4. Override screens shall be furnished for each controller to permit overriding control points without the need for vendor specific software.
5. An alarm screen shall also be furnished for each AHU, heating plant or cooling plant. The heating and cooling systems shall have similar screens as the AHUs.

C. Each VAV air terminal unit shall have a graphics screen and a text screen.

D. Systems that won't permit creating these customized screens as described herein will not be acceptable. Systems that use controllers that won't permit overrides of inputs and outputs from a browser based graphic screen will not be acceptable.

E. Animations
1. All shapes shall be 3-D with a common perspective.
2. All dampers shall have a minimum of 4 animation levels to show partially open, half open, mostly open, fully open, and closed position of dampers.
3. All analog inputs shall show the actual value and engineering units on the graphic screen.
4. Binary inputs shall be linked to flashing animated displays.
5. Safety alarms will flash when in alarm.
6. Filter status shall be indicated when value indicates that they are dirty.
7. To prevent clutter on the graphic displays, symbols will only be shown for equipment that is controlled or monitored by the DDC system.
8. Normal status for safeties will not be indicated, and normal status for safeties will be indicated by an image of a clean filter.
9. Pumps and fans shall rotate when flow is proven by a monitoring device. Coils shall change color when valves are open to permit water flow through the coils.

F. Color Schema – Graphics shall use common color schemes to make the overall system easy to understand. All overall backgrounds shall be white or other neutral color. All text shall be black. Any value that is in alarm shall be red or have a red background. Any value that is overridden shall have a blue background. All like sensors shall be the same color. For example, all temperature devices shall be yellow, all pressure devices shall be purple, all humidity devices shall be teal, all fire alarm devices shall be red, and all CO2 devices shall be green.

G. Current setpoints and occupancy status shall be shown at the bottom of each graphic screen.

H. Floor Plans – Overall floor plan drawings shall be provided, and permit access to each zone's individual floor plan sections.
1. On the individual floor plan sections, room numbers and room temperature and setpoint shall be displayed. Values that are out of the acceptable range shall appear in a different background color and/or flash.
2. Each VAV air terminal unit shall have its own graphic screen that contains the points from within its controller including the box flow setpoint, room temperature setpoint, maximum cooling flow setpoint, minimum cooling flow setpoint, and minimum heating flow setpoint, plus the discharge air temperature from the AHU supplying the unit. The VAV text screen shall have the same information as the graphic screen plus high and low flow calibration values, damper rotation adjustment (CW or CCW), and air balance set-up features.

3. GUI shall permit operator the ability to enable, set or disable high and low occupied and unoccupied limits for each room temperature reading.

I. Text Screens shall be available for all levels of access. Setpoint and output values are changeable from the text screen for users with appropriate access privileges and administrators, but not guests. When a value can be overridden or edited, a red box shall appear around it when the cursor is position on it. A single click of the mouse shall bring up pop up menu that provide options to make a permanent override, change setpoint, or release a previous override of an output point. Analog inputs shall have pop up menus that allow setting high and low alarm limits and the ability to enable and disable alarm limits as appropriate for the sensing device. Pop up menus must be customized to include a description of the point that is being modified. Generic override menus are not permitted because they would not describe to an operator what is about to be modified. The Control Contractor shall set up all initial alarms as indicated in the point matrix.

J. Text screens shall include schedule information including current state and date and time of next scheduled event. Positioning the mouse over the current state shall permit single click access to the schedule. The schedule screen shall allow the operator to edit a yearly, weekly, daily, holiday or special event schedule for the system being viewed. Temperature values and setpoints shall be displayed below the schedule information, and shall have a minimum of 1 decimal place. Heating, cooling and damper ouputs shall be displayed next. The OA temperature for economizer switchover shall be displayed and adjustable from the text screen. Air flow readings shall be shown with setpoint and actual readings. Fan information shall be shown next, followed by static pressure readings and setpoints, which shall have a minimum of 2 decimal places. Miscellaneous setpoints including night setback cooling and heating, average zone temperature, return air warm-up and cool-down, dehumidification, and unoccupied mixed air temperature setpoints shall all be shown and adjustable. All safeties shall be shown, followed by coil pump control information.

K. Each system shall have its own specific alarm screen available to all operators but only editable by operators with user and administration access privileges. From the alarm screen, users and administrators shall be able to enable and disable alarms. Points that are in alarm shall have an alarm symbol highlighted in red. Points that are not in alarm shall be shown in gray. Alarms that are disabled shall have a way to indicate this on the alarm screen graphic.

L. Loop tuning screens shall be available through the web browser interface to save the owner the cost and time associated with using vendor specific software for tuning loops. Access to these screens shall not be provided to guests. Air handling units shall have dedicated screens for discharge air temperature, static pressure, and outside air control loops. Loop tuning screen for discharge air temperature shall include the discharge air temperature, discharge air temperature setpoint, cooling loop throttling range, I-gain and ramp time, heating loop throttling range, I-gain and ramp time, economizer loop throttling range, I-gain and ramp time, unoccupied heating loop throttling range, I-gain and ramp time, cooling valve output, heating valve output, and damper control output. Screens shall also have graphs that show 5 minutes of live data for the discharge air temperature, setpoint, cooling valve, heating valve and mixed air dampers. Each loop tuning screen shall include the appropriate throttling range, I-gain and ramp time.

M. Each non-unitary controller shall have an override screen. These screens shall be available on-site for use during point-to-point check-out and commissioning. The override screen shall show the inputs and outputs for each controller with the points in their wired location. Unused points shall be shown as spares. Points that are in alarm shall have a red background, and points that

are overridden shall have a blue background just as on other screens. These screens shall show the actual values that come back from the controller, not the values that may have been typed in for override at the GUI if the controller software is not accepting the override value. The override screen shall also permit timed overrides.

N. Each air handling unit shall also have an overview screen listing every VAV terminals data in a text format that includes occupancy mode, room temperature, room setpoint, box flow, flow setpoint, temperature leaving VAV terminal, % cooling and % heating. Also, each VAV AHU shall have an air balance screen that will permit balancing the system through a computer connected to the Ethernet or directly to the appropriate BC without vendor specific software. The air balancing screens shall permit at least 8 manual override commands: normal, position (%), flow value, flow percent, open, close, min flow, and max flow.

O. Heating systems and cooling systems with multiple pieces of equipment such as pumps with lead-lag control shall display which device is lead and when the other device will become lead on the text screen.

P. Although only one outside air temperature sensor is needed per building, the GUI shall use independent outside air temperature points, so that during check-out and commissioning, the outside air temperature for a system can be changed without changing the outside air temperature for the whole building. The GUI shall also have a global outside air temperature point that can be overridden from the screen for the controller where the point is physically connected. Overriding this outside air temperature value will change it for all systems, except when outside air temperature has been overridden for an individual system.

Q. The system shall allow for the easy development and editing of dynamic graphics. Wizards shall be utilized to assist the operator with their manipulation of the graphic system. The operator shall be able to, through a single mouse function, select between the dynamic display mode and the graphic edit mode for the currently viewed graphic frame, assuming appropriate access level is provided to the operator. Systems requiring multiple mouse or operator keyboard commands to enter the graphic edit mode are not desirable and require thorough definition of steps involved to accomplish function.

R. Animation of system data shall be provided via graphic elements on the display frames. Standard graphic element library shall be provided to assist the operator with their implementation. The ability to define and add new animated graphic elements shall be provided. As a minimum, the ability to move, size, draw, arrange, align, layer, space, rotate, invert, duplicate, cut, copy, paste, erase any animated element shall be provided. System parameters and setpoints shall be assignable and modifiable by the animated graphic elements, relieving the need for keyboard commands for system manipulation.

S. The ability to simultaneously display a dynamic X/Y chart of selected points, shall be provided. The chart shall be an element of the graphic display and shall automatically update with the display data. The chart shall allow for dynamic manipulation to modify the range, rate, and timeframe of view, in both a real-time as well as historical configuration. A minimum of 4 values shall be included on any chart display element. There shall not be a limit to the quantity of chart elements displayed on a graphic frame. Trace colors and X values shall be User configurable. Systems not providing this capability are required to provide an equivalent charting package with the GUI offering.

T. The ability to provide graphically displayed global scheduling and editing functions shall be provided. The ability to link these functions to the associated equipment or zone frames shall be a standard feature. A calendar shall be provided for display and modification of the SDC time clock functions. The User shall be able to view a daily, weekly, monthly, annual, special or holiday schedule from a defined display frame. A list of served areas shall be displayed on the same screen, this list shall be displayed at all times, pull down menus or other means of accessing these areas shall not be acceptable. The system shall have a master override screen that will allow an operator to change the schedule for every piece of equipment in every building by changing the master schedule.

U. All analog values shall be trended every 15 minutes. The trend samples shall be saved in the BC for at least 36 hours. Access to trended data shall be available by the single click of a mouse on the analog value. Systems that open other windows and require a selection of the desired data are not acceptable.

2.9 GUI ALARMING

A. The GUI shall provide, as standard, alarm annunciation of system data. On every display frame, the ability to view, acknowledge, delete and manipulate real-time and historical alarms shall be provided. The ability to provide a unique and custom alarm display for every display frame shall be provided. The ability to continuously or upon request, view the alarm display, shall be provided.

B. Alarm conditions shall be capable of invoking, as a minimum; a display frame, an email message, a text message sent to a pager or cellular phone.

C. Alarm logging shall be provided in a user definable configuration. All alarms shall be displayed and/or routed as follows, as a minimum; GUI display frame, local printer, server printer, client printer, logged to file, and archived in standard format for information management. Alarm groupings shall be hierarchical in nature allowing up to 8 alarm groups and 16 sub-groups. The GUI shall not possess any limits on the quantity of alarms that can be logged, including historical data archiving. Systems possessing limits must define the restrictions and may not be acceptable.

D. Provide up to 999 alarm priorities with up to 5 alarm color changes, per priority, according to alarm status.

2.10 GUI TRENDING

A. The GUI shall automatically perform time based, user defined, periodic collection of real time point data. The data shall be presented as an X/Y chart in the display frame. The data shall be stored and archived in a file format that allows for the manipulation and utilization of the data by third party applications.

B. A dynamic trend shall be defined as a group of at least 4 data points, with a circular buffer of 2000 data points. A historical trend shall be defined as a group of at least 8 data points, with the sampled points limited only by archival disk space. Sampling rates shall be user selectable from instantaneous (one per second) to once a week. Collection of data shall be user selectable to start and stop on a specific time and date. There shall be no limit to the number of X/Y charts within a display frame.

C. X/Y charting and column and row reporting shall be an integral part of the system. All points shall be chartable or reportable. Analytical data shall be displayed for any of the selected points in a clearly displayed X/Y chart. This analytical data shall consist of at least the following: Average Mean, Standard Deviation, Simple Average, Current Value, Cycle Length, Cycle High and Cycle Low.

D. X/Y charting shall provide for the following chart manipulation: display, zoom, scroll, centering, pen legend and export to Excel, Text via Dynamic Data Exchange.

PART 3 - EXECUTION

3.1 Furnish a complete set of shop drawings showing the kind of control equipment for each of the various systems and their functions, along with indication on the drawing of all original setpoints and calibration values and set up parameters, and sequence of operation and also that of the automation system. These drawings shall be submitted for approval to the Engineer, together with a complete brochure describing the equipment and their function and operation.

3.2 The control equipment supplier shall submit a detailed outline of the owner training material for review and comment by the Engineer during the shop drawing phase. The control system training program shall be customized to reflect the systems installed under this contract and shall cover, as a minimum: software navigation (via custom graphics and Windows based icons), system architecture, pass wording and system security features, input/output control functions, alarm functions/acknowledgement, trending/long term reporting, and control component operation.

3.3 Upon completion of the project, furnish and turn over to the Owner and Architect (3) complete sets of brochures describing the various items of equipment, their functions and directions for operation and maintenance.

3.4 Upon completion of the control system, the Control Contractor shall adjust all components of the system. ATC Contractor shall make all adjustments in the control system required and as directed by the air balance contractor to achieve the desired air balance quantities. All instruments shall be carefully calibrated and each control function shall be demonstrated to function properly, to the satisfaction of the Engineer and the Owner. Provide a complete instruction manual covering the function and operation of all components. At the time of demonstration, each function shall be simulated to insure that controls respond properly to all signals, and the Owner shall be instructed in the proper operation of the system.

3.5 In addition to the adjustments and fine tuning, the Contractor shall include as a part of this contract an additional 40 hours of service technician time for work as directed or authorized by the Engineer to make software changes or field adjustments to hardware.

3.6 During the first year of operation, after acceptance by the Owner, the Control Contractor shall provide complete service to adjust or assist the Owner in adjusting the equipment to obtain optimum performance form the control equipment and from the heating and air conditioning systems in general. This shall be done without additional expense to the Owner. This work shall include revisions to DDC software programs and controller programs, and all PC front end software upgrades. All software shall be provided to the Owner in disk form, including back-ups of final field programs.

3.7 The control equipment manufacturer shall provide instruction and training of the Owner’s personnel regarding the hardware and software of the system. Software training shall include programs, methods of programming, control loops, scheduling and reports. Training covering

hardware shall include operation information, functional use, wiring diagrams and schematic diagrams necessary to troubleshoot the operating system. Training shall include “hands on” instructions to completely familiarize Owner’s personnel with the equipment and system. Training of Owner’s personnel shall be equal in scope and detail to that provided by the manufacturer to its service technicians.

3.8 TRAINING

The control equipment supplier shall provide 40 hours of instruction at the job site to familiarize the Owner’s personnel in the application and details of the installed system. Site training classes shall not be scheduled for longer than 4 hours duration except at the discretion of the Owner.

3.9 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing**.** Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove and replace malfunctioning units and retest.
2. Test and adjust controls and safeties.
3. Test calibration of controllers by disconnecting input sensors and stimulating operation with compatible signal generator.
4. Test each point through its full operating range to verify that safety and operating control set points are as required.
5. Test each control loop to verify stable mode of operation and compliance with sequence of operation. Adjust PID actions.
6. Test each system for compliance with sequence of operation.
7. Test software and hardware interlocks.

C. DDC Verification:

1. Verify that instruments are installed before calibration, testing, and loop or leak checks.
2. Check instruments for proper location and accessibility.
3. Check instrument installation for direction of flow, elevation, orientation, insertion depth, and other applicable considerations.
4. Check instrument tubing for proper fittings, slope, material, and support.
5. Check pressure instruments, piping slope, installation of valve manifold, and self-contained pressure regulators.
6. Check temperature instruments and material and length of sensing elements.
7. Check control valves. Verify that they are in correct direction.
8. Check dampers. Verify that proper blade alignment, either parallel or opposed, has been provided.
9. Check DDC system as follows:

a. Verify that DDC controller power supply is from emergency power supply, if applicable.
b. Verify that wires at control panels are tagged with their service designation and approved tagging system.
c. Verify that spare I/O capacity has been provided.
d. Verify that DDC controllers are protected from power supply surges.

D. Replace damaged or malfunctioning controls and equipment and repeat testing procedures.

END OF SECTION 23 0923

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SECTION 23 2113 – HYDRONIC PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes:

1. Pipe, Fittings and Joining Methods.
2. Steel Piping Products
3. Copper Tubing (ASTM B88-86) Products
4. Unions and flanges
5. Dielectric Connectors
6. Makeup-water piping.
7. Pipe sleeves, openings, curbing and escutcheons
8. Installation methods of piping
9. Pipe Schedules

B. Related Sections

1. 23 0004 Fire Stopping for HVAC Systems
2. 23 0523 General Duty Valves
3. 23 0529 Pipe Hangers, Supports & Penetrations
4. 23 2114 Hydronic Specialties
5. 23 2500 HVAC Water Treatment

1.2 SUBMITTALS

A. Product Data: For each type of the following:

1. Pipe and fittings for each type utilized.

1.3 QUALITY ASSURANCE

A. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

B. Welders shall be qualified and fully certified in accordance with ASME Boiler and Pressure Vessel Code, Section IX, Welding and Brazing Qualifications.

C. Welding procedures and testing shall comply with ANSI Standard B31.1.0 Standard Code for Pressure Piping, Power piping and The American Welding Society Welding Handbook.

D. Piping between the power boiler (steam boiler above 15 psig) and the valve to valves required in ASME Code, Section 1 shall be in conformance with ANSI B31.1 – Power Piping. Welding shall be performed under PP certification and so stamped.

E. Safety valves and all pressure vessels shall bear the appropriate ASME label.

F. All pressure piping systems regulated by the Ohio Pressure Piping Systems Code, Chapter 4101:8 shall conform to applicable requirements of the Code. Welders shall carry a current State of Ohio, Pressure Piping Board Certification. Each welder shall submit a copy of their signed performance qualification record to the Engineer for approval prior to beginning work on any pressure piping system.

PART 2 - PRODUCTS

2.1 STEEL PIPING PRODUCTS

A. Refer to 'Piping Systems Schedule' on drawings.

B. Reinforced forged welding outlets equal to Bonney Forge "Weldolet®" and "Thredolet®" shall be used where branch is two sizes smaller than the main. Unreinforced nipples and fish-mouthed connections are not acceptable.

2.2 COPPER TUBING (ASTM B88-86) PRODUCTS

A. Refer to 'Piping Systems Schedule' on drawings.

B. Mechanically formed tee fittings and couplings in copper tubing, such as T-Drill, are not permitted.

2.3 UNIONS AND FLANGES

A. Unions
1. Copper tubing, all sizes – All bronze construction 150 lb., solder ends.
2. Steel tubing, 2" and smaller sizes– Malleable iron construction with ground seat, bronze to steel, 300 lbs., screwed ends.

B. Flanges
1. Steel pipe, welded or screwed joints, 2-1/2" and larger.
2. Copper tubing – Class 150 cast copper alloy construction, soldered.
3. Gaskets shall be 1/16" thickness full face compressed sheet suitable for temperature and pressure ranges of the application.
4. Bolts for flanges in all steam piping shall be No. 7 hardened bolts.

C. Mechanical joints associated with grooved end pipe are not acceptable in lieu of unions and flanges.

2.4 DIELECTRIC CONNECTORS

A. A dielectric connector shall be incorporated at each connection between ferrous and copper piping. Connectors shall be:
   1. Dielectric coupling with non-conductive polymer liner, Lochinvar Corp. “V-line” Dielectric fitting on services 180 degrees and less.
   2. Dielectric flange with non-metallic bolt hole grommets and gasket.
   3. Brass adaptor, for HVAC application only.

PART 3 - EXECUTION

3.1 PIPING

A. Pipe and tubing shall be cut and fabricated to field measurements and run parallel to normal building lines. Pipe ends shall be cut square and ends reamed to remove burrs. The pipe interior shall be cleaned of foreign matter before erection of the pipe.

B. Annular space around piping through all walls shall be sealed off. Non-fire rated walls shall be sealed with pliable caulking or approved patching sealant. Fire rated wall penetrations shall be sealed per 23 0004 Fire Stoping for HVAC Systems.

C. Piping shall be pitched for drainage. The low points shall be fitted with a ¾” drain valve (with hose thread adapter if not piped to a floor drain) except that on piping 1-1/4” and smaller where a drain valve is not shown, a drain plug is acceptable. Hose thread adapters on drain valves of potable water piping shall be fitted with a non-removable vacuum breaker.

D. Piping shall be installed consistent with good piping practice and run concealed wherever possible. Coordinate with other trades to attain a workmanlike installation.

E. Piping shall be supported as specified in Section 230529 Pipe Hangers. Pipe alignment in both the horizontal and vertical must be tightly maintained. Misalignment must be corrected to the satisfaction of the Engineer before insulation is applied and the system accepted.

F. Internals of sweat end valves shall be removed when damage or warping could occur due to applied heat of soldering. Where silver brazing is specified, solder connection of valves shall be used to reduce the danger of damage.

G. Piping within 2 ft. of the coil connections to small heating and/or cooling units, reheat box coils and duct coils may be Type “L” soft copper to facilitate connection in a confined space. Joints shall be brazed or soldered consistent with the piping system or flared-tubing fittings may be used where appropriate

H. Close open ends of piping during installation to keep interior of the pipe clean.

I. Piping shall <u>not</u> be run above electrical switchgear or panelboards, nor above the access space in the immediate vicinity of the equipment, in accordance with N.E.C. Article 384.

J. Bulb wells for temperature sensing specified in the Controls and Instrumentation Section shall be furnished by the Control sub-contractor and installed by the Piping Contractor. Other types of control devices (differential pressure switches, flow meters, etc.) shall also be installed by the Piping Contractor. Devices, fittings (tees, weldolets, threadolets), locations and installation details shall be closely coordinated with the Controls sub-contractor and device manufacturer's instructions.

K. Automatic control valves shall be furnished by the Controls sub-contractor for installation by the HVAC piping contractor. Flare fittings for flare end valves shall be provided by the HVAC piping contractor.

L. Drawings (plans, schematics and diagrams) indicate the general location and arrangement of piping systems. Locations and arrangements of piping take into consideration pipe sizing and friction loss, pipe expansion, pump sizing and other design considerations; therefore, it is imperative that piping be installed as indicated.

M. Air vents shall be installed at high points of piping and system, on each heating coil and cooling coil and at other locations subject to air binding. Air vents shall be installed in locations accessible for servicing. A shutoff valve or cock on the inlet and drain tubing extending to a drain is required for each large capacity automatic vent. The drain tube shall be extended to a drain location (floor drain, janitor sink, etc.) or, in mechanical rooms, turned down over a clear area of the floor to afford notice by maintenance personnel.

N. Install strainers as indicated on the drawings. Provide a nipple and ball valve in the blow down connection of each strainer 2" and larger.

O. Piping shall be cleaned per specification 23 2500 HVAC Water Treatment.

P. Exposed pipe insulation shall be painted to match base material colors.

3.2 UNIONS AND FLANGES

A. Unions and flanges shall be installed at pipe connections to fixtures and equipment and as required for erection purposed.

3.3 TESTING

A. Piping shall be air tested at 50% higher than maximum system operating pressure for eight (8) hours before flushing.

END OF SECTION 23 2113

SECTION 23 2300 - REFRIGERANT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes refrigerant piping used for air-conditioning applications.

1.2 SUBMITTALS

A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop based on manufacturer's test data.

B. Shop Drawings: Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes, flow capacities, valve arrangements and locations, slopes of horizontal runs, oil traps, double risers, wall and floor penetrations, and equipment connection details. Show interface and spatial relationships between piping and equipment.

1. Refrigerant piping indicated on Drawings is schematic only. Size piping and design actual piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.

1.3 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to 2010 ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

B. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

C. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

D. The equipment manufacturer shall provide piping installation instructions to the Contractor and supervision as needed to insure that the piping system is installed in accordance with the equipment manufacturer’s recommendations.

1.4 PRODUCT STORAGE AND HANDLING

A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-32:

1. Suction Lines for Air-Conditioning Applications: 300 psig.
2. Suction Lines for Heat-Pump Applications: 535 psig.
3. Hot-Gas and Liquid Lines: 535 psig.

B. Line Test Pressure for Refrigerant R-454b:

1. Suction Lines for Air-Conditioning Applications: 300 psig.
2. Suction Lines for Heat-Pump Applications: 535 psig.
3. Hot-Gas and Liquid Lines: 535 psig.

2.2 COPPER TUBE AND FITTINGS

A. Copper Tube
1. Hard Copper Tube: ASTM B280 Type “ACR” hard, seamless copper thoroughly cleaned and dehydrated for use with the refrigerant used. Tubing which has not been so prepared and sealed or which has been open to the atmosphere for any length of time shall not be used.
2. Fittings: ASME B16.22 wrought-copper fittings.
3. Brazing Filler Metals: AWS A5.8/A5.8M silver brazed joints.

B. Copper Coil
1. Soft Copper Coil Piping: ASTM B280-20/B1003-16 Type C12200 coiled, seamless copper thoroughly cleaned and dehydrated for use with the refrigerant used. Tubing which has not been so prepared and sealed or which has been open to the atmosphere for any length of time shall not be used.
2. Fittings: ASME B16.22 wrought-copper fittings.
3. Brazing Filler Metals: AWS A5.8/A5.8M silver brazed joints.

2.3 VALVES AND SPECIALTIES

A. Refrigerant devices specified below shall be specifically designed for the refrigerant application and of construction pressure class consistent with the duty imposed.

B. Manual Shutoff Valves:

1. Brass construction with sweat ends. Valves shall be ball type or may be packed type with backseating construction or packless type.

C. Service Valves:

1. Shutoff type with charging and test ports.

D. Solenoid Valves:

1. Brass body, sweat ends, normally closed with manual lift stem and holding coil in a NEMA 1 enclosure, voltage to match controls.

E. Thermal Expansion Valves:

1. Thermostatically operated diaphragm type with brass body, external equalizer and external superheat adjustment.

2. Expansion valves shall be manufactured by:
   a. Alco
   b. Sporlan

F. Hot Gas By-pass Valves:

1. Pilot operated modulating regulators with integral solenoid pilot assembly and external equalizer tubing and connections.

2. Hot Gas By-pass valves shall be manufactured by:
   a. Alco FA8
   b. Sporlan

G. Flexible Pipe Connectors:

1. Corrugated copper bellows type with woven bronze wire protective jacket suitable for 535 psi refrigerant use.

H. Filter Dryers:

1. Sealed type or replaceable core type equal to Sporlan “Catch-All”.

2.4 REFRIGERANTS

A. ASHRAE 34, R-32: Difluoromethane (methylene fluoride)

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Arkema Inc.
   b. DuPont Fluorochemicals Div.
   c. Genetron Refrigerants; Honeywell International Inc.
   d. Mexichem Fluor Inc.

B. ASHRAE 34, R-454B: Difluoromethane/2,3,3,3-tetrafluoro-1-propene

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Arkema Inc.
   b. DuPont Fluorochemicals Div.
   c. Genetron Refrigerants; Honeywell International Inc.
   d. Mexichem Fluor Inc.

PART 3 - EXECUTION

3.1 SCHEDULE

A. Piping from Outdoor AC/Heat Pump unit to indoor branch selector boxes – Type C1

B. Piping from Indoor branch selector boxes to terminal units, fan coil units, etc. – Type C2

C. Piping from Outdoor AC/Heat Pump unit to indoor fan coil unit – Type C2

3.2 INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

B. Install refrigerant piping according to ASHRAE 15.

C. All joints shall be brazed using silver solder while flowing an inert gas such as dry nitrogen through the piping.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Piping shall be hung from the building structure with copper or plastic coated clevis hangers and steels rods as described in 230529 Pipe Hangers and Supports. Hangers for insulated pipe shall be oversized and a sheet metal saddle with belled ends incorporated to protect the insulation.

F. When brazing remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

G. Install pipe sleeves at penetrations in exterior walls and floor assemblies.

H. Seal penetrations through fire and smoke barriers according to Division 07 Section "Penetration Firestopping."

I. Service valves shall be provided on the condensing unit liquid and suction connections/compressor suction and hot gas connections/condenser hot gas and liquid connections if not furnished on the unit.

J. A solenoid valve, a sight glass-moisture indicator and a thermostatic expansion valve shall be provided for each evaporator coil circuit. A filter dryer shall be provided in each liquid line near the condensing unit or the evaporator coil. A shut off valve shall be provided on both the inlet and outlet of a replaceable core filter-dryer.

K. Hot gas by-pass valve assembly shall be provided on the first stage of capacity control/for each compressor where lead-lag selection is incorporated and as indicated. Hot gas piping shall be run from the compressor discharge to the refrigerant distributor of the evaporator coil and the equalized line extended to the suction header.

L. Flexible pipe connectors shall be provided where recommended by the equipment manufacturer.

M. Solenoid valves shall be mounted within the enclosure of outdoor equipment or otherwise protected from weather.

3.3 CLEANING

A. Before installation of refrigerant piping, clean pipe and fittings using the following procedures:
1. Shot blast the interior of piping.
2. Remove coarse particles of dirt and dust by drawing a clean, lintless cloth through tubing by means of a wire or electrician's tape.
3. Draw a clean, lintless cloth saturated with trichloroethylene through the tube or pipe. Continue this procedure until cloth is not discolored by dirt.
4. Draw a clean, lintless cloth, saturated with compressor oil, squeezed dry, through the tube or pipe to remove remaining lint. Inspect tube or pipe visually for remaining dirt and lint.
5. Finally, draw a clean, dry, lintless cloth through the tube or pipe.
6. Safety-relief-valve discharge piping is not required to be cleaned but is required to be open to allow unrestricted flow.

3.4 SYSTEM CHARGING

A. Charge system using the following procedures:

1. Install core in filter dryers after leak test but before evacuation.
2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
4. Charge system with a new filter-dryer core in charging line.

3.5 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.

B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.

D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:

1. Open shutoff valves in condenser water circuit.
2. Verify that compressor oil level is correct.

3. Open compressor suction and discharge valves.
4. Open refrigerant valves except bypass valves that are used for other purposes.
5. Check open compressor-motor alignment and verify lubrication for motors and bearings.

E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION 23 2300

SECTION 23 3113 - DUCTWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Duct materials.
2. Duct liner.
3. Rectangular ductwork.
4. Round ductwork.
5. Flat Oval ductwork.
6. Duct connectors.
7. Sealants and gaskets.
8. Hangers and supports.

B. Related Sections:

1. Division 23 Section "Testing, Adjusting, and Balancing" for testing, adjusting, and balancing requirements for metal ducts.
2. Division 23 Section "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.

B. Structural Performance: Duct hangers and supports / and seismic restraints shall withstand the effects of gravity / and seismic loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and ASCE/SEI 7.

1. Seismic Hazard Level C: Seismic force to weight ratio, 0.15.

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. Fabrication, assembly, and installation techniques.
2. Factory- and shop-fabricated ducts and fittings.
3. Reinforcement and spacing.
4. Seam and joint construction.
5. Duct Connectors
6. Duct Liner
7. Duct Sealants and Gaskets
8. Penetrations through fire-rated and other partitions.
9. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
10. Hangers and supports, including methods for duct and building attachment and vibration isolation.

C. Welding certificates.

1.4 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
3. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-Up."

C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 DUCT MATERIALS

A. Refer to ‘Ductwork Systems Schedule’ on drawings.

2.2 RECTANGULAR DUCTWORK

A. Construction
1. Single wall factory- or shop-formed continuous helical (spiral) lock seam.

B. Fittings/Transitions – Shall conform to SMACNA Figure 2-7.
1. Transition angles shall be limited to 30 degrees on converging transitions and 20 degrees on diverging transitions.
2. Elbows shall have an inside radius equal to the duct width. 90 degree elbows shall be square with double wall turning vanes. Elbows less than 90 degrees shall be radiused. Non-radiused elbows less than 90 degrees, with or without turning vanes are not permitted.

3. Branch take-offs, where not detailed otherwise, shall be with a static boot (45 degree clinch collar) per SMACNA Figure 2-6 or conical spin-in fitting. Straight tap take-offs are not permitted.
4. Square throat, radius heel 90-degree elbows are not permitted.
5. Radiused, Angled (15° Max.), or Mitered (15° Max.) offsets.
6. Concentric Transitions, θ = 45° Max.
7. Eccentric Transitions, θ = 30° Max.

2.3 SINGLE WALL ROUND AND FLAT OVAL DUCTWORK

A. Medium pressure applications (2" S.P. and higher).

1. Construction
   a. Single wall factory- or shop-formed continuous helical (spiral) lockseam.

2. Joints/Seams
   a. Slip connections or gasketed flanges.

3. Fittings/Transitions – Shall be compatible with duct system.
   a. 90-Degree Branch tees shall be streamlined, spin-in conical type with Y branches.
   b. 45-Degree lateral tee wherever possible.
   c. Die-stamped elbows, r/D = 1.5 (minimum).
   d. Radiused, angled (15° max.) or mitered (15° max.) offsets.
   e. Concentric transitions, θ = 45° max.
   f. Eccentric transitions, θ = 30° max.

B. Low pressure applications (1" S.P. or less).
1. Construction
   a. Single wall factory- or shop-formed continuous helical (spiral) lockseam.

2. Joints/Seams
   a. Slip connections or gasketed flanges.
   b. Round Ductwork: Longitudinal seams may be utilized for 1" and less (positive and negative) static pressure construction class at final air devices.

3. Fittings/Transitions – Shall be compatible with duct system.
   a. Factory- or shop-formed and welded.
   b. Elbows shall be long radius type.
   c. Elbows for longitudinal seam round ductwork shall be factory- or shop-formed segmented standing seam or pleated. Other fittings shall be comparable to the elbows.
   d. Round Ductwork Additional Provisions:
      1) Standard tees allowed.
      2) Segmented elbows allowed.

2.4 DOUBLE WALL ROUND AND FLAT OVAL DUCTWORK

A. Construction:

1. Shall be acoustically lined double wall spiral lock seam with perforated liner and insulation thickness per 'Ductwork Insulation Schedule'.

B. Fittings:
1. Double wall to single wall transitions shall be provided where flat oval and single wall round ducts connect.
2. Fittings shall utilize a solid inner liner.
3. 90-Degree branch tees shall be streamlined, spin-in conical type with Y-branches.
   a. Branch fittings from oval main duct shall be lateral round taps located on the minor axis and shall be at no less than a 45° angle.
4. 45-Degree lateral tee whenever possible.
5. Die-Stamped elbows, R/D = 1.5 (Min.).
6. Radiused, Angled (15° Max.), or Mitered (15° Max.) offsets.
7. Concentric Transitions, θ = 45° Max.
8. Eccentric Transitions, θ = 30° Max.

C. Connections shall be flanged, gasketed and "slip & drive" style connection utilizing a ¼" thick neoprene gasket between the two flanges.

2.5 DUCT CONNECTORS

A. Rectangular Duct Connectors

1. Shall be equal to Ductmate Industries "25 and "35" may be used on rectangular ductwork except where welding or brazing is specifically required. Adhere strictly to manufacturers instructions.

B. Round duct branch connection to rectangular sheet metal duct
1. Shall be equal to Flexmaster Series FL, straight side with or without manual damper, as described on the drawings. Connectors installed on interior lined rectangular duct shall have an integral insulation guard sleeve.

C. Rectangular tap-to-round branch connection with static boot configuration

1. Shall be equal to Flexmaster USA Type STO. Buckley "Air-Tite" Bellmouth BM and BM-D fittings with neoprene gasket and adhesive facing may be used for duct taps to rectangular sheet metal duct which is not internally lined.

2.6 SEALANT AND GASKETS

A. Duct sealant materials shall be:

1. Water based synthetic latex emulsion duct sealant equal to Ducmate PROSeal.
   a. No V.O.C.'s
   b. UL 181B-M Listed, UL 723 classified
   c. For applications up to 15" w.g.
   d. Gray Color

B. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

2.7 HANGERS AND SUPPORTS

A. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."

B. Hanger Rods
1. Noncorrosive Environments: Cadmium-plated steel rods and nuts.
2. Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Steel Cables
1. Galvanized-Steel Ducts: Galvanized steel complying with ASTM A603.
2. Stainless-Steel Ducts: Stainless steel complying with ASTM A492.

D. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

E. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

F. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General
1. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

2. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

B. Ductwork Coordination

1. General Coordination – Coordinate duct layout carefully with other trades to avoid conflict with structural elements, lighting and plumbing- heating piping. Flattening of ductwork and offsets to fit ductwork in available space is generally shown. In the absence of such, the Contractor shall arrange the ductwork to maintain concealment and allow ceilings and lights to be installed as intended. Do not hang ductwork until possible interferences with electrical and mechanical trades have been resolved. Having ductwork

fabricated and delivered in advance shall not be justification for interference with other trades.

C. Joints & Seals

1. Transverse joints and longitudinal seams shall be assembled with sealant to conform to SMACNA Class B seal. Selection of sealant materials shall be compatible with the application. Sealants shall be applied in accordance with the manufacturer's recommendations.
2. Exterior ductwork shall be sealed with mineral impregnated fiber tape. Ductwork shall be supported as noted or detailed on the drawings.
3. System Pressure Testing – Ductwork systems operating at 3" S.P. or greater (positive or negative) and all exterior ductwork shall require duct pressure testing.

D. Hangers, Straps & Supports – Attachment of hangers, straps, and supports to the structure shall be as follows:

1. Concrete Construction
   a. Pre-set concrete inserts – In concrete construction of 4" minimum depth.
   b. After-set concrete inserts – In 4" minimum depth concrete, set in drilled holes. Powder actuated driven fasteners are not permitted.

2. Steel Construction – Utilize beam clamps in steel beam construction. For steel joists, provide clamps or threaded rod, nuts and washers through the bottom chord. Provide anchoring where clamps are attached to sloping surfaces of beam flanges and where otherwise required to insure permanent attachment.

3. Wood Construction – Side beam bracket in wood construction, secured to the wood joist with lag screws set in drilled pilot holes.

4. Unistrut Channel – Unistrut type channel support systems may be utilized. Channels should be attached to the structure with inserts or clamps. Utilize threaded rod and appropriate attachments with channels as required.

5. Deck Mounting – *Attachment to steel deck is prohibited.* Span from steel structural members with supplementary steel shapes where direct attachment to structural members is not practical. This does not apply to steel decks with concrete slab poured on the deck. Refer to Parts A. and B. above.

6. Refer to Drawings for additional notes on supports and hangers.

E. Duct Routing and Penetrations

1. General Coordination – Coordinate openings required for the passage of ductwork through walls, partitions, floors and roofs with the General Contractor.

2. Electrical Coordination – Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures. Ductwork shall not be run above electrical switchgear or panelboards, nor above the access space in the immediate vicinity of the equipment in accordance with NEC.

3. Wall Penetrations
   a. Non-Fire-Rated Penetrations – Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
   b. Fire-Rated Penetrations – Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers where required or fire seal perimeter of duct when no damper is required. Comply with requirements in Division 23 Section "Air Duct Accessories" for fire and smoke dampers.

4. Sleeves & Concrete Curbs
   a. Sleeves – Sheet metal sleeves in conjunction with fire dampers shall be placed in walls and floors to pass ductwork. Floor sleeves shall project 4” above the finished floor in equipment rooms and areas of similar usage, and shall form a waterproof seal.
   b. Concrete Curbs – Exceptions to sleeves shall be at locations where the opening is protected from drainage falling thru by means of concrete curbs or shaft walls. This Contractor shall be responsible for providing 4” high x 4” wide concrete curbs with beveled edges to protect floor openings related to his work in equipment rooms or providing an equal effective waterproofing metal curb, if not specifically included in the General Contract.

F. Duct Protection & Cleaning

1. Protect duct interiors from moisture, construction debris and dust, and other foreign materials by covering each open end of the duct with visqueen secured with duct tape before the end of each day’s work. Comply with SMACNA's "Duct Cleanliness for New Construction Guidelines.”- Duct Cleanliness Level – Advanced.
2. Due to the high level of cleanliness required, the Contractor shall take extreme care in erecting and maintaining a clean duct system. Each duct section shall be wiped out with a wet cloth and dried with a clean, dry cloth immediately before installation. Before the end of each day’s work, all open ductwork, fittings and air devices shall be sealed with heavy visqueen plastic and completely taped around all edges. Just prior to starting the air system, the visqueen barriers shall be removed and a temporary filter shall be placed over all return air openings or registers. Secure the filters firmly in place. If deficiencies in storing practices are found by the Engineer, the Contractor will be required to thoroughly clean all interior surfaces with alcohol prior to installation.

G. Duct Liner – Interior insulating duct liner shall be installed in strict accordance with manufacturer’s printed instructions and SMACNA standards. Liner in rectangular duct shall be shop-applied with adhesive over 90% of the surfaces and with weld pins. Liner in round duct shall be installed per manufacturer’s instructions. Edges not factory-sealed, cut edges and all joints shall be coated and closed with an adhesive-sealant, both in shop fabrication and field assembly. Leading edges shall be protected with metal “Z” or channel nosing where air velocity exceeds 3,000 fpm. Duct liner shall be protected from getting wet or dirty while being transported to the building site, stored on site and after installation.

H. Painting

1. Where interior duct surfaces are visible through grilles, registers and diffusers, the inside of the duct shall be coated with flat black paint before the device is installed, to eliminate obtrusive appearances.
2. All exposed ductwork not installed with insulation in finished spaces to be painted shall be prepared for painting by the General Contractor to match Architect's base material colors.

END OF SECTION 23 3113

SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Air Control Dampers & Accessories
   a. Manual balancing dampers.
   b. Backdraft dampers.
2. Life Safety Dampers & Accessories
   a. Fire dampers.
   b. Smoke dampers.
   c. Combination fire-smoke dampers.
3. Pressure Differential gauges.
4. Turning vanes.
5. Duct-mounted access doors.
6. Flexible connectors.
7. Flexible ducts.
8. Air blenders.
9. Sound attenuators:
   a. Duct Silencer
   b. Return Air Canopy

B. Related Sections:
1. Division 23 Section "Identification for HVAC Piping and Equipment" for valve tags and schedules.
2. Division 23 Section “Ductwork” for ductwork materials, requirements, and schedules.
3. Division 23 Section "Testing, Adjusting, and Balancing" for testing, adjusting, and balancing requirements for metal ducts.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details, and attachments to other work.

1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances, and method of field assembly into duct systems and other construction. Include the following:

   a. Special fittings.
   b. Manual volume damper installations.
   c. Fire-damper and smoke-damper installations, including sleeves; and duct-mounted access doors.

d. Wiring Diagrams: For power, signal, and control wiring.

C. Operation and maintenance data.

1.3 QUALITY ASSURANCE

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with AMCA 500-D testing for damper rating.

PART 2 - PRODUCTS

2.1 AIR CONTROL DAMPERS & ACCESSORIES

A. MANUAL BALANCING DAMPERS & ACCESSORIES

1. Steel Rectangular Dampers

a. Construction
1) General – Single cross-blade up to 12 blade widths and in larger sizes, multiple blade type 6" maximum width with opposed blade arrangement.
2) Frame – 16 ga., galvanized steel hat channel with reinforced corners
3) Blades – 14 ga., galvanized steel, one piece airfoil shape, parallel blade. Synthetic blade edge seals.
4) Jamb Seals – 300 Series stainless steel cambered compression type.
5) Linkage – Out of airstream steel assembly
6) Leakage Class – Class 1A

b. Manufacturers
1) Ruskin CD60 or approved equal by
2) Greenheck
3) Nailor
4) Pottorff

2. Aluminum Rectangular Dampers

a. Construction
1) General – Single cross-blade up to 12 blade widths and in larger sizes, multiple blade type 6" maximum width with opposed blade arrangement.
2) Frame – 16 ga., extruded aluminum hat channel with reinforced corners
3) Blades – heavy gage extruded aluminum, one piece airfoil shape, parallel blade. Synthetic blade edge seals.
4) Jamb Seals – Flexible metal compressible type.
5) Linkage – Out of airstream steel assembly.
6) Leakage Class – Class 1A.

b. Manufacturers
1) Ruskin CD50 or approved equal by

2) Greenheck
3) Nailor
4) Pottorff

3. Steel Round Dampers

a. Construction
1) General – Single blade design.
2) Frame – 20-ga. galvanized steel.
3) Blades – 20-ga. galvanized steel.
4) Control Shaft – Square axle shaft.
5) Max Velocity – 1500 fpm.

b. Manufacturers
1) Ruskin #MDRS25 or approved equal by
2) Greenheck
3) Nailor
4) Pottorff

4. Damper Adjustment Handle

a. Construction
1) General – Locking quadrant positioner with handle
2) Handle – Heavy gage steel handle to accept square rod.

b. Schedule
1) Uninsulated ductwork – Ventfabrics "Ventlock" #641
2) Externally insulated ductwork – Ventfabrics #644

c. Manufacturers
a) Ventfabrics
b) Duro Dyne
c) DynAir

B. BACKDRAFT DAMPERS

1. Construction
a. General – Adjustable, counterbalanced type.
b. Frame – Extruded aluminum, 12-ga., galvanized steel brace at corners.
c. Blades – Extruded aluminum with extruded vinyl blade edge seals mechanically locked into blade edge.
d. Bearings – Corrosion resistant, synthetic type.
e. Counterbalance – Zinc plated bar on blades.

2. Manufacturers
a. Ruskin #CBD6 or approved equal by:
b. Greenheck
c. Nailor
d. Pottorff

2.2 LIFE SAFETY DAMPERS & ACCESSORIES

A. FIRE DAMPERS

1. Compliance – Dampers shall be constructed and tested to conform with UL 555 and shall be UL listed. AMCA Leakage Classes.

2. Construction
   a. General – Dynamic rated, folded blade curtain type with blades folded in the head of the damper housing. Equipped with a 165°F fusible link (unless otherwise noted).
   b. Horizontal Air Streams – Gravity-drop type.
   c. Vertical Air Streams – Spring-loaded type.

3. Damper Schedule – The following is a description of the fire damper types as indicated on the plans:
   a. TYPE “B”
      1) Low velocity with blades stored out of the air stream.
   b. TYPE “C”
      1) High velocity with blades stored out of the air stream and rectangular, round, or oval duct collar each side.
   c. TYPE “D”
      1) Horizontal ceiling radiation classified damper, folded type equal to Ruskin CFD and CFDR, with coated fire-retardant fabric over blades, and spring-closing mechanism. Dampers are to be mounted in conjunction with diffusers, grilles, and registers in fire rated ceiling assemblies to maintain fire integrity of the UL listing of the floor-ceiling or roof-ceiling assembly. Installation shall conform to manufacturer’s instructions for mounting, connection and support or dampers and insulating board protection over diffusers and duct above.
   d. TYPES ““BB” and “CC” – (3-hour)
      1) Duct fire doors similar to Ruskin IBD 23, identical in configuration to Types “B” and “C” fire dampers respectively. Fire doors shall be designed specifically for application in ducts or in fire wall openings, shall bear a UL fire door label for a 3-hour rating (Class A opening) and conform to NFPA 90A, Paragraph 3-3.1.

4. Controls – Fire dampers located at double wall locations shall be provided with a closed position proving micro-switch. Switch shall change state if the fusible link releases and closes the fire damper. The switch shall be equal to Honeywell BX-2RW863-A2.

5. Manufacturers
   a. Ruskin
   b. Greenheck
   c. Pottorff
   d. Nailor
   e. Duro Dyne

2.3 PRESSURE DIFFERENTIAL GAUGES

A. Pressure differential gauges for air filter application shall be dial type gauges. Range shall be appropriate for the application. Gradations shall read in inches w.c.

B. Each gauge shall be furnished with vent valves, aluminum or plastic tubing, static pressure tips and mounting bracket or flange.

C. Manufacturer
   1. Dwyer "Magnehelic" Series 2000 or approved equal.

2.4 TURNING VANES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   1. Ductmate Industries, Inc.
   2. Duro Dyne Inc.
   3. METALAIRE, Inc.
   4. SEMCO Incorporated.
   5. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

   1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

C. Manufactured Turning Vanes for Nonmetal Ducts: Fabricate curved blades of resin-bonded fiberglass with acrylic polymer coating; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

D. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-3, "Vanes and Vane Runners," and 2-4, "Vane Support in Elbows."

E. Vane Construction: Single wall for ducts up to 36 inches wide and double wall for 36” wide and larger dimensions.

2.5 DUCT-MOUNTED ACCESS DOORS

A. Duct Access Doors – Doors shall be factory fabricated with following characteristics:
   1. Construction Material – Constructed of the same material as the ductwork system served (except galvanized sheet metal for fiberglass duct).
   2. Door Thickness – Doors located in:
      a. Insulated ductwork (internal and/or external) shall have double-wall insulated doors, thickness as required per the insulation schedule.
      b. Uninsulated ductwork shall have single-wall construction.
   3. Hinge – Continuous Piano Hinge. 1.5” wide steel construction, zinc plate.
      a. Ventfabrics #Ventlok 157 or equal.

4. Latches – Provide the following type of latch for each application:
   a. Low pressure ductwork (1" w.c. or less) – Cam lock type latches.
   b. High Pressure ductwork (greater than 1" w.c.) – Heavy duty handle type latches.
5. Frame & Seal – Frame and neoprene gasket between door and frame.
6. Size – Access doors shall be 18" x 16" minimum except smaller where duct size will not permit such size.
7. Pressure Application – Access doors and panels shall be designed to provide tight seal commensurate with the duct system operating pressure. Apply duct sealer or rubber gasket between frame and duct and on ducts of 3" S.P. and higher construction class, mechanical fastening of the frame and rubber gasket shall be provided.
8. Removable Sash Access Door – Where sufficient clearance is not available to allow the door to swing open 90 degrees or for round ductwork, a removable access panel with neoprene gasket, frame and cam lock latches on all four sides shall be provided in lieu of the hinged door.

B. Large Plenum Access Doors – doors shall be factory fabricated and as described for duct access doors except that doors shall be 18" x 48" (unless otherwise noted) with overlapping frame,
1. Construction Material – Constructed of the same material as the ductwork system served (except galvanized sheet metal for fiberglass duct).
2. Door Thickness – Doors located in:
   a. Insulated ductwork (internal and/or external) shall have double-wall insulated doors, thickness as required per the insulation schedule.
   b. Uninsulated ductwork shall have single-wall construction.
3. Hinge – Continuous piano hinge. 2" wide steel construction, zinc plated. Ventfabrics #Ventlok 167 or equal.
4. Latches – Heavy duty type. Lever both outside and inside. Ventfabrics #Ventlok No. 310 or equal.
5. Latch Quantity – Two latches shall be provided, except on doors 50" and higher three shall be provided.
6. Frame & Seal - Shall be mechanically fastened to the plenum wall.
7. Pressure Application – Access doors and panels shall be designed to provide tight seal commensurate with the duct system operating pressure. Apply duct sealer or rubber gasket between frame and duct and on ducts of 3" S.P. and higher construction class, mechanical fastening of the frame and rubber gasket shall be provided.

2.6 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. Ventfabrics, Inc.
4. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Materials: Flame-retardant or noncombustible fabrics.

C. Coatings and Adhesives: Comply with UL 181, Class 1.

D. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 30 oz./sq. yd.
2. Net Fabric Width: 4” wide.
3. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
4. Service Temperature: Minus 40 to plus 200°F.

E. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.

1. Minimum Weight: 24 oz./sq. yd.
2. Net Fabric Width: 4” wide.
3. Tensile Strength: 530 lbf/inch in the warp and 440 lbf/inch in the filling.
4. Service Temperature: Minus 50 to plus 250°F.

2.7 FLEXIBLE DUCTS

A. Flexible insulated duct shall be constructed of galvanized steel spiral wire mechanically locked to an airtight aluminum or polyester inner core, 1" thick 3/4 lb. density fibrous glass insulation and a polyethylene or reinforced metalized vapor barrier outer jacket equal to Flexmaster Type 5 or 5M. Duct shall be rated at a minimum of 6” positive and 4" negative static pressure and shall be listed as Class 1 Air Duct or Air Duct Connector with 25-50 flame-smoke ratings per UL 181 and comply with NFPA 90A.

B. Non-insulated flexible duct equal to Flexmaster NI-85 may be used on duct systems not specified to be insulated, with similar restriction stated above.

C. Flexible duct shall be used at final connections to air control terminal units and ceiling air diffusers except as limited in Part 3.

2.8 SOUND ATTENUATORS

A. Duct Mounted Silencer
1. Sound attenuators shall be constructed of sheet metal with inner perforated metal lining and baffles backed with sound absorbing fiberglass, designed for maximum attenuation with minimum air resistance.
2. Dynamic insertion loss in Decibels for a 5 ft. rectangular unit shall be:

Octave Band	dB
1	6
2	10
3	18
4	30
5	42
6	33
7	22
8	11

3. Units shall be:
   a. Industrial Acoustics “Quiet Duct” Type MS or equal by
   b. Semco

c. Vibro-Coustics.

B. Return Air Canopy
1. Performance – ASHRAE, SMACNA pressure and velocity classifications and ASTM E477, ASTM E84 25/50 Flame/Smoke Spread
2. Construction – 20-gauge solid steel casing, absorptive acoustic fiberglass acoustic media. Fiberglass to be shot-free inorganic glass fiber with long, resilient fibers, bonded with thermosetting resin.
3. Manufacturer:
a. Price Industries
b. Titus
c. Tuttle & Bailey

PART 3 - EXECUTION

3.1 INSTALLATION

A. GENERAL

1. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

2. Materials – Install duct accessories of materials suited to duct materials use:
a. Galvanized-steel accessories in galvanized-steel and fibrous-glass ducts,
b. Stainless-steel accessories in stainless-steel ducts,
c. Aluminum accessories in aluminum ducts,
d. Or as noted above.

B. BACKDRAFT DAMPERS

1. Install at discharge of exhaust fans at least one half the fan diameter away from fan.

C. FIRE DAMPERS

1. Fire dampers shall be installed in conformance with the manufacturer’s instructions and SMACNA recommendations.

2. Dampers shall be installed in sheet metal wall or floor sleeves along with retaining angles and duct access doors or panels. Sleeve and duct connections shall be breakaway type or rigid type with corresponding gauge requirements in accordance with SMACNA recommendations.

D. VOLUME DAMPERS

1. Locations:
a. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts.

b. Install volume damper upstream/downstream of each supply, return or exhaust air device, register or grille.
c. Volume dampers shall be in accessible locations for testing, balancing, and adjusting purposes. Coordinate with reflected ceiling plans.

2. Lined Ductwork – Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
3. Install steel volume dampers in steel ducts.
4. Install aluminum volume dampers in aluminum ducts.
5. Set dampers to fully open position before testing, adjusting, and balancing.

E. PRESSURE DIFFERENTIAL GAUGES

1. Install air filter pressure differential gauges in a readable location on or near the air handling unit, filter housing or as otherwise indicated on the drawings.

F. ACCESS DOORS

1. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

a. On both sides of duct coils.
b. Upstream / and downstream from duct filters.
c. At outdoor-air intakes and mixed-air plenums.
d. At drain pans and seals.
e. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
f. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors; and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
g. Control devices requiring inspection.
h. Elsewhere as indicated.

2. Install access doors with swing against duct static pressure to ensure closure.

3. Label access doors according to Division 23 Section "Identification for HVAC System" to indicate the purpose of access door.

G. FLEXIBLE CONNECTORS

1. Location: Install flexible connectors to connect ducts to equipment.

2. For fans developing static pressures of 5-inch w.g. and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

H. FLEXIBLE DUCTS

1. Connect flexible ducts to metal ducts with Panduit straps or stainless-steel clamps. End of the insulation and jacket shall be sealed to the metal duct with double wrapped duct tape. Maximum length of flexible duct shall be:

    a. Terminal units to supply ducts – 3 ft.
    b. Air devices to ducts – 7 ft.

2. Flexible duct installation locations:
    a. Shall be installed:
        1) At final air devices above accessible ceilings.

    b. Shall *not* be installed:
        1) Where ductwork is exposed.
        2) Above inaccessible ceilings – coordinate with reflected ceiling plan.
        3) Through any wall, ceiling, floor, or fire rated assembly.
        4) In the immediate vicinity of, and connecting to, air devices in fire rated ceilings where the assembly details require steel ductwork.

I. SOUND ATTENUATORS

1. Return Air Canopy – Install above return air device per manufacturer's recommendations in lieu of shop-fabricated plenum per detail.

END OF SECTION 23 3300

SECTION 23 3400 - FANS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Inline Centrifugal Duct Fan.
   2. Downblast Power Roof Ventilator.
   3. Upblast Power Roof Ventilator.

B. Related Sections

   1. 23 0513 Electrical Requirements for HVAC Equipment
   2. 23 0531 Equipment Drives
   3. 23 0548 Vibration Control

1.2 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

C. Operation and maintenance data.

1.3 QUALITY ASSURANCE

A. Fans shall be constructed, rated and labeled in accordance with AMCA Standard 210-67. Fans shall be statically and dynamically balanced throughout the operating range.

B. Where the Class (I, II, III, etc.) of fan is stated, the class shall be adequate for the duty specified plus a 25 percent increase in static pressure. No infringement will be allowed on this requirement.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.

E. UL Standard: Power ventilators shall comply with UL 705.

PART 2 - PRODUCTS

2.1 GENERAL

A. Fans shall be provided as specified below and shown on the drawings, complete with motors, drives and associated devices.

B. All fans of any one listed type shall be of the same manufacturer.

C. Fan motors shall be direct drive, ECM type. Refer to Section 23 0513 Electrical Requirements for HVAC Equipment.

D. Motorized backdraft dampers, where specified, shall be furnished with a 120V actuator. Refer to HOA controller details on HVAC drawings for additional information.

E. All fans shall be provided with a Hand/Off/Auto controller from the unit manufacturer.

2.2 MOTORS

A. Refer to Section 23 0513 - Electrical Requirements for HVAC Equipment

2.3 INLINE SQUARE CENTRIFUGAL FAN

A. Construction – Backward inclined fan wheel, direct drive ECM motor, as indicated, motor disconnecting means and inlet cone. Housing shall be constructed of square galvanized sheet metal with 1” acoustical lining.

B. Mounting – Mounting brackets with neoprene vibration isolators for suspension mounting.

C. Direct drive units shall have motor out of the air stream and be furnished with a solid state speed controller with off position, and cover plate. The speed controller shall be turned over to the Electrical Contractor for installation.

D. Finish– The exterior of the fan shall be galvanized/factory primed and painted with a semi-gloss enamel, color selected by the Architect.

E. Refer to the drawings for capacities, arrangement, class and other features and accessories. Fans shall be manufactured by:

1. Acme
2. Carnes
3. Cook
4. Greenheck
5. Twin City Fan

2.4 DOWNBLAST POWER ROOF VENTILATOR

A. Construction – Power roof ventilator shall consist of a spun aluminum weather hood, counterflashing base, vertical shaft open centrifugal wheel direct drive ECM, motor disconnecting means in the motor compartment, motorized backdraft damper and bird screen.

B. Finish– The exterior of the fan shall be galvanized/factory primed and painted with a semi-gloss enamel, color selected by the Architect.

C. Mounting – A 14” high insulated metal roof curb with straight edges and wood nailer on top shall be provided with each fan. Provide wood cant strips around the curb only if recommended for the roofing system.

D. Refer to the drawings for capacities, arrangement, class and other features and accessories. Fans shall be manufactured by:

1. Greenheck
2. Cook
3. Carnes
4. PennBarry
5. Twin City Fan

2.5 UPBLAST POWER ROOF VENTILATOR

A. Construction – Upblast power roof ventilator shall consist of a spun aluminum weather hood with arrangement for upward discharge, counterflashing base, vertical shaft open centrifugal wheel, direct drive ECM**,** motor disconnecting means in the motor compartment

B. Color – The exterior of the fan shall be factory primed and painted with a semi-gloss enamel, color selected by the Architect.

C. Accessories – A motorized backdraft damper and bird screen shall be provided with each fan except that for kitchen range hood.

D. Mounting – A 14” high insulated metal roof curb with straight edges and wood nailer on top shall be provided with each fan. Provide wood cant strips around the curb only if recommended for the roofing system.

E. Refer to the drawings for capacities, arrangement, class and other features and accessories. Fans shall be manufactured by:

1. Greenheck
2. Cook
3. Carnes
4. PennBarry
5. Twin City Fan

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install fans and roof curbs level and plumb, in accordance with manufacturer's written instructions.

B. Support units as described below using the vibration control devices specified in Section 23 0548 Vibration Control.

1. Base mounted unit: Set unit on equipment base using vibration isolators as specified. Secure unit to equipment base.

2. Roof curb mounted units: Set unit on the curb and fasten the fan base to the curb.

3. Suspended unit: Suspend unit from structural steel support frame using threaded steel rods and vibration isolation springs.

4. Wall mounted units: Mount unit from wall angle with housing or collar. For masonry applications, mount directly to wall.

C. Arrange installation of fans to provide access space around fans for service and maintenance.

D. Adjust damper linkages for proper damper operation. Motorized backdraft dampers are to be wired by the Electrical Contractor to open when the fan operates.

E. Perform the following operations and checks before start-up.

1. Remove shipping blocking and bracing.

2. Verify unit is secure on mountings and supporting devices and that connections for piping, ductwork and electrical are complete. Verify proper thermal overload protection is installed in motors starters and disconnects.

3. Verify proper motor rotation direction and verify fan wheel free rotation and smooth bearings operations. Align belts and reinstall belt guards.

4. Lubricate bearings, pulleys, belts and other moving parts with factory-recommended lubricants.

5. Verify manual and automatic volume control, and fire and smoke dampers in connected ductwork systems are in the full open position.

END OF SECTION 23 3400

SECTION 23 3713 - DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Grilles
2. Registers
3. Diffusers
4. Louvers
5. Special Air Diffusion Devices

B. Related Sections:

1. Division 08 Section "Louvers and Vents" for fixed and adjustable louvers and wall vents, whether or not they are connected to ducts.
2. Division 23 Section "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, grilles, and return air canopies.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated, include the following:

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static pressure drop, and noise ratings.
2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

PART 2 - PRODUCTS

2.1 GRILLES, REGISTERS AND DIFFUSERS

A. Air outlet and inlet devices shall be equal to those specified by catalog number and description in the schedule on the drawings. Damper operators shall be concealed screw type. An auxiliary mounting frame shall be furnished with each grille and register except those mounted on exposed ducts or in lay-in application.

B. Linear “T” bar air supply diffusers shall be slotted diffusers with fixed air pattern control complete with a galvanized sheet metal supply plenum having a round or oval duct connection and 1/2” neoprene coated fiberglass insulation on the interior. The unit shall be designed to mount on or alongside the ceiling “T” bar and shall include flanges on both sides of the diffuser to support the ceiling tiles. Additional “T” bars matching those of the ceiling system shall be provided by the HVAC Contractor if the diffuser does not have these flanges. Units shall have a center notch where required to accommodate intervening “T” bars.

C. Manufacturers:

1. Price
2. Titus
3. Tuttle & Bailey
4. Krueger

2.2 LOUVERS

A. Louvers shall be exterior weatherproof type equal to those scheduled and shown on the drawings. Louvers shall be assembled entirely by welding. Louvers shall withstand uniform wind loading pressure of 20 psf. Performance data indicating pressure loss and water penetration, derived from AMCA 500 testing, shall be included with submittals.

1. Aluminum louvers shall be 12 ga. Extruded aluminum with R1 caustic etch and finished with Kynar 500 (or equivalent) fluoropolymer finish. Color is to be selected by the Architect from the manufacturer's standard colors.

2. Bird screen shall be ½" mesh aluminum wire on the interior face of the louver attached at 12" centers on the perimeter.

B. Manufacturers:

1. Ruskin
2. Pottorff
3. Greenheck
4. Airolite

PART 3 - EXECUTION

3.1 INSTALLATION

A. The Contractor shall be responsible for comparability of ceiling mounted devices with the ceilings and suspension systems (lay-in, concealed spline, plaster, drywall, etc.). Verify with architectural drawings.

B. Carefully align square and rectangular devices with the vertical and horizontal building lines. Diffusers shall be attached rigidly to the ductwork. Where connected by flexible ducts, special supports shall be provided as required, either from the ceiling suspension system or by independent suspension wires or rods from the building structure.

C. Inside of ducts behind grilles, registers, and diffusers shall be painted flat black, as needed, to eliminate the sight of shiny surfaces.

D. Each ducted air device shall be provided with a balancing damper, located either at the run out duct to the final air device for accessible locations or an integral damper at the air device for inaccessible locations. Transfer air devices are not required to have balance dampers, unless noted. Duct mounted air devices shall be provided with standoff frame and integral balance damper or scoop style damper, as noted. Refer to drawings for other specific instances.

E. Exterior louvers shall be installed by the General / HVAC Contractor. Install louver assemblies in strict accordance with manufacturer's recommendations. Louvers to be installed plumb, square, level and true. Blank off all unused portions of the louver with 14 ga. Aluminum and insulate blank off with 1" rigid foil faced insulation. Seal blank off areas airtight.

END OF SECTION 23 3713

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SECTION 23 5100 - BREECHINGS, CHIMNEYS, AND STACKS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Listed double-wall vents and chimneys.

1.2 SUBMITTALS

A. Product Data: For the following:

1. Building-heating-appliance chimneys.

B. Shop Drawings: For vents, breechings, chimneys, and stacks. Include plans, elevations, sections, details, and attachments to other work.

PART 2 - PRODUCTS

2.1 LISTED TYPE B AND BW VENTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Heat-Fab, Inc.
2. Metal-Fab, Inc.
3. Metalbestos.
4. MASCO
5. Van-Packer Company

B. Description: Double-wall metal vents tested according to UL 441 and rated for 480 deg F continuously for Type B, or 550 deg F continuously for Type BW; with neutral or negative flue pressure complying with NFPA 211.

C. Construction: Inner shell and outer jacket separated by at least a 1/4-inch airspace.

D. Inner Shell: Aluminum

E. Outer Jacket: Galvanized steel.

F. Accessories: Tees, elbows, increasers, draft-hood connectors, terminations, adjustable roof flashings, storm collars, support assemblies, thimbles, firestop spacers, and fasteners; fabricated from similar materials and designs as vent-pipe straight sections; all listed for same assembly.

1. Termination: Round chimney top designed to exclude minimum 98 percent of rainfall.

PART 3 - EXECUTION

3.1 INSTALLATION OF LISTED VENTS AND CHIMNEYS

A. Locate to comply with minimum clearances from combustibles and minimum termination heights according to product listing or NFPA 211, whichever is most stringent.

B. Support vents at intervals recommended by manufacturer to support weight of vents and all accessories, without exceeding appliance loading.

C. Slope breechings down in direction of appliance, with condensate drain connection at lowest point piped to nearest drain.

D. Lap joints in direction of flow.

E. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finishes.

F. Clean breechings internally, during and after installation, to remove dust and debris. Clean external surfaces to remove welding slag and mill film. Grind welds smooth and apply touchup finish to match factory or shop finish.

G. Provide temporary closures at ends of breechings, chimneys, and stacks that are not completed or connected to equipment.

END OF SECTION 23 5100

SECTION 23 5523 - GAS-FIRED RADIANT HEATERS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes gas-fired, tubular infrared radiant heaters.

1.2 SUBMITTALS

A. Product Data: For each type of gas-fired radiant heater indicated. Include rated capacities, operating characteristics, and accessories.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.

C. Field quality-control test reports.

D. Operation and maintenance data.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.4 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of gas-fired radiant heater that fails in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 TUBULAR INFRARED HEATERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

C. Manufacturers

1. Detroit Radiant – Re-Verber-Ray
2. Superior Radiant Products (SRP)
3. Gas-Fired Products Inc.; Space-Ray Div.
4. Reznor/Thomas & Betts Corporation.
5. Roberts-Gordon, Inc.

D. Description: Factory assembled, piped, and wired, and complying with ANSI Z83.20/CSA 2.34.

E. Fuel Type: Design burner for natural gas having characteristics same as those of gas available at Project site.

F. Combustion Tubing: 4-inch- 16 gauge aluminized coated steel radiant emitter tubes.

G. Tubing Connections: Stainless-steel couplings or flared joints with stainless-steel draw bolts.

H. Reflector: Polished aluminum, 97 percent minimum reflectivity, with end caps. Shape to control radiation from tubing for uniform intensity at floor level with 100 percent cutoff above centerline of tubing. Provide for rotating reflector or heater around a horizontal axis for minimum 30-degree tilt from vertical.
1. Include hanger kit.

I. Burner Safety Controls:

1. Gas Control Valve: Modulating, regulated redundant 24-V ac gas valve containing pilot solenoid valve, electric gas valve, pilot filter, pressure regulator, pilot shutoff, and manual shutoff all in one body.
2. Blocked Vent Safety: Differential pressure switch in burner safety circuit to stop burner operation with high discharge or suction pressure.
3. Control Panel Interlock: Stops burner if panel is open.
4. Indicator Lights: Burner-on indicator light.

J. Burner and Emitter Type: Gravity-vented power burner, with the following features:

1. Emitter Tube: 4-inch- diameter, aluminized-steel tubing with sight glass for burner and pilot flame observation.
2. Venting: Connector at exit end of emitter tubing for vent-pipe connection.

a. Vent Terminal: Vertical.

3. Burner/Ignition: Power gas burner with electronic spark and electronic flame safety.
4. Burner/Ignition: Stainless-steel burner cup and head with balanced-rotor draft fan and hot-surface ignition.
5. Combustion-Air Connection: Duct connection for combustion air to be drawn directly from outdoors by burner fan.

2.2 CONTROLS

A. Thermostat: Wall-mounted, microprocessor type provided by manufacturer.

1. Control Transformer: Integrally mounted.

2. 50 to 90 deg F operating range and fan on switch.

3. Mode selection

4. Capable of setting unit into “blast mode” operation, i.e., the unit runs at full capacity for a predetermined amount of time and then resumes normal operaton.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install and connect gas-fired radiant heaters and associated fuel and vent features and systems according to NFPA 54, applicable local codes and regulations, and manufacturer's written installation instructions.

B. Suspended Units: Suspend from substrate using chain hanger kits and building attachments.

C. Maintain manufacturers' recommended clearances to combustibles.

D. Install piping adjacent to gas-fired radiant heaters to allow service and maintenance.

E. Vent Connections: Comply with Division 23 Section "Breechings, Chimneys, and Stacks."

F. Electrical Connections: Comply with applicable requirements in Division 26 Sections.

1. Install electrical devices furnished with heaters but not specified to be factory mounted.

G. Adjust initial temperature set points.

H. Adjust burner and other unit components for optimum heating performance and efficiency.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections: Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

END OF SECTION 23 5523

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SECTION 23 5533 - FUEL-FIRED UNIT HEATERS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes gas-fired unit heaters.

1.2 SUBMITTALS

A. Product Data: For each type of fuel-fired unit heater indicated. Include rated capacities, operating characteristics, and accessories.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power[**, signal, and control**] wiring.

C. Field quality-control test reports.

D. Operation and maintenance data.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. ASHRAE/IESNA 90.1-2013 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2013, Section 6 - "Heating, Ventilating, and Air-Conditioning."

1.4 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace heat exchanger of fuel-fired unit heater that fails in materials or workmanship within specified warranty period.

1. Warranty Period: 10 year heat exchanger, 1 year on burner, and 2 years on parts/components.

PART 2 - PRODUCTS

2.1 GAS-FIRED UNIT HEATERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Modine Manufacturing Company.
2. Reznor/Thomas & Betts Corporation.
3. Sterling HVAC Products; Div. of Mestek Technology Inc.
4. Detroit Radiant.
5. Trane

B. Description: Factory assembled, piped, and wired, sealed combustion complying with ANSI Z83.8/CSA 2.6.

C. Fuel Type: Natural Gas

D. Type of Venting: Forced draft, power exhauster.

E. Housing: 20 gauge aluminized steel.

F. Heat Exchanger:

1. Primary Heat Exchanger: Aluminized Steel.
2. Secondary Heat Exchanger: Stainless Steel

G. Burner Material: Aluminized steel.

H. Unit Fan: Propeller blades riveted to heavy-gage steel spider bolted to cast-iron hub, dynamically balanced, and resiliently mounted.

I. Controls: Regulated redundant gas valve containing pilot solenoid valve, electric gas valve, pilot filter, pressure regulator, pilot shutoff, and manual shutoff all in one body.

1. Gas Control Valve: Single stage.
2. Ignition: Solid state direct spark igniter.
3. Fan Thermal Switch: Operates fan on heat-exchanger temperature.
4. Vent Flow Verification: Differential pressure switch to verify open vent.
5. Control transformer.
6. High Limit: Thermal switch or fuse to stop burner.
7. Thermostats: Devices and wiring are specified in Division 23 Section "Instrumentation and Control for HVAC" and on Control Drawings.

J. Discharge Louvers: Independently adjustable horizontal blades.

K. Accessories:

1. On/Off Disconnect Switch
2. Status Indicator Lights

3. External terminals for thermostat wiring.
4. Fan guard.
5. Condensate pH Neutralizing Kit

L. Capacities and Characteristics: Refer to Schedule on Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install and connect gas-fired unit heaters and associated fuel and vent features and systems according to NFPA 54 applicable local codes and regulations, and manufacturer's written installation instructions.

B. Install and connect oil-fired unit heaters and associated fuel and vent piping according to NFPA 31 applicable local codes and regulations, and manufacturer's written installation instructions.

C. Suspended Units: Suspend from substrate using threaded rods, spring hangers, and building attachments. Secure rods to unit hanger attachments. Adjust hangers so unit is level and plumb.

D. Install piping adjacent to fuel-fired unit heater to allow service and maintenance.

E. Gas Piping: Comply with Division 22 Section 1613 " Natural-Gas House Piping." Connect gas piping to gas train inlet; provide union with enough clearance for burner removal and service.

F. Vent Connections: Comply with Division 23 Section "Breechings, Chimneys, and Stacks."

G. Electrical Connections: Comply with applicable requirements in Division 26 Sections.

1. Install electrical devices furnished with heaters but not specified to be factory mounted.

H. Adjust initial temperature set points.

I. Adjust burner and other unit components for optimum heating performance and efficiency.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections: Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

END OF SECTION 235533

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SECTION 23 7413 – PACKAGED, OUTDOOR, AIR HANDLING UNIT

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes packaged, outdoor, central-station air-handling units (rooftop units) with the following components and accessories:

1. Direct-expansion cooling.
2. Gas furnace.
3. Energy recovery module
4. Roof curbs.

1.2 SUBMITTALS

A. Product Data: Include manufacturer's technical data for each RTU, including rated capacities, dimensions, required clearances, characteristics, furnished specialties, and accessories.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.

C. Operation and maintenance data.

D. Warranty.

1.3 QUALITY ASSURANCE

A. ARI Compliance:

1. Comply with ARI 210/240 and ARI 340/360 for testing and rating energy efficiencies.
2. Comply with ARI 270 for testing and rating sound performance.
3. Comply with ARI 1060 for testing and rating of energy recovery module.

B. ASHRAE Compliance:

1. Comply with ASHRAE 15 for refrigerant system safety.
2. Comply with ASHRAE 33 for methods of testing cooling and heating coils.
3. Comply with applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

C. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

D. NFPA Compliance: Comply with NFPA 90A and NFPA 90B.

E. UL Compliance: Comply with UL.

F. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

G. Motors 1 HP and larger shall be “premium efficiency” series motor.

1.4 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to replace components of units that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Compressors: Manufacturer's standard, but not less than five (5) years from date of Substantial Completion.
2. Warranty Period for Gas Furnace Heat Exchangers: Manufacturer's standard, but not less than ten (10) years from date of Substantial Completion.
3. Warranty Period for Solid-State Ignition Modules: Manufacturer's standard, but not less than three (3) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Daikin
2. Trane
3. York

2.2 CASING

A. Exterior Casing Material: Galvanized steel with factory-painted finish, with pitched roof panels and knockouts with grommet seals for electrical and piping connections and lifting lugs. Panels shall be easily removable for servicing all components.

B. The casing interior shall be insulated with 1” thick 1-½ lb. density neoprene coated fiberglass.

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

2.3 FANS

A. Indoor air circulating fan shall be forwardly curved centrifugal type with resiliently mounted motor, belt drive and adjustable pulley. See fan duty and HP requirements listed on the drawings.

B. Condenser fans shall be direct driven propeller type with wire guards.

C. Barometric air relief shall be incorporated in the units.

2.4 COILS

A. Supply-Air Refrigerant Coil:

1. Aluminum plate fin and seamless copper tube in steel casing with equalizing-type vertical distributor.
2. Polymer strip shall prevent all copper coil from contacting steel coil frame or condensate pan.
3. Coil Split: Interlaced.
4. Condensate Drain Pan: Stainless steel formed with pitch and drain connections complying with ASHRAE 62.1.

2.5 REFRIGERANT CIRCUIT COMPONENTS

A. Compressor: Inverter-Duty, hermetic scroll, mounted on vibration isolators; with internal overcurrent and high-temperature protection, internal pressure relief, and crankcase heater.

B. Refrigeration Specialties:

1. Refrigerant: R-32 / R-454b.
2. Expansion valve with replaceable thermostatic element.
3. Refrigerant filter/dryer.
4. Manual-reset high-pressure safety switch.
5. Automatic-reset low-pressure safety switch.
6. Minimum off-time relay.
7. Automatic-reset compressor motor thermal overload.
8. Brass service valves installed in compressor suction and liquid lines.

C. Refrigerant Detection & Mitigation Control

1. Refrigerant systems with an A2L or higher flammability classification, as defined in ASHRAE Standard 15 and 34, shall be equipped with a refrigerant leak detection system. The leak detection system shall provide the following mitigation controls to ensure there is never a build up of refrigerant greater than the lower flammability of the respective refrigerant. The following shall occur
   a. Activate refrigerant system safety shut-off valves to reduce releasable refrigerant charge.
   b. Energize the air circulation fan(s).

c. De-energize potential ignition sources, including open flames (direct and indirect gas furnaces) and unclassified electrical sources of ignition with apparent power rating greater than 1kVa, where the apparent power is the product of the circuit voltage and current rating.

2.6 AIR FILTRATION

A. Minimum arrestance according to ASHRAE 52.1, and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.

1. Pleated: 2" Merv & 4" Merv 14 thick disposable type with cardboard frame, 30% efficiency similar to Farr "30/30".

2.7 GAS FURNACE

A. Description: Factory assembled, piped, and wired; complying with ANSI Z21.47 and NFPA 54.

1. CSA Approval: Designed and certified by and bearing label of CSA.

B. Burners: Stainless steel

1. Fuel: Natural gas.
2. Ignition: Electronically controlled electric spark or hot-surface igniter with flame sensor.

C. Heat-Exchanger and Drain Pan: Stainless steel.

D. Power Vent: Integral, motorized centrifugal fan interlocked with gas valve.

E. Safety Controls:

1. Gas Control Valve: Modulating.
2. Gas Train: Single-body, regulated, redundant, 24-V ac gas valve assembly containing pilot solenoid valve, pilot filter, pressure regulator, pilot shutoff, and manual shutoff.

2.8 ELECTRICAL POWER CONNECTION

A. Provide for single connection of power to unit with unit-mounted disconnect switch accessible from outside unit and control-circuit transformer with built-in overcurrent protection.

2.9 CONTROLS

A. Unit shall be provided with a remote thermostat capable of 7-day programmable operation.

B. Unit shall be provided with a BACnet MS/TP card to connect with the building DDC control system.

2.10 ACCESSORIES

A. Duplex, 115-V, ground-fault-interrupter outlet with 15-A overcurrent protection. Include transformer if required. Outlet shall be energized even if the unit main disconnect is open.

B. Filter differential pressure switch with sensor tubing on either side of filter. Set for final filter pressure loss.

C. Coil guards of painted, galvanized-steel wire.

2.11 ROOF CURBS

A. 14” Roof curb for each roof mounted unit shall be furnished with the unit, fabricated of steel with insulation, wood nailer, counterflashing, cant strip and seals for a watertight installation.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The roof curb shall be set in place, shimmed level and secured. After the roofing contractor applies the roofing membrane to the curb, the unit shall be set in place and the installation completed.

B. Provide condensate drainage piping from the drain pan with a 4” deep trap and cleanout.

C. The Electrical Contractor will provide power wiring thru a fused disconnect switch to one set of power terminals in each unit. All other power and control wiring required for the completion of the systems shall be furnished and installed by the HVAC Contractor. All wiring shall be furnished and installed by the HVAC Contractor. All wiring shall be run in ½” and larger conduit in accordance with applicable provisions of the Electrical Specifications.

END OF SECTION 23 7415

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DIVISION 26 ELECTRICAL

26 0000 General Requirements for Electrical Systems

26 0001 Basic Electrical Requirements
26 0002 Electrical Work in Existing Buildings
26 0004 Firestopping for Electrical Systems
26 0005 Excavation, Backfill and Surface Restoration

26 0500 Common Work Results for Electrical

26 0519 Low-Voltage Electrical Power Conductors and Cables
26 0526 Grounding and Bonding for Electrical Systems
26 0529 Hangers and Supports for Electrical Systems
26 0533 Raceway and Boxes for Electrical Systems
26 0537 J-Hook Pathways for Electrical Systems
26 0543 Underground Ducts and Raceways for Electrical Systems
26 0553 Identification for Electrical Systems
26 0563 Specific Wiring Applications
26 0590 Electrical Specialties

26 0900 Instrumentation and Control for Electrical

26 0923 Lighting Control Devices

26 2000 Low-Voltage Electrical Distribution

26 2416 Panelboards
26 2726 Wiring Devices
26 2813 Fuses
26 2816 Enclosed Switches and Circuit Breakers

26 3000 Facility Electrical Power Generating and Storing Equipment

26 3213 Engine Generators (**Station 16 Only – Alternate E1)**
26 3623A Automatic Transfer Switch and Portable Docking Station **(Station 15 Only)**
26 3623B Automatic Transfer Switch and Portable Docking Station **(Station 16 Only)**

26 4000 Electrical Cathodic Protection

26 4313 Surge Protective Devices (SPD) for Low-Voltage Electrical Power Circuits

26 5000 Lighting

26 5113 Interior Lighting Fixtures
26 5200 Exit and Emergency Lighting
26 5700 Suspended Ceiling Mounted Circulation Fans

26 7000 Communications

26 7533 Raceway and Boxes for Communications Systems

SECTION 26 0001 - BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes the following:

1. General Requirements
2. Definitions
3. Scope of Work
4. Drawings and Specifications
5. Reference Standards
6. Allowances, Unit Prices and Alternates
7. Site Visit
8. Permits, Regulations and Inspections
9. Project Management and Coordination
10. Temporary Electric Services
11. Workmanship
12. Protection
13. Painting
14. Cleaning
15. Equipment Selection
16. Shop Drawings
17. Testing
18. Final Inspection and Punch List
19. Operation and Maintenance Manuals
20. Record Drawings
21. Warranties
22. Operation and Adjustment of Equipment
23. Operating Demonstration and Instruction

1.2 GENERAL REQUIREMENTS

A. All provisions of Division 00 Front End Documents and Division 01 General Requirements apply to work specified in this Division.

B. Specification provisions of other relevant Divisions shall apply where applicable work is required to be performed under this Electrical work.

C. A complete and functional Electrical system installation shall be provided under this Division. Should overlap of work among the trades become evident, this shall be called to the attention of the Architect. In such event, none of the trades or their suppliers shall assume that he is relieved of the work which is specified under his branch until instructions in writing are received from the Architect.

D. The Mechanical and Electrical drawings and specifications assign work (labor and/or materials to be provided by the General, Plumbing, Fire Suppression, HVAC or Electrical Contractor or their sub-contractors. Understanding that the contractors for mechanical and electrical work are sub-contractors to the (General) Contractor, such assignments are not intended to restrict the Contractor in assignment of work among the sub-contractor to accommodate trade agreements and practices or the normal conduct of the construction work.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.4 SCOPE OF WORK

A. The scope of the electrical work includes furnishing, installing, testing and warranty of all electrical work and complete electrical systems shown on the electrical drawings and specified herein, including Division 00, Division 01, Division 26 and applicable provisions of other relevant Divisions.

1.5 DRAWINGS AND SPECIFICATIONS

A. The drawings indicate the general arrangement of the work and are to be followed insofar as possible. The word "provide", as used shall mean "furnish and install". If significant deviations from the layout are necessitated by field conditions, detailed layouts of the proposed departures shall be submitted to the Architect for approval before proceeding with the work.

B. Make all necessary field measurements to insure correct fitting. Coordinate work with all other trades in such a manner as to cause a minimum of conflict or delay.

C. The drawings and specifications shall be carefully studied during the course of bidding and construction. Any errors, omissions or discrepancies encountered shall be referred immediately to the Architect for interpretation or correction, so that misunderstandings at a later date may be avoided. The contract drawings are not intended to show every vertical or horizontal offset which may be necessary to complete the systems. Having equipment, wireways and fittings

fabricated and delivered in advance of making actual measurements shall not be sufficient cause to avoid making offsets and minor changes as may be necessary to install wireways, fittings and equipment.

D. The Architect shall reserve the right to make minor adjustment in locations of system runs and components where he considers such adjustments desirable in the interest of concealing work or presenting a better appearance where exposed. Any such changes shall be anticipated and requested sufficiently in advance so as to not cause extra work, or unduly delay the work. Coordinate work in advance with all other trades and report immediately any difficulties which can be anticipated.

E. Equipment, ductwork and piping shall not be installed in the dedicated electrical space above or in the working space required around electrical switchgear, motor control centers or panelboards as identified by NEC 110.26 Spaces About Electrical Equipment – 1000 Volts Nominal or Less. For Equipment rated over 1000 volts nominal – 110.32 Work Space About Equipment – 110.33 Entrance and Access to Work Space – 110.34 Work Space and Guarding. The Electrical Contractor shall caution other trades to comply with this stipulation.

F. Where any system runs and components are so placed as to cause or contribute to a conflict, it shall be readjusted at the expense of the Contractor causing such conflict. The Architect's decision shall be final in regard to arrangement of equipment, conduit(s), devices, wireways etc., where conflict arises.

G. Provide offsets in system runs, additional fittings, necessary conduit, pull boxes, conductors, switches and devices required to complete the installation, or for the proper operation of the system. Each contractor shall exercise due and particular caution to determine that all parts of the work are made quickly and easily accessible.

H. Should overlap of work among the trades become evident, this shall be called to the attention of the Architect. In such event, none of the trades or their suppliers shall assume that he is relieved from the work which is specified under his branch until instructions in writing are received from the Architect.

1.6 REFERENCE STANDARDS

A. Where standards (NFPA, NEC, ASTM, UL, etc.) are referenced in the specifications or on the drawings, the latest edition is to be used except, however, where the authority having jurisdiction has not yet adopted the latest edition, the edition so recognized shall be used.

1.7 ALLOWANCES, UNIT PRICES AND ALTERNATES

A. Refer to Sections 012100 Allowances, 012200 Unit Prices and 012300 Alternates.

1.8 SITE VISIT

A. Each bidder shall visit the project site to understand the existing conditions and compare the conditions with information shown on the drawings. Report immediately to the Architect any

issues or discrepancies which are discovered that affect the bid. Changes to contract price will not be considered for site condition issues that are readily apparent from a thorough site review.

1.9 PERMITS, REGULATIONS AND INSPECTION

A. Work must conform to applicable local, state and federal laws, ordinances and regulations. Where drawings or specifications exceed code requirements, the drawing and specifications shall govern. Install no work contrary to minimum legal standards.

B. Except where the permit application is made by the Architect or the Engineer, the Electrical contractor shall be responsible to file for and obtain all required permits from the governing inspection agencies for the Electrical work. Where the Architect or Engineer is the Architect or Engineer of record, they will furnish sealed and signed drawings and specifications required by the permit authorities except fire alarm permit documents shall be prepared and submitted by an approved, licensed fire alarm subcontractor.

C. Include payment of all permit and inspection fees applicable to the work in this Division.

D. All work shall be subject to inspection and approval of Federal, State and local agencies as may be appropriate as well as the Architect and Engineer.

E. Furnish for the Owner certificates of approval from the governing inspection agencies as a condition for final payment.

1.10 PROJECT MANAGEMENT AND COORDINATION

A. Refer to Section 013100 Project Management and Coordination.

B. The HVAC Contractor shall initially prepare and be responsible for ¼" scale coordination drawings. These drawings shall be reproduced and distributed to the Plumbing, Fire Suppression and Electrical Contractors for their input and revisions. Assure that all contractors work together to obtain finish coordinated drawings and no work being installed until all contractors have approved and signed-off with their approval and drawings have been submitted and reviewed by the Engineer.

1.11 TEMPORARY ELECTRIC SERVICES

A. The temporary service and temporary lighting for construction is provided by the Electrical Contractor.

B. Labor, receptacles, boxes, fixtures, wire, etc. required by the various Contractors inside their offices shall be paid for by the respective Contractors.

C. Lighting fixtures shall be placed every 40 ft. along each corridor or where corridors do not occur, along the long axis of all rooms. Provide a minimum 800 lumen lamp in a commercial grade molded plastic socket and lattice wire guard temporary lighting assembly with extra heavy duty "ST" 3-wire cord. Lamps shall be spaced a minimum of 10 ft. apart. For large open areas or during the early stages of construction, 250 watt watt metal halide fixtures (or LED

equivalent) with wire guards may be utilized. Receptacle circuits shall consist of 1-gang cast "FS" type box with grounded duplex receptacles a maximum of 50 ft. on center with a maximum of 4 per circuit. All receptacle circuits shall be protected by its own overcurrent device in a panel board. Install wiring and equipment above 6'-6" and below the finished ceiling. Extend circuits as required. Provide GFCI protected receptacles and circuits as required by NEC and OSHA.

D. Contractors requiring extension cords shall provide their own cords and plugs up to capacity of 20 amperes. For services to larger items of equipment and welders, this Contractor shall extend proper feeders as requested at the expense of the Contractors requiring the service.

E. The Electrical Contractor shall maintain the temporary light and power system for the duration of the work and shall remove it from the site when directed. Temporary wiring and equipment shall remain the property of the Electrical Contractor.

F. The use of the permanent electrical system for temporary services during the latter stages of construction shall be allowed. Expedite completion of system as practicable to this end. Maintain the system during this period.

G. Warranty periods on equipment, materials and systems shall commence upon Owner acceptance of the building or systems. Temporary use shall not jeopardize or alter warranty requirements.

H. The complete temporary service shall comply with Power Company, OSHA, and all Code requirements.

1.12 WORKMANSHIP

A. Materials and equipment shall be installed and supported in a first-class and workmanlike manner by mechanics skilled in their particular trades. Workmanship shall be first-class in all respects, and the Architect shall have the right to stop the work if highest quality workmanship is not maintained.

B. Electrical work shall be performed by a licensed Electrical Contractor in accordance with requirements of the jurisdiction.

1.13 PROTECTION

A. Each Contractor shall be entirely responsible for all material and equipment furnished in connection with his work. Special care shall be taken to properly protect all parts thereof from theft, damage or deterioration during the entire construction period in such a manner as may be necessary, or as directed by the Architect.

B. The Owner’s property and the property of other contractors shall be scrupulously respected at all times. Provide plastic sheeting, drop cloths or similar barriers where dust and debris is generated, to protect adjacent areas.

C. Contractor shall protect all equipment and materials from detrimental effects of weather or construction activity. All items shall be stored and secured in a protected location away from the daily work area. Equipment or materials shall be placed on raised skids to protect from surface

moisture. Where appropriate, provide plastic sheeting or similar vapor barrier underneath the stored products to reduce the effects of ground moisture or curing concrete on the local humidity levels. Where unfinished ferrous products or finished ferrous products with raw edges are stored, provide local, dry heat to maintain ambient relative humidity levels below 65% RH to prevent rust.

D. All equipment shall retain the original packaging until required to be removed for installation or operation. Open ends of ducts, piping, conduit, etc. shall be capped or sealed and ventilation openings into equipment shall be wrapped and sealed in plastic sheeting to prevent dust or dirt entry both when stored and after installation but still open to the effects of construction activity. Stored items as well as installed equipment shall be covered with plastic sheeting at all times until placed in service or until dust generating activity in the area has ceased.

1.14 PAINTING

A. In addition to any painting specified for various individual items of equipment, the following painting shall be included in the Electrical Contract:

1. All metal which is not factory or shop painted and which remains exposed to view in the building including finished areas, mechanical rooms, storage rooms and other unfinished areas shall be given a prime coat of paint.
2. All metal installed outside the building which is not factory or shop painted shall be given a prime coat of paint.
3. Equipment and materials which have been factory or shop coated (prime or finished painted or galvanized), on which the finish has been damaged or has deteriorated, shall be cleaned and refinished equal to its original condition. The entire surface shall be repainted if a uniform appearance cannot be accomplished by touch-up.
4. Apply Z.R.C. Cold Galvanizing Compound, or approved equal, for touch-up of previously galvanized surfaces.
5. Paint, surface preparation and application shall conform to applicable portions of the Painting section of Division 09 Finishes. All rust must be removed before application of paint.

B. Finish painting is included in the General Contract. Refer to the Cutting and Patching paragraph in this Section for finishing requirements.

1.15 CLEANING

A. Debris, dust, dirt, etc shall be removed daily, particular attention shall be paid to areas that the Owner is continuing to occupy or use; any mess created in corridors, stairwells and egress paths that are maintained during construction shall be cleaned immediately.

B. The Owners dumpsters and trash receptacles shall not be used. If a dumpster is required, it shall be provided by the contractor and located where approved by the Owner. Coordinate dumpster requirements with other contractors.

C. Before turning an area back over to the Owner, thoroughly clean the space to leave the area in a similar condition before the start of the project where finishes are to remain.

D. Before placing each system in operation, the equipment shall be thoroughly cleaned; cleaning shall be in accordance with equipment manufacturer's recommendations.

E. Refer to appropriate Sections for cleaning of other equipment and systems for normal operation.

1.16 EQUIPMENT SELECTION

A. Materials and equipment furnished under this contract shall be in strict accordance with the specifications and drawings and shall be new and of best grade and quality. When two or more articles of the same material or equipment are required, they shall be of the same manufacturer.

B. All electrical equipment and wiring shall bear the Underwriters Laboratories, Inc. label where UL label items are available, and shall comply with NEC (NFPA-70) and NFPA requirements.

C. The selection of materials and equipment to be furnished under this contract shall be governed by the following:

1. Where trade names, brands, or manufacturers of equipment or materials are listed in the specification, the exact equipment listed shall be furnished. Where more than one name is used, the Contractor shall have the option of selecting between any one of the several specified. All products shall be first quality line of manufacturers listed.
2. Where the words "or approved equal" appear after a manufacturer's name, specific written approval must be obtained from the Engineer during the bidding period in sufficient time to be included in an addendum. The same shall apply for equipment and materials not named in the specifications, where approval is sought.
3. Where the words "equal to" appear, followed by a manufacturer's name and sometimes a model or series designation, such designation is intended to establish quality level and standard features. Equal equipment by other manufacturers will be acceptable, subject to the Engineer's approval during shop drawing submittal.

D. Substitute equipment of equal quality and capacity will be considered when the listing of such is included as a separate item of the bid. State the deduction or addition in cost to that of the specified product.

E. Before bidding equipment, and again in the preparation of shop drawings, the Contractor and his supplier shall verify that adequate space is available for entry and installation or the item of equipment, including associated accessories. Also verify that adequate space is available for servicing of the equipment and that required NEC (and other applicable Code’s) clearances are met. The Contractor and his supplier shall also verify compatibility of equipment specified with available system/service voltages, etc.

F. If extensive changes in conduit, equipment layout or electrical wiring and equipment are brought about by the use of equipment or existing site conditions which are not compatible with the layout shown on the drawings, necessary changes shall be deemed to be included in the contract.

1.17 SHOP DRAWINGS

A. Refer to Section 016000 Product Requirements.

B. One set of shop drawings, in electronic format (pdf), with descriptive information shall be assembled by each Contractor of equipment and materials furnished in his contract, and submitted to the Architect and/or Engineer for review as stated in Division 01. These shall be submitted as soon as practicable and before special equipment is manufactured and before installation.

C. Shop drawings for equipment fixtures, devices and materials shall be labeled and identified same as on the Contract Documents. Failure to do so may be cause for rejection of shop drawings.

D. The review of shop drawings by the Architect or Engineer shall not relieve the Electrical Contractor from responsibility for errors in the shop drawings. Deviations from specifications and drawing requirements shall be called to the Engineer's attention in a separate clearly stated notification at the time of submittal for the Engineer's review.

E. Shop drawings of the following electrical equipment and materials shall be submitted:

1. Firestopping.
2. Wireway.
3. Wiring devices and coverplates.
4. Service/Distribution panelboard.
5. Panelboards and associated distribution equipment.
6. Fuses.
7. Motor controllers and disconnects.
8. Lighting Controls including layout plans of Occupancy Sensors.
9. Low voltage switching/lighting control system
10. Lighting fixtures.
11. Fire alarm system with schematic and point to point wiring diagrams.

1.18 TESTING

A. As each wiring system is completed, it shall be tested for continuity and freedom from grounds.

B. As each electrically operated system is energized, it shall be tested for function.

C. The Contractor shall perform megger and resistance tests and special tests on any circuits or equipment when an authorized inspection agency suspects the system's integrity or when requested by the Architect or Engineer.

D. All signaling and communications systems shall be inspected and tested by a qualified representative of the manufacturer or equipment vendor. Submit four (4) copies of reports indicating results.

E. Tests shall be witnessed by field representatives of the Architect or Engineer or shall be monitored by a recorder when appropriate. Furnish a written record of each system test indicating date, system, test conditions, duration and results of tests.

F. Instruments required for tests shall be furnished by the Contractor.

1.19 FINAL INSPECTION AND PUNCH LIST

A. As the time of work completion approached, the Contractor shall survey and inspect his work and develop his own punch list to confirm it is complete and finished. He shall then notify the Architect and request that a final inspection be made. It shall not be considered the Architect's or Engineer's obligation to perform a final inspection until the Contractor has inspected the work and so states at the time of the request for the final inspection.

B. The Architect and/or Engineer will inspect the work and prepare a punch list of items requiring correction, completion or verification. Corrective action shall be taken by the Contractor to the satisfaction of Architect and Engineer within 30 days of receipt of the Architect/Engineer's punch list.

1.20 OPERATING AND MAINTENANCE MANUALS

A. Digital copy (pdf) of operating and maintenance manuals shall be assembled for the Electrical work by the Contractor and provided on a flash drive.

B. All shop drawings and installation, maintenance and operating instruction pamphlets or brochures, wiring diagrams and other information, along with warranties, shall be obtained from each manufacturer of the principal items of equipment. In addition, the Contractor shall prepare a chart listing all items of equipment which are furnished under his contract and indicating the nature of maintenance required, the recommended frequency of checking these points and the type of replacement material required. Major items of equipment shall consist of not less than the following:

1. Distribution switchgear.
2. Specialty equipment.

C. Standard NEMA publications on the operation and care of equipment may be furnished in lieu of manufacturer's data where the manufacturer's instruction is not available.

D. These shall be combined into a single electronic file in .PDF format. An index and tabbed sheets to separate the sections shall be included. These shall be submitted to the Architect or Engineer for review. Upon approval, manuals shall be turned over to the Owner.

1.21 RECORD DRAWINGS

A. The Electrical Contractor shall maintain a separate set of prints of the contract documents and shall show all changes or variations, in a manner to be clearly discernible, which are made during construction. Upon completion of the work, these drawings shall be turned over to the Architect. This shall apply particularly to underground and concealed work, and to other systems where the installation varies to a degree which would justify recording the change.

1.22 WARRANTIES

A. This Contractor shall warrant all workmanship, equipment and material entering into this contract for a period of one (1) year minimum from date of final acceptance or date of beneficial use, as agreed to between Contractor and Architect. Any materials or equipment proving to be defective during this warranty period shall be made good by this Contractor without expense to the Owner.

B. This provision shall not be construed to include maintenance items such as making normally anticipated adjustments or correcting adjustment errors on the part of the Owner's personnel.

C. Provisions of this warranty shall be considered supplementary to warranty provisions under General Conditions.

D. Extended warranties shall be provided where indicated in the equipment specification Sections.

1.23 OPERATION AND ADJUSTMENT OF EQUIPMENT

A. As each system is put into operation, all items of equipment included therein shall be adjusted to proper working order. This shall include balancing and adjusting voltages and currents and adjusting all operating equipment.

B. Caution: Verify that all bearings of equipment furnished are lubricated, all motors are operating in the right direction, and correct overload heater elements are provided on all motors. Do not depend wholly on the other trades judgment in these matters. Follow specific instructions in regard to lubrication of equipment furnished under this Contract.

1.24 OPERATING DEMONSTRATION AND INSTRUCTIONS

A. The Contractor shall set the various systems into operation and demonstrate to the Owner and Architect that the systems function properly and that the requirements of the Contract are fulfilled.

B. The Contractor shall provide the Owner's representatives with detailed explanations of operation and maintenance of equipment and systems. A thorough review of the operating and maintenance manuals shall be included in these instructional meetings.

C. A minimum of 8 hours shall be allowed for instructions to personnel selected by the Owner. Instructions shall include not less than the following:

1. Show locations of items of equipment and their purpose.
2. Review binder containing instructions and equipment and systems data.
3. Coordinate written and verbal instructions so that personnel understand each.
4. Separate instructions shall be given by manufacturer's representatives for the various special systems.

PART 2 - PRODUCTS – NOT APPLICABLE

PART 3 - EXECUTION – NOT APPLICABLE

END OF SECTION 26 0001

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SECTION 26 0002 – ELECTRICAL WORK IN EXISTING BUILDINGS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes the following:

1. General Requirements for Renovation Work
2. Inspection of Existing Building
3. Asbestos Material
4. Work Hours
5. Tobacco Products
6. Barriers and Signage
7. Storage of Tools and Materials
8. Protection of Existing Building and Equipment
9. Confined Spaces
10. Noise, Fumes and Dust Control
11. Removals Disposal and Reuse
12. Cutting and Patching

1.2 GENERAL REQUIREMENTS FOR RENOVATION WORK

A. Refer to Article 1 Specification requirements and notes on the drawings where provided for requirements related to renovation work.

B. Meet with the Owner and Architect before demolition or construction begins to establish procedures for work effort in the existing building. Provide names and phone numbers and establish emergency contact information where work is performed. Provide security information requested by the Owner for all personnel who will be working on site. Educate all construction personnel in regard to the project requirements and procedures.

C. Coordinate effort with other contractors involved in the renovation project to minimize the disruption, phasing of work, share cleaning responsibilities, etc.

1.3 INSPECTION OF EXISTING BUILDING

A. Each bidder shall inspect the project site and the existing building in the early time frame of the bidding period. Conditions shall be compared with information shown on the drawings. Report to the Architect any significant discrepancies which may be discovered in a timely fashion so that direction may be provided in an addendum. After the contract is signed, no allowance will be made for failure to have made a thorough inspection.

1.4 ASBESTOS MATERIAL

A. Abatement, removal or encapsulation of existing materials containing asbestos is not included in the Contract. Necessary work of this nature will be arranged by the Owner to be done outside of this construction and remodeling project by a company regularly engaged in asbestos abatement. Such work will be scheduled and performed in advance of work in the construction and remodeling project.

B. If, in the performance of the mechanical work, materials are observed which are suspected to contain asbestos, the Contractor shall immediately inform the Architect who in turn will notify the Owner. Work that would expose workers to the inhalation of asbestos particles shall be terminated. Work may be resumed only after a determination has been made and unsafe materials have been removed or encapsulated and the area declared safe.

1.5 WORK HOURS

A. Work hours for construction shall be considered as normal working hours. The facility will be vacated by the Owner for the duration of construction but certain equipment ay remain on site that shall be protected by the Contractor while work is being performed in the vicimity.

B. Access to the work area shall be coordinated with the Owner; follow all security protocols for parking, sign in, key control, etc. established by the Owner.

1.6 TOBACCO PRODUCTS

A. Smoking or chewing tobacco products are expressly prohibited to be used within the building and on the premises except where specifically permitted by the Owner or in construction company trailers or vehicles where permitted by the construction company.

PART 2 - PRODUCTS- NOT APPLICABLE

PART 3 - EXECUTION

3.1 BARRIERS AND SIGNAGE

A. Barriers and signage shall be provided as appropriate to identify work areas and to prevent unauthorized entry by non construction personnel. Refer to appropriate Division 1 specification requirements and notes on the drawings where provided.

B. All barriers and signs should be high visibility type and be maintained at all times.

3.2 STORAGE OF TOOLS AND MATERIALS

A. Store all site material and tools in the active job site area, specific storage areas are not provided except where otherwise noted for material and tools. The contractor is responsible for security.

B. Storage is specifically prohibited in means of egress paths and stairwells.

3.3 PROTECTION OF EXISTING BUILDING AND EQUIPMENT

A. The Owners' property and the property of other contractors shall be respected at all times. Provide drop clothes, visqueen or other suitable barriers where dust and debris is generated. Tape ends of barriers for sealing purposes.

B. Provide plywood sheets for protection of walls, floors or Owner equipment or systems that are remaining in place near demolition or new installation work where there is possible damage from heavy material or equipment.

3.4 FUME AND DUST CONTROL

A. Arrange with the Owner when required to shutoff fire alarm or smoke detectors to perform work. With the Owners' prior approval. Cover smoke detectors where needed to prevent false alarms due to generated dust or fumes. Minimize outages and coordinate efforts to limit the effect due to false alarms.

3.5 REMOVALS DISPOSAL AND REUSE

A. Refer to the drawings for the scope of remodeling in the existing building.

B. Cooperate with the General Contractor regarding all removal and remodeling work. Each Contractor shall remove existing work which is associated with his trade and which will be superfluous when the new work is installed and made operational.

C. Extraneous conduit and wiring which is or becomes accessible shall be removed back to source or last active device. Conduit and wiring that is and remains inaccessible shall be abandoned. Upon completion of the work no abandoned boxes, conduits or wiring shall extend thru finished floors, walls or ceilings.

D. Where existing equipment, boxes, conduits etc. are removed and holes are left in existing walls, finished ceilings, floors etc. these holes shall be patched using materials to match the existing construction to restore and maintain the integrity of the existing partition.

E. Materials and equipment which are removed shall not be reused within the scope of this project unless specifically noted to be relocated or reused. Turn over to the Owner and place where directed on the premises all removed material and equipment so designated by the Owner. All material and equipment which the Owner does not wish to retain shall become the property of

the Contractor responsible for removal and shall be removed from the premises and properly disposed.

F. Disposal of materials regulated by EPA, including lamps and ballasts shall be done in strict accordance with latest requirements. Provide documentation to the Owner that disposal was properly executed.

G. In areas of minor work where the space is not completely vacated, temporarily move portable equipment and furnishings within the space as required to complete the work. Coordinate this activity with Owner. Protect the Owner's property by providing dust covers and temporary plastic film barriers to contain dust. Remove barriers and return equipment and furniture upon completion of the work.

H. Refinish any surface disturbed under this work to match existing, except where refinishing of that surface is included under the General Contract.

I. The removal of fire alarm devices, if those devices are not to be reused, shall include all programming changes needed at the fire alarm head end panel.

3.6 CUTTING AND PATCHING

A. Refer to Division 1 – General Requirements for information regarding cutting and patching.

B. Plan the work well ahead of the general construction. Where conduits are to pass thru new walls, partitions, floors, roof or ceilings, place sleeves in these elements or arrange with the General Contractor to provide openings where sleeves are not practical. Where sleeves or openings have not been installed, cut holes and patch as required for the installation of this work, or pay other trades for doing this work when so directed by the Architect. Any damage caused to the building shall be repaired or rectified.

C. Where conduits are to pass thru, above or behind existing walls, partitions, floors, roof or ceiling, cutting, patching and refinishing of same shall be included in this contract. Core drilling and saw cutting shall be utilized.

D. All material, methods and procedures used in patching and refinishing shall be in accordance with applicable provisions of specifications governing the various trades. The final appearance and integrity of the patched and refinished areas must meet the approval of the Architect. Wall, floor and ceiling refinishing must extend to logical termination lines (entire ceiling of the room repainted, for instance), if an acceptable appearance cannot be attained by finishing a partial area.

E. Provide steel angle or channel lintels to span openings which are cut in existing jointed masonry wall where the opening span exceeds 16 inches. Provide framing around roof openings for required support of the roof deck.

END OF SECTION 26 0002

SECTION 26 0004 – FIRESTOPPING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes through-penetration firestop systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items.

1.2 PERFORMANCE REQUIREMENTS

A. General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.

B. Rated Systems: Firestopping assemblies shall be tested and rated in accordance with ASTM E814 (ANSI/UL 1479) Fire Tests of Through-Penetration Fire Stops (minimum positive pressure of .01 inches of water column) and E119 (ANSI/UL 263) Fire Tests of Building Construction and Materials Time-Temperature Curve. Firestopping shall provide an “F” fire rating equal to that of the construction being penetrated. Firestop systems shall meet all requirements of the Ohio Building Code.

C. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.

1. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.
2. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

D. For through-penetration firestop systems exposed to view or above ceilings in air return plenums, provide products with flame-spread and smoke-developed indexes of less than 25 and 50, respectively, as determined per ASTM E 84.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For each through-penetration firestop system, submit documentation, including illustrations, from a qualified testing and inspecting agency, showing each type of

construction condition penetrated, relationships to adjoining construction, and type of penetrating item.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Firestopping materials shall be manufactured and/or supplied by:

1. Hilti, Inc.
2. Specified Technologies Inc.
3. 3M; Fire Protection Products Division.

2.2 FIRESTOPPING

A. Materials shall be in the form of caulk, putty, sealant, intumescent material, wrap strip, fire blocking, ceramic wool and other materials required for the UL listed assemblies. These shall be installed in conjunction with sleeves and materials for fill and damming.

PART 3 - EXECUTION

3.1 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

A. General: Installation of all materials and assemblies shall be in accordance with UL assembly drawings and the manufacturer’s instructions.

B. Installation shall be done by an experienced installer who is certified, licensed or otherwise qualified by the firestopping manufacturer as having the necessary training and experience.

C. Provide firestop system for every conduit or opening at penetration of all fire resistance rated walls and horizontal assemblies.

D. Provide rigid supports for conduit on both sides of the fire resistance rated wall or assembly where required as part of the fire stop assembly.

E. Coordinate opening size and additional framing requirement with the General Contractor for each opening to meet the firestop installation requirements.

F. Refer to 26 0533 Raceway and Boxes for Electrical Systems for sleeve requirements and treatment of penetrations not requiring firestopping.

G. Annular space of penetrations of nonfire-resistant-rated floor, floor/ceiling assemblies, or the ceiling membrane of a nonfire-resistant rated roof/ceiling assembly shall be filled with an approved firestopping material to resist the free passage of flame and products of combustion.

H. Smoke Barriers:
1. Penetrations shall be sealed with a firestopping system to prevent the passage of smoke.

I. Smoke Partitions:
   1. Penetrations shall be sealed with a caulking material to prevent the passage of smoke. Non-rated smoke partitions do not require a fire stopping system.

3.2 BUILDING STRUCTURE FIRE STOPPING

A. Where building structural members have a fire stopping system installed and portions of this fire stopping system are removed to install new systems hangers, the E.C. shall provide new fire stopping system onto portions of the building structure and hanger where fire stopping was removed. The fire stopping system shall be equal to the existing system and be 2-hour rated.

END OF SECTION 26 0004

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SECTION 26 0005 – EXCAVATION, BACKFILL AND SURFACE RESTORATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Excavating and backfilling for all in-grade underfloor conduit, exterior ducts, conductors, conduit, handholes, pullboxes, utility trenches and any incidental work included in the Electrical Contract.

1.2 DEFINITIONS

A. Backfill: Soil material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over conduit or duct in a trench, including haunches to support sides of conduit.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Bedding Course: Course placed over the excavated sub-grade in a trench before laying manhole, pullbox or conduit.

C. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

D. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions changes in the Work.
2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

E. Fill: Soil materials used to raise existing grades.

F. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

G. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below topsoil materials.

H. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.3 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Architect and then only after arranging to provide temporary utility services according to requirements indicated.

1.4 GENERAL

A. Excavate for all in-grade underfloor conduit, exterior ducts, conductors, conduit, handholes, pullboxes, utility trenches and any incidental work included in the Electrical Contract.. Backfill to finish grade or to levels consistent with the General Contractor's and Site Contractor's activities. Cut existing street, drive and parking lot paving, walks, curbs and other permanent hard surfaces which are to be encountered. Repair or restore exterior surfaces to original condition where such are not affected by Division 2 – Site Work. Cut existing floor slabs and replace slabs in conformance to 26 002 Basic Electrical Materials and Methods. All work shall comply with requirements set forth in Division 2.

B. Excavation and trench wall supporting, cribbing, sloping and stepping of excavations required for safety shall be done in accordance with OSHA and local requirements. Pumping of water from excavations and trenches which may be required during construction shall be included in this contract.

C. Contact the Ohio Utilities Protection Service (1-800-362-2764) well in advance of the start of any excavation to determine if any of the utility companies or departments have underground utilities in or near the project area.

D. Contact local water and sewer departments, gas company, electric company, telephone company, etc., regarding the possibility of encountering existing utilities. The integrity of all existing utilities shall be respected.

E. Existing utilities encountered during excavation work shall be protected in a manner acceptable to the utility owner. Any utilities that are damaged shall be repaired or replaced by the Contractor to the full satisfaction of the utility owner.

PART 2 - PRODUCTS

2.1 Refer to Division 31 Earthwork for bedding and backfill materials

PART 3 - EXECUTION

3.1 EXCAVATION FOR UTILITY TRENCHES

A. Interior and exterior trenches shall be over-excavated and the conduits, ducts or conductors shall be laid on 6" minimum depth sand bed.

B. Backfilling of excavations and trenches inside the building and outside under paved or other hard surfaced areas, shall be with graded pea gravel, graded coarse sand or crushed limestone, 3/4" maximum size, to prevent undue settlement. Backfill material for plastic piping shall be pea gravel or sand. Other excavations and trenches shall be backfilled with similar materials up to 18" above the top of the conduit or conductor. The remainder shall be with similar materials or with excavated material having no large clods, stones or rocks.

C. Maintain in place adequate barricades, guards, planking, plating signage, warning lights, etc., at and around excavations.

D. Backfill shall be mechanically compacted in layers not over 6" deep. Water settling will not be permitted. Where excavations have not been properly filled or where settlement occurs, they shall be refilled, compacted, smoothed off, and finally made to conform to the initial requirements. Excess excavated materials shall be removed from the site or disposed of as directed by the General Contractor. Refer to Division 31 Earthwork for compaction requirements.

E. Concrete floor slabs, paving, sidewalks, curbs sodded and other finished surfaces which have been damaged or removed in order to install the underground work shall be replaced but this Contractor equal to original conditions. This requirement is not applicable in areas where the General Contractor or the Site Contractor is obligated to provide new surfaces.

F. Excavation, backfill, surface repair and traffic control within the public right-of-way shall be in accordance with governing agency rules and regulations. Any fee for activity in the roadways shall be included in this contract so that no additional cost will accrue to the Owner.

G. All exterior underground direct buried conductor, conduit and concrete encased ducts shall be protected against future excavation damage by placing a plastic tape warning marker in each trench during backfill. Tape shall be 6" wide with black letters identifying the type of service. Tape shall be equal to that manufactured by Seton. Install tape full length of the trench approximately 18' above and on the centerline of the conductor, conduit or duct.

END OF SECTION 26 0005

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SECTION 26 0519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Building wires and cables rated 600 VAC and less.
2. Connectors, splices, and terminations rated 600 VAC and less.
3. Photovoltaic wires and cables rated for 1500 VDC or less.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control test reports.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Copper Conductors: Comply with NEMA WC 70.

B. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN and XHHW.

C. Multiconductor Cable: Comply with NEMA WC 70 for armored cable, Type AC and metal-clad cable, Type MC with ground wire.

D. Photovoltaic Wiring: Comply with NEMA WC 70 for PV Wire.

2.2 CONNECTORS AND SPLICES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Hubbell Power Systems, Inc.
3. O-Z/Gedney; EGS Electrical Group LLC.
4. 3M; Electrical Products Division.
5. Tyco Electronics Corp.

C. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR SIZE

A. Refer to schedule on drawings.

3.2 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Stranded for No. 8 AWG and larger.

B. PV Strings: Copper. Stranded for No. 12 AWG and larger.

3.3 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. PV Strings: Type PV Wire with MC4 connectors.

B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN-THWN, single conductors in raceway.

D. Class 1 Control Circuits: Type THHN-THWN, in raceway.

E. Class 2 Control Circuits: Power-limited cable, in raceway.

F. Use conductors such as type FEP with high temperature insulation as identified in the NEC for connections to resistance heating elements or in other areas subject to temperature exceeding the rating of THWN, XHHW or THHN.

G. In addition to the conduit system, a separate grounding conductor shall be installed with all feeders and branch circuitry.

H. Equipment grounding conductors shall be green, or completely taped green, at all accessible points.

I. Wire size ampacity shall equal or exceed its overload protective device. Where sizes shown on the drawings are greater than the apparent ampacity requirements, the size shown shall prevail to compensate for voltage drop. In no instance shall conductors be installed that are less than required by the N.E.C. Minimum conductor size shall be No. 12 AWG except No. 14 AWG may be used for control wiring or where otherwise specifically indicated.

3.4 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Conduit systems shall be clean and clear before pulling wires. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway. Pulling of branch circuit conductors shall be performed by manual means without the use of levers or heavy pulling devices that may compromise the conductor’s or insulation integrity.

D. A maximum of 8 conductors shall be installed in a branch circuit conduit unless specifically noted otherwise on the drawings. Equipment ground conductors are not counted when determining maximum fill.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Wiring in vertical raceways shall be supported with strain relief devices; Kellems grips or approved equal.

G. Support cables according to Division 26 Sections "Hangers and Supports for Electrical Systems."

H. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."

I. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

J. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

K. Underground splices (including splices in exterior pullboxes and manholes) shall be made using sealing kits or wire nuts U.L. listed and approved for the application.

L. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack. Refer to additional notes on plans for branch circuitry installation requirements.

3.5 TESTING

A. As each wiring system is completed, it shall be tested for continuity and freedom from grounds.

B. As each electrically operated system is energized, it shall be tested for function.

C. On all electric services including change-outs, backfeeds, etc. the Contractor shall verify phase rotation and voltage readings to assure the final installation is proper. Submit to the Engineer in writing a record of voltage readings and current readings taken at no-load and fully loaded conditions.

D. The Contractor shall perform megger and resistance tests and special tests on any circuits or equipment when an authorized inspection agency suspects the system's integrity or when requested by the Engineer.

E. Tests shall be witnessed by field representatives of the Engineer or shall be monitored by a recorder. Furnish a written record of each system test indicating date, system, test conditions, duration and results of tests. Copies of all test reports shall be included in the O&M manuals.

F. Instruments required for tests shall be furnished by the Contractor.

END OF SECTION 26 0519

SECTION 26 0526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes methods and materials for grounding systems and equipment.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control test reports.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.2 GROUNDING RODS

A. Grounding Rods shall be copper clad, molten welded copper to steel; unless otherwise designated, ¾” diameter X 10 ft. long.

2.3 CONNECTORS

A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.

1. Pipe Connectors: Clamp type, sized for pipe.

C. Clamps and continuity devices shall be non-ferrous material, UL approved. Connections to ground rods and all underground connections shall be made with welded connections ("Thermoweld" or "Cadweld").

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.

B. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

C. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Connections to Structural Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.
7. Armored and metal-clad cable runs.

8. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels.

B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

C. Wiring devices shall be connected with grounding jumper from ground pole on device to grounding screw (or grounding pigtail) in the outlet box.

D. Signal and Communication Equipment: For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.

1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch grounding bus.
2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

3.3 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.

C. Main service neutral shall be grounded to the street side of the building water service. A bonding jumper shall be installed around the water meter. In addition to using the water service as a grounding electrode, effectively grounded building steel, driven ground rods outside or buried electrode shall be provided and connected. Bond to interior metallic water, gas and all other metallic lines.

D. The complete metal conduit system shall be used for the equipment grounding system. Conduit systems and associated fittings and terminations shall be made mechanically tight to provide a continuous electrical path to ground and shall be safely grounded at all equipment by bonding all metallic conduit to the equipment enclosures with locknuts cutting thru paint of enclosures. Bond all conduits entering service entrance switchboard with a ground wire connecting the grounding bushings to the equipment ground bar. Conductors shall be sized per NEC Tables 250-66 and 250-122. Bond all communications conduit systems to ground.

E. In addition to using the conduit system for grounding, a complete auxiliary green wire equipment grounding system shall be installed, continuous from main ground, thru distribution

and branch circuit panelboards and paralleling all feeders and branch circuit wiring. Grounding conductor sizes shall comply with NEC Table 250-122, minimum size shall be #12 copper except #14 on control circuits. This shall apply to all circuits rated 100 volts or more above ground potential.

F. Ground neutral of all transformers for separately derived systems.

G. Motor frames shall be bonded to the equipment grounding system by an independent green wire, sized as shown.

H. Cord connected appliance frames shall be grounded to the equipment grounding system thru a green wire in the cord.

I. A green grounding conductor shall be installed in each non-metallic conduit and all flexible conduits, including exterior underground conduits.

J. System neutral connections shall be insulated from metal enclosures except at the neutral of the service entrance equipment and on the neutral of a separately derived system. Connections to the main service enclosure shall be by means of bonding jumpers.

K. The building neutral shall be identified throughout with white conductors for 280/120 volt systems.

L. A minimum #6 ground wire shall be run from each telephone backboard/data rack back to the main building ground. Or where indicated on the drawings or in the specifications, a separate communications grounding system shall be provided and bonded to the electrical grounding system at the main ground bar.

M. Bond the generator neutral to the generator equipment grounding conductor. Bond the generator frame to the equipment grounding conductor. Provide signs at the grounding locations per NEC Article 701.

N. Where metal covers on pull boxes and junction boxes are used, they shall comply with the grounding and bonding requirements of NEC Article 250.

O. Connections to driven ground rods or other such electrodes shall be a minimum of 3 feet from the building foundation wall or beyond the roof drip line, whichever is greater.

END OF SECTION 26 0526

SECTION 26 0529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Hangers and supports for electrical equipment and systems.

1.2 PERFORMANCE REQUIREMENTS

A. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.3 QUALITY ASSURANCE

A. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Allied Tube & Conduit.
b. Cooper B-Line, Inc.; a division of Cooper Industries.
c. ERICO International Corporation.
d. Thomas & Betts Corporation.
e. Unistrut; Tyco International, Ltd.
f. Wesanco, Inc.

2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
5. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1) Cooper B-Line, Inc.; a division of Cooper Industries.
2) Empire Tool and Manufacturing Co., Inc.
3) Hilti Inc.
4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
5) MKT Fastening, LLC.

2. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
3. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
5. Toggle Bolts: All-steel springhead type.
6. Hanger Rods: Threaded steel.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

C. Utilize supports with swivel type attachments to maintain true vertical support from sloped structure or inclined structural elements (such as beam clamp with swivel option).

D. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

E. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
6. To Light Steel: Sheet metal screws.
7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on blocking attached to substrate by means that meet anchorage requirements.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.4 CONCRETE BASES

A. Provide dowel rods to connect concrete bases to concrete floors/slabs/substrates. Unless otherwise indicated, install dowel rods on maximum 18-inch centers around the full perimeter of concrete base.

B. Provide epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor/slab/substrate, unless concrete bases are installed directly on grade. Place and secure anchorage devices. Using setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded. Install anchor bolts to elevations required for proper attachment to supported equipment.

C. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast galvanized or stainless-steel anchor-bolt inserts into bases.

D. Indoor bases shall be at least 4” thick and shall have straight and finished sides and a 1”-45 degree chamfer at the top perimeter. Reinforcing steel bars shall be placed in both directions of the bases. Where required for supplemental support, provide lateral support work to adjacent wall(s). Provide concrete bases/housekeeping pads beneath all electrical power and systems distribution equipment that is floor mounted or wall mounted within 4” of the floor.

E. Outdoor bases shall be at least 6” thick and shall have straight and finished sides and a 1”-45 degree chamfer at the top perimeter. Perimeter of pads shall extend down below the frostline. Reinforcing steel bars shall be placed in both directions of the bases and a mesh overlay shall be provided. Where required for supplemental support, provide lateral support work to adjacent wall(s). Provide concrete bases/housekeeping pads beneath all electrical power and systems distribution equipment that is slab or grade mounted or mounted within 6” of slab or grade.

F. Unless indicated otherwise in specifications or on drawings, use minimum 3000-psi, 28-day compressive-strength concrete. Size and provide concrete bases so expansion anchors will be a minimum of 10 bolt diameters from the edge of the concrete base.

G. Forms: As required for equipment pads or other special applications in field, provide forms made of steel, wood, or other suitable material of size and strength to resist movement during concrete placement, and to retain horizontal and vertical alignment until removal. Use straight forms, free distortion and defects. Use flexible spring steel forms or laminated boards to form radius bends. Do not remove forms for 24 hours after concrete has been placed. Set forms to required grades and lines, rigidly braced and secured. Provide sufficient quantity of forms to allow continuous progress of work, and so that forms can remain in place at least 24 hours after concrete placement. Clean forms after each use, and coat with form release agent as often as required to ensure separation from concrete without damage. Form areas that involve termination of spare conduits below grade, or that involve continuation of conduits by others, accordingly to accommodate easy future access to the ends of conduits for future extensions.

H. Reinforcement: Cut bars true to length with ends square and free of burrs. Provide metal expansion caps for one end of each dowel bar in expansion joints. Design caps with one end closed and minimum length of 3” to allow bars movement of not less than 1”, unless otherwise indicated. Provide these for joining applications where continuous pouring cannot be accomplished.

I. Concrete Placement: Remove loose material from subbase surface immediately before placing concrete. Check subbase and forms for line and grade before placing concrete. Moisten subbase if required to provide a uniform dampened condition at time concrete is placed. Place concrete using methods that prevent segregation of mix. Use splash boards to divert the flow of concrete away from the trench sides, and to avoid dislodging soil and stones. Coordinate with Owner's Representative at least 72 hours prior to placing concrete. Line up concrete trucks as required to achieve one continuous pour where applicable. Do not backfill until a minimum of 48 hours have passed.

J. Concrete Finishing: Smooth surface by screeding after striking-off and consolidating concrete. Provide Class A finishing. Broom finish concrete pads, and aprons around pullboxes and structures. Protect concrete from damage until acceptance of work. Exclude traffic over affected areas for at least 14 days after placement.

3.5 PLYWOOD EQUIPMENT BOARDS

A. Plywood Equipment Boards: Lumber shall be preservative treated in accordance with AWPB LP-2, and kiln dried to a moisture content of not more than 19 percent. Provide plywood panels; APA C-D PLUGGED INT, with exterior glue; thickness as indicated, or if not indicated, not less than ¾ inches deep. Provide marine grade plywood where subject to moisture conditions. Provide Simpson Strong Tie (or equal) expansion screw anchors.

B. Unless otherwise noted, boards shall be painted with two coats of good grade weatherproof flat gray non-conductive fire-retardant paint on all sides and edges (prior to mounting) and plumbed in a true vertical position. Provide nominal ½" rustproof spacers between back of plywood and wall. Cut, fit, and place plywood equipment boards accurately in location, alignment, and elevations to support and anchor electrical materials and equipment. Select fastener sizes that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood members. Attach to substrates as required to support applied loads. Maintain at least 4 inches from bottom of plywood equipment boards and the finished floor surface.

C. Unless directed otherwise in field, plywood equipment boards shall be 8 feet high by ¾ inches deep by length shown on drawings (as dimensioned or as scaled) or length as required to accommodate equipment if not indicated on drawings. Unless directed otherwise in field, provide plywood equipment boards for all indoor surface mounted panelboards and systems "head-end" equipment for all applications where located in mechanical or electrical rooms/areas and only where specifically shown on drawings for all other applications.

END OF SECTION 26 0529

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SECTION 26 0533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.2 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, details, and attachments to other work.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

A. Rigid Steel Conduit: ANSI C80.1.

B. IMC: ANSI C80.6.

C. EMT: ANSI C80.3.

D. FMC: Zinc-coated steel.

E. LFMC: Flexible steel conduit with PVC jacket.

F. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
2. Fittings for EMT: Steel only; set-screw or compression type.

2.2 NONMETALLIC CONDUIT AND TUBING

A. ENT: NEMA TC 13.

B. RNC: NEMA TC 2, unless otherwise indicated.

C. LFNC: UL 1660.

D. Fittings for ENT and RNC: NEMA TC 3; match to conduit or tubing type and material.

E. Fittings for LFNC: UL 514B.

2.3 SURFACE RACEWAYS

A. Surface Metal Raceways: Painted Steel with snap-on covers, white finish.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Mono Systems.
b. Walker Systems, Inc.; Wiremold Company (The).
c. Hubbell Wiring Systems.

2.4 BOXES, ENCLOSURES, AND CABINETS

A. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

B. Cast-Metal Outlet and Device Boxes: NEMA FB 1, aluminum, Type FD, with gasketed cover.

C. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

D. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.

E. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.

F. Cabinets:

1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:

1. Exposed Conduit: Rigid steel conduit.
2. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Comply with the following indoor applications, unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: Surface Raceway.
2. Exposed, Not Subject to Severe Physical Damage: Surface Raceway.
3. Exposed and Subject to Severe Physical Damage: Rigid steel conduit. Includes raceways in the following locations:

   a. Mechanical rooms.
   b. Apparatus Bay, 48” A.F.F. and below.

4. Concealed in Ceilings and Interior Walls and Partitions: EMT except FMC may be utilized in existing walls.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
6. Damp or Wet Locations: Rigid steel conduit.
7. Raceways for Optical Fiber or Communications Cable: EMT.
8. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, stainless steel in damp or wet locations.

C. Minimum Raceway Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

2. EMT: Use all steel, setscrew type, concrete tight.

3. Flexible conduit: Use malleable iron, “squeeze” type, non-insulated. (For lighting fixture whips only: Use all steel or die-cast screw-in connector).

4. Liquid-tight conduit: steel or malleable iron.

3.2 INSTALLATION

A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter. Generally run conduit and conductors as high as practicable against underside of floor slab in concrete construction or immediately below the **top chord** of bar joist construction unless otherwise shown or noted. This high level zone shall be used for running electrical raceways and shall be grouped or

racked together wherever feasible. Runs at bottom chord level or ceiling grid level are not acceptable.

B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation. Plan raceway routing to minimize the number of offsets and junction boxes.

D. Support raceways as specified in Division 26 Section "Hangers and Supports for Electrical Systems."

E. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.

F. Conceal conduit and EMT within newly constructed walls, ceilings, and floors, unless otherwise indicated. All conduit shall parallel building lines. Minimize use of surface raceways where necessary on existing masonry and concrete walls.

G. Conduit shall be run overhead and shall not be run below concrete slabs unless specifically indicated on the drawings and in the legend on the drawings.

H. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.

I. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.

J. Raceways for Data, Audio Visual and Communications Cable: Install as follows:

1. 1-Inch Trade Size and Smaller: Install raceways in maximum lengths of 75 feet.
2. Install with a maximum of two 90-degree bends or equivalent for each length of raceway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes where necessary to comply with these requirements.

3. Raceway shall be installed continuously from outlet box to above accessible ceiling.

4. Provide J-Hook System above accessible corridor ceilings to Systems Racks/Cabinets for various building systems (Fire Alarm, Voice/Data, Fire Call System).

5. Provide wall sleeves above accessible ceilings in all new/existing walls to allow cabling pass-thru from device to rack locations (size sleeves accordingly to allow cabling capacity plus 50% future).

K. Flexible Conduit Connections: Use maximum of 72 inches of flexible conduit for recessed and semirecessed lighting fixtures, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in all locations except MC may be used for lighting fixture whips.

L. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.

M. Do not install wall-mounted boxes back-to-back in opposite sides of wall; in stud walls, boxes shall be on opposite side of studs.

N. Provide access to all junction and pull boxes.

O. Set metal floor boxes level and flush with finished floor surface. Provide trim ring compatible with finish floor system.

P. Pull mandrel or large swab thru conduit to assure freedom from debris before pulling wires. Use listed pulling lubricants where necessary.

Q. Contractor shall record carefully on a set of “as-built” prints, the exact location of all feeder conduits (100 amps and larger).

R. Unless noted otherwise on the drawings, a maximum of 8 conductors shall be installed in a branch circuit conduit. This maximum is a count of all phase and neutral conductors only.

3.3 INSTALLATION OF EXPOSED CONDUIT OUTDOORS

A. Only install conduit exposed outdoors when it is impossible to do otherwise, or only if specifically indicated for such installation case-by-case elsewhere in documents. Installation convenience, financial considerations, lack of coordination with other trades and similar rationale are not sufficient reasons for conduit sizes per NFPA 70 (National Electrical Code, NEC). Provide expansion fittings, which are Listed and labeled for the respective applications, at all building expansion joints and at maximum distances of 100 feet. Paint all such conduits with at least two coats of UV-resistant weatherproof paint. Provide colors to match respective surrounding surfaces; submit colors to Design Professional for review in advance of procuring paint.

3.4 INSTALLATION OF EXPOSED CONDUIT ON ROOFS

1. Only install conduit exposed on rooftops when it is impossible to do otherwise, or only if specifically indicated for such installation case-by-case elsewhere in documents. Installation convenience, financial considerations, lack of coordination with other trades and similar rationale are not sufficient reasons for doing so. In cases where conduits must be installed on rooftops, de-rate conductors and modify conduit sizes per NFPA 70 (National Electrical Code, NEC). Provide expansion fittings, which are Listed and labeled for the respective applications, at all building expansion joints and at maximum distances of 100 feet. Paint all such conduits with at least two coats of UV-resistant weatherproof paint. Provide white paint of flat rooftops that have finishes white in color, and for otherwise-colored roof finishes that are not visible from the building interior or from the ground outdoors. Elsewhere select colors to match surrounding surfaces; submit colors to Design Professional for review in advance of procuring paint.

END OF SECTION 26 0533

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SECTION 26 0537 – J-HOOK PATHWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 GENERAL

A. Conduit/Raceway/Pathway: "Conduit", "raceway", "pathway" and similar terms shall be taken to mean "conduit" unless specifically indicated otherwise in project manual documents, or unless specifically directed otherwise in field by Owner or Design Professionals. All such terms shall be considered synonymous for the general purposes of installation means and methods.

B. Provide J-Hook pathway systems only for the following limited applications: Class 2 ("low voltage") control wiring above accessible finished-ceiling systems.

C. Coordination Drawing Submittals: Prior to commencing with any related work, submit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
1. Routing.
2. Scaled layout and relationships between components and adjacent structural, electrical, and mechanical elements.
3. Vertical and horizontal offsets and transitions.
4. Clearances for access above and to side of pathways.
5. Vertical elevation of pathways above the floor or below bottom of ceiling structure.
6. Structural members in paths of conduit groups with common supports.
7. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

PART 2 - PRODUCTS

2.1 J-HOOK PATHWAYS

A. Acceptable Manufacturers: Subject to being equivalent and subject to compliance with requirements, provide product by one of the manufacturers listed below, or equivalent NRTL listed and labeled equivalent.
1. Cooper B-Line (basis of design, model numbers as specified further below).
2. Mono-Systems, Inc.

B. Materials Description:
1. Provide J-Hook system components that are plenum-rated (regardless of whether air plenum ceilings exist on the project). Provide J-Hooks, not Cable Fasteners, and not Bridle Rings. Provide open-top hooks, so cables can be laid into J-Hooks rather than threaded through. Provide tool-less cable retainer clips (do not use cable ties). Provide hooks sized for maximum 40% fil (in cross section) based on outside diameter of cables. Accordingly, provide multiple sets of J-Hooks along any given pathway as applicable.
2. Provide necessary factory hooks, cable retainers, fasteners, attachment kits, etc. as required for complete installations.

2.2 MATERIALS AND FINISHES

A. Provide steel units with rolled hook edges to prevent damage to cable jackets and insulation.

B. Cable hooks for non-corrosive areas shall be pre-galvanized steel, ASTM A653. Where additional strength is required, cable hooks shall be spring steel with a zinc-plated finish, ASTM B633, SC3.

C. Cable hooks for corrosive areas shall be stainless steel, AISI Type 304.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide J-Hook support along “free-air” cable pathway routes. Provide J-Hooks at four-foot intervals and at offsets. Route J-Hooks above ceilings through corridors and similar open areas wherever possible to minimize above-ceiling wall penetrations.

B. Layout and install all electrical work in strict compliance with Chapter 1, Part B, Section 110.26 of the latest adopted edition of NFPA 70. Locations and routing that may be shown on plans are schematic and diagrammatic in nature. Layout all proposed pathway routing, elevations, installation methods, etc. on coordination drawings and coordinate all proposed routing with all affected trades prior to commencing with work. In addition, review the information with Owner and Design Professionals for all areas where pathways will be visible after completion of construction, to ensure a neatly organized installation occurs. Where exposed in finished areas, install in a manner that minimizes detrimental effects on room aesthetics. Install as out of site as reasonably possible.

C. Keep pathways at least 24 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal runs above liquid and steam piping. Level and square runs, and install at proper elevations and heights. Do not begin installation of cables unit J-Hook pathway installations are complete and until installations locations (end to end) are in a weatherproof environment. Install pathways so that they are accessible for cable installation after construction is complete. Install pathways with enough workspace to permit access for installing cables. Strictly adhere to factory load capacities and fill capacity. Provide factory cable retainers, fasteners, attachment kits, and other accessories as required for a complete installation.

D. Securely anchor (mechanical, not adhesive) J-Hooks directly to structural components of the building. Do not anchor J-Hooks to ductwork, conduit, piping, fixtures, equipment, ceiling supports (rods, wires, T-bars), etc. Comply with requirements in Section 260529 and related sections for hangers and supports. Support using factory-approved methods. Fasten cables on horizontal runs with factory cable clamps, retainers, fasteners, attachment kits or flexible Velcro-secured wraps compliant with to NEMA VE 2. Tighten clamps/wraps only enough to secure the cable, without indenting the cable jacket. Use of synthetic or plastic “tie-wraps”, “zip ties”, “wire ties” and similar products are not permitted as a permanent means of anchoring, securing, supporting or otherwise installing any cables, conductors, conduits, raceways, devices equipment or other electrical work. Do not use perforated strap.

E. Coordinate work prior to rough-in with respective equipment and cable installers, and with Owner's Representative. Carefully coordinate proposed routing, including elevations, with affected installers and entities prior to rough-in. Neatly route paths parallel and perpendicular to building architectural lines, plumb on walls, and at a consistent elevation wherever possible. Install paths in a uniform plane/elevation wherever possible. Keep horizontal and vertical offsets to an absolute minimum. Route paths so that a minimum of 24 inches exists between cables and potential EMI sources such as lighting ballasts, motors, power wiring, dimmer circuits, etc.

F. Provide a minimum of two (2) 3-inch bushed conduit sleeves where pathway is routed above inaccessible ceilings, and at penetrations of floors, masonry walls, fire rated walls, smoke-tight partitions, smoke-related partitions, and similar elements. Provide smoke and fire stopping at such penetrations as applicable in (see Section 260502). Provide EMT conduit for "drops" from paths to outlets and equipment, with sweep bends, insulated throat fittings and 200-pound pull string.

END OF SECTION 26 0537

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SECTION 26 0543 –UNDERGROUND DUCTS AND RACEWAYS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Conduit, ducts, and duct accessories for direct-buried and concrete-encased duct banks, and in single duct runs.
2. Handholes and boxes.

1.2 SUBMITTALS

A. Product Data: For accessories for handholes, and boxes.

B. Shop Drawings for Factory-Fabricated Handholes and Boxes: Include dimensioned plans, sections, and elevations, and fabrication and installation details, including the following:

1. Duct entry provisions, including locations and duct sizes.
2. Cover design.
3. Grounding details.
4. Dimensioned locations of cable rack inserts, and pulling-in and lifting irons.

C. Field quality-control test reports.

1.3 QUALITY ASSURANCE

A. Comply with ANSI C2.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 CONDUIT

A. Rigid Steel Conduit: Galvanized. Comply with ANSI C80.1.

B. RNC: Type EPC-40-PVC, UL 651, with matching fittings by same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B. Utilize galvanized rigid steel for 90 degree bends (long sweep type) with proper adapters between PVC duct and galvanized steel.

2.2 NONMETALLIC DUCTS AND DUCT ACCESSORIES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cantex, Inc.
2. CertainTeed Corp.; Pipe & Plastics Group.
3. Heritage Plastics.
4. Carlon Electrical Products.
5. Manhattan/CDT; a division of Cable Design Technologies.
6. Spiraduct/AFC Cable Systems, Inc.

B. Duct Accessories:

1. Duct Separators: Factory-fabricated rigid PVC interlocking spacers, sized for type and sizes of ducts with which used, to provide minimum duct spacings while supporting ducts during concreting or backfilling.

2.3 HANDHOLES AND BOXES

A. Description: Comply with SCTE 77.

1. Color: Gray.
2. Configuration: Units shall be designed for flush burial and have open bottom, unless otherwise indicated.
3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
5. Cover Legend: Molded lettering, As indicated for each service**.**
6. Duct Entrance Provisions: Duct-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
7. Handholes 12 inches wide by 24 inches long and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.

B. Polymer Handholes and Boxes: Molded of fiberglass-reinforced polymer concrete, with matching covers.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Carson Industries LLC.
b. Quazite (Hubbell).
c. Highline Products, Inc.

PART 3 - EXECUTION

3.1 EARTHWORK AND RESTORATION

A. Refer to Division 26 Section “Excavation, Backfill and Surface Restoration”.

3.2 DUCT INSTALLATION

A. Slope: Pitch ducts toward handholes and away from buildings.

B. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends at other locations, unless otherwise indicated.

C. Joints: Stagger couplings so those of adjacent ducts do not lie in same plane.

D. Building Wall Penetrations: Make a transition from underground duct to rigid steel conduit at least 10 feet outside the building wall without reducing duct line slope away from the building, and without forming a trap in the line. Use fittings manufactured for duct-to-conduit transition.

E. Sealing: Provide temporary closure at terminations of ducts that have cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15-psig hydrostatic pressure.

F. Pulling Cord: Install 100-lbf- test nylon cord in ducts, including spares.

G. Concrete-Encased Ducts: Support ducts on duct separators.

1. Separator Installation: Space separators close enough to prevent sagging and deforming of ducts. Secure separators to earth and to ducts to prevent floating during concreting. Stagger separators between tiers. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
2. Concreting Sequence: Pour each run of envelope between manholes or other terminations in one continuous operation.

    a. If more than one pour is necessary, terminate each pour in a vertical plane and install 3/4-inch reinforcing rod dowels extending 18 inches into concrete on both sides of joint near corners of envelope.
3. Reinforcement: Reinforce concrete-encased duct banks where they cross disturbed earth and where indicated. Arrange reinforcing rods and ties without forming conductive or magnetic loops around ducts or duct groups.
4. Stub-Ups: Use manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.

    a. Stub-Ups to Equipment: For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of base. Install insulated grounding bushings on terminations at equipment.
5. Identify Ductbank with one of the following methods:

a. Mark the top of all underground duct runs with concentrated red dye or powder on top.

b. Provide 6” wide yellow plastic tape, with black letters indicating “Electric”; place approximately 18” above and continuously along the centerline of duct bank.

3.3 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting ducts to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of ducts, and seal joint between box and extension as recommended by the manufacturer.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: Set covers of handholes 1 inch above finished grade and boxes with bottom below the frost line.

D. Field-cut openings for ducts and conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.4 GROUNDING

A. Ground underground ducts and utility structures according to Division 26 Section "Grounding and Bonding for Electrical Systems."

3.5 CLEANING

A. Pull mandrel through full length of ducts. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.

END OF SECTION 26 0543

SECTION 26 0553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Identification for conductors and communication and control cable.
2. Wiring device circuit identification.
3. Warning labels and signs.
4. Equipment identification labels.

1.2 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

1.3 QUALITY ASSURANCE

A. Comply with ANSI A13.1.

1.4 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

PART 2 - PRODUCTS

2.1 CONDUCTOR AND COMMUNICATION- AND CONTROL-CABLE IDENTIFICATION MATERIALS

A. Marker Tape: Vinyl or vinyl -cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

2.2 WIRING DEVICE CIRCUIT IDENTIFICATION

A. Marker Tape: Self-laminating, clear polyester, 3/8” high tape with black lettering.

B. Provide label on every wiring device cover plate, indicating panel and circuit breaker fed from. Utilize 12 pt. font. Mount label on face of device cover plate, centered near the top .

2.3 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.

C. Warning label and sign shall include, but are not limited to, the following legends:

1. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 mm)."

2.4 EQUIPMENT IDENTIFICATION LABELS

A. Self-Adhesive, Engraved, Laminated Phenolic Label: Adhesive backed, with black letters on a white background. Minimum letter height shall be 3/8 inch.

PART 3 - EXECUTION

3.1 APPLICATION

A. Electrical and Auxiliary Systems Box, Conductor and Cable Identification: Use marker tape to identify field-installed branch circuit, alarm, control, signal, sound, intercommunications, voice, and data wiring connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and cable pull points. Identify by system and circuit designation.

2. Identify panel and branch circuit number(s) on all junction box covers permanently clearly printed with bold black indelible marker.

3. Use system of designations that is uniform and consistent with system used by manufacturer for factory-installed connections.

B. Conduit and junction boxes:

1. Color code or label all junction boxes and exposed conduit at 20 ft. intervals. Coding shall be painted or labels of the pre-manufactured type permanently mounted with metal or plastic band.

2. Label panelboard and branch circuit number(s) on outside of junction box cover at all junction boxes containing branch circuit wiring. Labelling shall be neatly done utilizing black indelible ink markers.

3. Paint all junction boxes and covers for fire alarm wiring red.

C. Branch circuit panelboards:

1. Identify panel designation on directory card within the panel.
2. Fill out branch circuit directory indicating circuit number and area served, rooms, group of rooms, lighting, convenience outlets, motors, etc. Card index shall be neatly typed.
3. Replace branch circuit directory in existing panelboards in areas of alteration.
4. Branch circuit phase conductor color format shall be permanently identified inside each panelboard.

D. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply self-adhesive warning. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.

1. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.

E. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

a. Indoor Equipment: Self-adhesive, engraved, laminated phenolic label. Unless otherwise indicated, provide a single line of text with 1/4-inch- high letters on 5/8-inch- high label; where 2 lines of text are required, use labels 1 inch high.

2. Equipment to Be Labeled:

a. Panelboards, electrical cabinets, and enclosures.
b. Disconnect switches.
c. Enclosed circuit breakers.
d. Motor controllers.

3. Label shall include equipment name, voltage and where fed from. Where equipment is located in finished spaces, accessible to the public, in addition to adhesive, secure labels with screws, one on each end.

3.2 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach nonadhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.

F. Color-Coding for Phase and Voltage Level Identification, 600 V and Less: Use the colors listed below for ungrounded feeder, and branch-circuit conductors.

1. Color shall be factory applied.
2. Colors for 208/120-V Circuits:

a. Phase A: Black.
b. Phase B: Red.
c. Phase C: Blue.
d. Neutral: White

END OF SECTION 26 0553

SECTION 26 0563 – SPECIFIC WIRING APPLICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Various items of equipment require additional electrical connections, wiring and/or interlocks that are not specifically identified on the drawings or in the specifications. Included, but not limited to, are the following items:

1. Kitchen, laboratory and laundry equipment.
2. Mechanical/HVAC Equipment and motors.
3. Plumbing Equipment and Compressors.
4. Exterior Lighting Control Equipment.
5. Motorized Doors.
6. Security/Access Control Equipment.
7. Fire Protection/Suppression Equipment.

1.2 COORDINATION

A. Coordinate wiring requirements and interlocks for equipment provided by other Contractors. Obtain copies of approved Shop Drawings and/or manufacturer's wiring diagrams to determine exact wiring requirements.

B. This Contractor shall inquire of the Engineer during bidding, or at the earliest practical date, any questions which may arise regarding the intention and scope of this work.

PART 2 - PRODUCTS

2.1 Materials and equipment shall be as indicated on the drawings and in the specifications.

PART 3 - EXECUTION

3.1 Final connections to fixture pigtails shall be made with approved pressure connectors such as IDEAL “Twister” or T&B “Freespring Winged”.

3.2 Miscellaneous Equipment Connections

A. Various items of equipment such as kitchen, laboratory, laundry, HVAC, Plumbing, etc. will be furnished and set in place by other trades. This equipment, unless otherwise shown on the drawings, will be furnished with necessary electrical outlets, operating and control switches, terminating in an electrical outlet box, or equivalent electrical connector located on the

equipment. This contractor shall furnish power wiring to these various items of equipment and connect them up complete for full operation.

B. Where disconnect switches are indicated or where otherwise required, they shall be mounted in an accessible location. In the case of labs, kitchens, laundries and finished areas, provide NEMA 4X Stainless Steel enclosure and locate in as inconspicuous a place as possible. Locate disconnect switches under counters where feasible and accessible in lieu of above counter, however, this contractor shall ensure that the installation of equipment does not interfere with access and operation of such switches.

C. Where necessary to expose conduit in finished spaces, rigid aluminum conduit and conduit body ("LB") fittings shall be utilized.

D. Coordinate and provide any additional 120 volt power connections required for special low voltage systems devices or equipment panels such as Security System/Door Access System control panels, door strikes, surveillance cameras, security/fire shutters or doors, temperature control system panels/transformers, etc.

E. Roughing-in drawings for equipment shall be obtained from the Architect or Contractor providing the equipment with substantial time prior to the installation of such equipment to enable proper electrical rough-in equipment.

3.3 Miscellaneous Wiring Interlocks

A. Various items of work are required in connection with interlocking motor and starter/VFD operations and providing wiring to serve equipment which is furnished by other trades.

B. Interlocks between motor controllers for purposes of accomplishing sequence control or simultaneous operation of motors are all to be included in the Electrical Contract. Requirements for a simple simultaneous motor operation interlock are indicated by a schedule on the drawings or by specific notes. These interlocks consist of auxiliary contacts on the starter/VFD of the lead motor wired in, according to standard diagrams of the motor starter/VFD manufacturer to energize the holding coil of the starter or VFD control input for the motor. These interlocks shall be thru the "automatic" position only of the starter/VFD where HOA switches are supplied. Furnish extra contacts on external relays as required for interlocks. Where interlocks, other than the simple sequence above, are required, they shall be as described as follows in this section.

C. Air handling unit motors shall lead and exhaust fans and moving media air filters (if applicable) follow. Chiller pumps shall lead, followed by chiller, condenser pump and cooling tower, in that order. Condenser pumps shall lead and chemical feeder shall follow. Hot water pumps shall lead and boilers follow.

D. All safeties, such as freezestats and firestats for air handling systems or high temperature/pressure switches for pumping systems, where required to be wired by the Electrical Contractor, shall be wired thru both the "Hand" and "Automatic" positions.

E. The following is a list of equipment and systems requiring wiring. Note that these are in addition to standard interlocks scheduled on the drawings.

1. Exterior lighting control shall consist of a combination multiple circuit timer and photoelectric cell system furnished by this Contractor. Controls shall be equal to Tork Time Controls, Inc. Model T930-LE for 3 circuit (Model T920-LE for 2 circuit) (Series 7000 timer for one circuit without photocell); or equal by Paragon, Grasslin or Sangamo. Provide photoelectric cell, arranged and wired to turn on lights automatically at a pre-determined light level. The photocell shall be mounted on the North wall of the building, facing North, away from interfering light sources and wired to the contactor/controller assembly. Timer shall be mounted in a NEMA 1 lockable enclosure. Include a hand-off-auto (H-O-A) switch to bypass automatic operation. Control circuit shall operate electrically-operated, electrically held contactor to control lights. Provide auxiliary relay with contactor where required. Where the drawings indicate a different configuration/assembly for exterior lighting control, the drawings shall take precedence.

2. Motorized backdraft dampers on exhaust fans and power roof ventilators shall be connected to their respective associated motor leads to energize the backdraft damper motor and open the damper when the fan operates. Dampers, operator and transformer, if required, will be furnished by the fan supplier, install transformer and wire to damper.

3. Motorized Doors: Door controls, including door switches (pressplates, prox sensors, etc.), limit switches, relays, etc. will be furnished by the door equipment supplier. This equipment shall be turned over to the Electrical Contractor and installed for a complete and operational motorized door operator system per the equipment supplier wiring diagrams. Provide additional boxes, conduit and wiring as required per the supplier's diagrams and to meet field conditions. Where motorized door operators are located in fire walls and/or smoke partitions, provide a signal from the fire alarm system to disable the door controls to allow it to be manually operable while maintaining it's latching feature. Where motorized door operators are located on exterior doors and are required to open doors for smoke evacuation, provide a signal from the fire alarm system to open and hold doors during the course of smoke evacuation sequence.

4. Independently mounted controllers furnished by others: Where starters/VFD's are furnished by other trades, and are required to be mounted remote from the motor, the Electrical Contractor shall accept and mount them and perform all power and control wiring between the controls and motors indicated. Motor controllers equipped with automatic alternators shall have two independent circuits and control sources to preclude loss of operation when one circuit fails.

5. Kitchen hood fire suppression system is provided by the HVAC Contractor. Wiring by the Electrical Contractor shall include:
   a. 120 volt power supply to the fire suppression control panel.
   b. Connection to the fire alarm system to signal on alarm on actuation of the suppression system.
   c. Control wiring from the suppression panel to shunt-trip breakers in the power circuits of electric appliances under the hood to disconnect power on actuation of the suppression system.
   d. Control wiring from the suppression panel to electric gas valve(s) in the piping to gas appliances under the hood to shut the valve on actuation of the suppression system.

END OF SECTION 26 0563

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SECTION 26 0590 – ELECTRICAL SPECIALTIES

PART 1 - GENERAL – (NOT APPLICABLE)

PART 2 - PRODUCTS

2.1 ELECTRICAL SPECIALTIES

A. Apparatus Bay Drop Cords
   1. Connect each cord drop to a separate 20A/1P, 120V GFCI circuit breaker. Wire circuits with separate neutrals for each circuit.

B. Residential Type Washers and Dryers
   1. Provide power to washer and dryers. Provide either direct connections or cord & plug connections (including cords, plugs and receptacles) as determined in field.
   2. Provide dedicated 20A/1P, 120V circuit and GFCI receptacle for washers.
   3. Wherever a residential style dryer power outlet is indicated, provide a flush NEMA 14-30R wall outlet receptacle and matching 30A dryer cord-set 6 feet long and include the connection of this cord-set to the equipment. Provide dedicated 30A/2P circuit.
   4. Note that the washer and dryer may be separate residential type units, or a single stacked washer/dryer unit. Field-verify electrical requirements for the Washer/Dryer equipment with equipment installer prior to rough-in. provide GFCI source breaker if hard-wired connections are required.
   5. If cord & plug dryer vent booster fans are provided by Owner or under Division 23, provide GFCI duplex receptacle near each fan and connect to the 20-ampere/120V laundry circuit that serves the washer.

C. Residential Type Dishwashers
   1. Provide flush wall switch (plate engraved: “Dishwasher”) above counter and provide power wiring and connections. Provide dedicated 120V circuit.

D. Disposals
   1. Provide flush wall switch (plate engraved: “Disposal”) above counter and provide power wiring and connections. Provide dedicated 120V circuit.

E. Emergency-Power-Off for Kitchen Equipment
   1. See detail(s) on drawings.

F. Turn-Out Gear Washer/Extractor and Similar Equipment
   1. Coordinate with Owner prior to commencing with any procurement of materials or roughing in of work to determine exact electrical requirements based on the final selection of equipment made by the Owner. Provide power wiring and connections to equipment and associated accessories. Provide identified stainless-steel local fusible disconnecting means within sight of each.

G. SCBA Equipment

1. Coordinate with Owner prior to commencing with any procurement of materials or roughing in of work to determine exact electrical requirements based on the final selection of equipment made by the Owner. Provide power wiring and connections to equipment and associated accessories. Provide identified stainless-steel local fusible disconnecting means within sight of each.

PART 3 - EXECUTION – REFER TO APPLICABLE “PRODUCTS” SUB-SECTIONS ABOVE

END OF SECTION 26 0590

SECTION 26 0923 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following lighting control devices:

1. Indoor occupancy sensors.

B. See Division 26 Section "Wiring Devices" for wall-box dimmers, wall-switch occupancy sensors, and manual light switches.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Operation and maintenance data.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 2 - PRODUCTS

2.1 INDOOR OCCUPANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Current.
2. Leviton Mfg. Company Inc.
3. Lithonia Lighting; Acuity Lighting Group, Inc.
4. Watt Stopper (The).
5. Sensorswitch.
6. Sensorworx.

B. General Description: Wall- or ceiling-mounting, solid-state units with a separate relay unit.

1. Operation: Unless otherwise indicated, turn lights on when covered area is occupied and off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 30 minutes.

2. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.
3. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
4. Mounting:

    a. Sensor: Suitable for mounting in any position on a standard outlet box.
    b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
    c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.

5. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.
6. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; keep lighting off when selected lighting level is present.

C. Dual Technology Type: Ceiling mounting; detect occupancy by sensing a combination of heat and movement in area of coverage.

1. Detector Sensitivity: Detect occurrences of 6-inch- minimum movement of any portion of a human body that presents a target of not less than 36 sq. in.
2. Detection Coverage (Room): Detect occupancy anywhere in a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.
3. Detection Coverage (Corridor): Detect occupancy within 90 feet when mounted on a 10-foot- high ceiling.

D. Application:

1. Utilize sensor type to best apply to the area it controls (i.e. office, corridor, restrooms, etc.) and provide proper quantity and spacing of sensors to adequately cover the entire area it serves.
2. Sensors shall be located and adjusted in private office to prevent incidental activation from passerby in hallways or sensor shall utilize ‘adaptive’ technology to recognize usage patterns and adjust sensitivity.
3. Provide override switch where indicated on plans to disable operation of sensor and leave lights off.

2.2 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

A. Install and aim sensors in locations to achieve not less than 95 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

B. After construction period and just prior to turn-over of facility for beneficial use, reset all sensors that are “Adaptive Technology” (or “Smart Technology”) to initiate their “learning mode” while in use by the Owner during move-in and beneficial use. Follow up with necessary sensor adjustments within 15 working days.

C. When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to Project during other than normal occupancy hours for this purpose.

3.2 WIRING INSTALLATION

A. Wiring Method: Comply with Division 26 Section "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size shall be 1/2 inch.

B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

C. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.

D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.3 IDENTIFICATION

A. Identify components and power and control wiring according to Division 26 Section "Identification for Electrical Systems."

1. Identify controlled circuits in lighting contactors.
2. Identify circuits or luminaries controlled by photoelectric and occupancy sensors at each sensor.

3.4 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections:

1. After installing sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.
2. Operational Test: Verify operation of each lighting control device, and adjust time delays.

B. Lighting control devices that fail tests and inspections are defective work.

END OF SECTION 26 0923

SECTION 26 2416 - PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes distribution panelboards and lighting and appliance branch-circuit panelboards.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types and details for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.
5. Include evidence of NRTL listing for series rating of installed devices.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

C. Panelboard schedules for installation in panelboards.

D. Operation and maintenance data.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NEMA PB 1.

C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

A. Enclosures: Flush- and/or surface-mounted cabinets, as indicated on the drawings.

1. Rated for environmental conditions at installed location.

a. Indoor Dry and Clean Locations: NEMA 250, Type 1.

b. Outdoor Locations: NEMA 250, Type 3R.
c. Kitchen/Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
d. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
4. Directory Card: Inside panelboard door, mounted in transparent card holder.

B. Incoming Mains Location: Top and/or bottom as Project condition dictates.

C. Phase, Neutral, and Ground Buses: Hard-drawn copper, 98 percent conductivity.

D. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Main and Neutral Lugs: Mechanical type.
3. Ground Lugs and Bus Configured Terminators: Mechanical type.
4. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
5. Subfeed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.

E. Service Equipment Label: NRTL labeled for use as service equipment for panelboards with one or more main service disconnecting and overcurrent protective devices.

F. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

G. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

H. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cutler-Hammer.
2. Siemens.
3. Square D.
4. ABB.

2.2 DISTRIBUTION PANELBOARDS

A. Panelboards: NEMA PB 1, power and feeder distribution type.

B. Doors: Secured with vault-type 3 point latch with tumbler lock; keyed alike.

C. Mains: Circuit breaker, Lugs only as identified on the drawings.

D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

B. Mains: Circuit breaker and/or lugs only as identified on the drawings. Sized to have 225 amp bussing unless indicated otherwise on drawings.

C. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units. Sized to accommodate 42 poles unless indicated otherwise on drawings. Furnish number of breakers shown.

D. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents listed on the drawings.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
4. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
5. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
6. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:

    a. Standard frame sizes, trip ratings, and number of poles. Where more than one pole is used, they shall employ a common trip.
    b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
    c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits. Type HACR for feeding heating, air conditioning and refrigeration equipment.
    d. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
    e. Shunt Trip: 120 -V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
    f. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.
    g. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

B. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.

1. Fuses, and Spare-Fuse Cabinet: Comply with requirements specified in Division 26 Section "Fuses."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Receive, inspect, handle, store and install panelboards and accessories according to NEMA PB 1.1.

B. Receive Service Entrance ATS from Owner, where generator and ATS are pre-purchased by Owner, inspect and install ATS and all accessory wiring per manufacturer instructions.

C. Mount top of lighting and appliance panelboard trim 72 inches above finished floor; distribution panelboard trim 90 inches above finished floor, unless otherwise indicated.

D. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

E. Install overcurrent protective devices and controllers not already factory installed.

1. Set field-adjustable, circuit-breaker trip ranges and ground fault settings as applicable.

F. Install filler plates in unused spaces.

G. Stub four 1-inch empty conduits from flush mounted panelboard into accessible ceiling space or space designated to be ceiling space in the future.

H. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

I. Comply with NECA 1.

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Division 26 Section "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads and incorporating Owner's final room, area or equipment designations. Temporary conditions of occupancy shall not be utilized as circuit descriptions. Indicated spare circuits shall be specifically labeled as such. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Panelboards will be considered defective if they do not pass tests and inspections.

END OF SECTION 26 2416

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SECTION 26 2726 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Wall-box motion sensors.
3. Snap switches and wall-box dimmers.
4. Solid-state fan speed controls.
5. Wall-switch and interior occupancy sensors.
6. Communications outlets.

B. See Division 27 Section "Communications Horizontal Cabling" for workstation outlets.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

1.3 QUALITY ASSURANCE

A. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Cooper Wiring Devices; a division of Eaton Industries, Inc. (Cooper/Arrow Hart).
2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
3. Leviton Mfg. Company Inc. (Leviton).
4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Legrand).

2.2 STRAIGHT BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Cooper; 5351 (single), 5352 (duplex).
    b. Hubbell; 5361 (single), 5362 (duplex).
    c. Leviton; 5351 (single), 5352 (duplex).
    d. Pass & Seymour; 5361 (single), 5362 (duplex).

2.3 GFCI RECEPTACLES

A. General Description: Straight blade, non-feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.

B. All receptacles installed outdoors shall be weather resistant type.

C. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Cooper.
    b. Pass & Seymour/Legrand.
    c. Leviton.
    d. Hubbell.

2.4 TAMPER RESISTANT STRAIGHT BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, NEC 406.12 & 517.18(C) and UL 498.

B. Where indicated on plans to provide Tamper Resistant type receptacle, device shall have non-conductive dual mechanical shutter mechanisms on 120V connection ports, compliant with NEC requirements. This is in addition to required device configuration indicated (ie: Standard Straight Blade, Hospital Grade, GFCI, etc.).

2.5 USB CHARGING TYPE RECEPTACLES

A. Convenience Receptacles, 125V, 20A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, UL 498.

B. Where indicated on plans to include USB Type Charging ports, device shall include Dual-Port USB Type A-C charging ports with minimum 5 Amps combined charging power (minimum 25 watts), in addition to required device configuration indicated (ie: Standard Straight Blade, Hospital Grade, GFCI, Tamper-resistant, etc.).

2.6 NIGHT LIGHT ACCESSORY

A. Where indicated on plans to include night light accessory ("NL"), device shall have LED night light, integral with the face of device and photo-sensor for control of night light function. This is in addition to required device configuration indicated (ie: Standard Straight Blade, Hospital Grade, GFCI, Tamper-resistant, etc.). However, device may be 5-15R rated where multiple devices are connected to the same 20A-120V circuit.

2.7 SNAP SWITCHES

A. Comply with NEMA WD 1 and UL 20.

B. Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Cooper; 2221 (single pole), 2222 (two pole), 2223 (three way), 2224 (four way).
   b. Hubbell; CS1221 (single pole), CS1222 (two pole), CS1223 (three way), CS1224 (four way).
   c. Leviton; 1221-2 (single pole), 1222-2 (two pole), 1223-2 (three way), 1224-2 (four way).
   d. Pass & Seymour; 20AC1 (single pole), 20AC2 (two pole), 20AC3 (three way), 20AC4 (four way).

2.8 WALL-BOX DIMMERS

A. Dimmer Switches: Modular, 0-10V, solid-state units with integral, quiet on-off switches. Unit listed and compatible for type of lighting controlled and rated for connected load unless larger rating is indicated for future capacity.

B. Control: Continuously adjustable slider, with separate on-off switch; single-pole or three-way switching capability. Comply with UL 1472.

2.9 OCCUPANCY SENSORS

A. Wall-Switch Sensors:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, manufacturer shall match that submitted for ceiling mounted occupancy sensors.

3. Description: Passive-infrared type, 120/277 V, adjustable time delay up to 30 minutes, 180-degree field of view, with a minimum coverage area of 900 sq. ft..

2.10 WALL PLATES

A. Single and combination types to match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: Nylon.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant, die-cast aluminum with lockable cover.
1. Outdoor receptacle covers shall be “In Use” type rated “Extra Duty”.

2.11 FINISHES

A. Color: Wiring device catalog numbers in Section Text do not designate device color.

1. Wiring Devices: White, unless otherwise indicated or required by NFPA 70 or device listing.

2. Device plates: Nylon, to match color of wiring devices.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.

B. Coordination with Other Trades:

1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.
5. All 15 or 20 amp-120V wiring devices located within 6 feet from the edge of a sink, located in Kitchens or Bathrooms or serving electric water cooler shall be GFCI protected type device.

C. Conductors:

1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
2. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.

3. Existing Conductors:

   a. Cut back and pigtail, or replace all damaged conductors.
   b. Straighten conductors that remain and remove corrosion and foreign matter.
   c. Pigtailing existing conductors is permitted provided the outlet box is large enough.

D. Device Installation:

1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
2. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
3. When there is a choice, use side wiring with binding-head screw terminals.
4. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
5. Tighten unused terminal screws on the device.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Dimmers:

1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan speed control are listed for that application.
3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

3.2 “PLUG CONNECT/PLUG TAIL” DEVICES

A. In lieu of terminal screw connected receptacles and switches as specified above, specialized plug-in type devices may be provided as long as it is offered by the same manufacturer and listed equivalent to the same product line specified. Permanent wiring pigtails shall be of sufficient length to enable replacement of device with standard terminal screw type device as required by Code.

B. Where plug-in type wiring devices are provided, furnish a minimum of five (5) of each type and color device installed to the Owner as spares. Where more than one hundred (100) of any type is installed, provide a minimum of ten (10) spare devices.

3.3 IDENTIFICATION

A. Comply with Division 26 Section "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.

END OF SECTION 26 2726

SECTION 26 2813 - FUSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Cartridge fuses rated 600-V ac and less for use in, enclosed switches, panelboards, enclosed controllers and motor-control centers.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Operation and maintenance data.

1.3 QUALITY ASSURANCE

A. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Cooper Bussman, Inc.
2. Mersen.
3. Littelfuse.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

PART 3 - EXECUTION

3.1 FUSE APPLICATIONS

A. Feeders: Class RK1, time delay.

B. Motor Branch Circuits: Class RK1, time delay.

C. Other Branch Circuits: Class RK1, time delay.

D. Control Circuits: Class CC, fast acting.

3.2 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

3.3 IDENTIFICATION

A. Install labels complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems" and indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block and holder.

END OF SECTION 26 2813

SECTION 26 2816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Nonfusible switches.
3. Molded-case circuit breakers (MCCBs).
4. Enclosures.

1.2 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 FUSIBLE/NON-FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cutler-Hammer.
2. Siemens.
3. Square D.
4. ABB.

B. All starters and disconnect switches shall be of the same manufacturer unless otherwise approved.

C. Type HD, Heavy Duty, Single Throw, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate fuses specified when so indicated on

the drawings, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

D. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
4. Lugs: Suitable for number, size, and conductor material.
5. Service-Rated Switches: Labeled for use as service equipment.

2.2 MOLDED-CASE CIRCUIT BREAKERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cutler-Hammer.
2. ABB.
3. Siemens.
4. Square D.

B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.

C. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

D. Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Suitable for number, size, trip ratings, and conductor material.
3. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
4. Auxiliary Contacts: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
5. Alarm Switch: One NO contact that operates only when circuit breaker has tripped.

2.3 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 3R.
3. Kitchen/Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.

5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at 6’-0” A.F.F. unless otherwise indicated.

B. Install fuses in fusible devices.

C. Coordinate location of devices to allow working clearances and to avoid interference with other equipment and trades.

D. Comply with NECA 1.

3.2 IDENTIFICATION

A. Comply with requirements in Division 26 Section "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved laminated-plastic nameplate.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

END OF SECTION 26 2816

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SECTION 26 3213 – EMERGENCY POWER SYSTEM

STATION 16 ONLY (ALTERNATE E1)

PART 1 - GENERAL

1.1 SUMMARY

A. Provide a standby power system to supply electrical power in event of failure of normal supply consisting of a liquid cooled engine, an AC alternator with main breaker and system controls, fuel system including fuel tank, and piping, exhaust system with muffler and piping and cooling system.

B. 80 kW Rating (at 208Y/120V-3Ph-4W) for standby service with 100 hours or less per year operating time.

C. The electric generating system, consisting of a prime mover, generator, governor, coupling and all controls, must have been tested as a complete unit, on a respresentative engineering prototype model of the equipment to be sold.

D. See Division 26 Section "Transfer Switches" for transfer switches including sensors and relays to initiate automatic-starting and -stopping signals for engine-generator sets.

1.2 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer’s authorized representative who is trained and approved for installation of units required for this Project.

B. Manufacturer Qualifications: A qualified manufacturer. Maintain, within 100 miles of Project site, a service center capable of providing training, parts, and emergency maintenance repairs.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Comply with ASME B15.1.

E. Comply with NFPA 37.

F. Comply with NFPA 70.

G. Comply with NFPA 99.

H. Comply with NFPA 101.

I. Comply with NFPA 110 requirements for Level 2 optional standby power supply system.

J. Comply with UL 2200, package unit shall be listed and labeled.

K. Engine Exhaust Emissions: Comply with applicable state and local government requirements.

L. Noise Emission: Comply with applicable state and local government requirements for maximum noise level at adjacent property boundaries due to sound emitted by generator set including engine, engine exhaust, engine cooling-air intake and discharge, and other components of installation.

1.3 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 2 year(s) from date of Substantial Completion/Beneficial Use.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The generator set shall be of standard design with complete factory assembly by Caterpillar, Cummuns-Onan or Kohler (Rehlko).

2.2 ENGINE-GENERATOR SET

A. The engine set shall be diesel fueled, four cycle for heavy duty industrial application, rated to deliver the specified capacity at an ambient temperature of 104 degrees F (40 degrees C)., and an elevation of 1000 ft. above sea level. Engine shall develop approximately 1.5 HP for each KW of generator, after deducting the HP required for the unit mounted fan and pump operation. Maximum speed at rating – 1800 RPM, ratings shall be those in standard published curves and data. Special test ratings for non-standard products will not be acceptable. Engine shall incorporate all standard equipment including:

1. Liquid cooling radiator, engine mounted, with engine driven fan, duct flange and fan guard; engine driven water pump and closed coolant recovery system providing visual diagnostics means to determine if the system is operating with normal coolant level. The radiator shall be designed for operation in 110 degrees F ambient temperature.
2. Engine mounted intake air filter(s) with replaceable element.
3. Full pressure engine lubrication supplied by a positive displacement lube oil pump. Engine shall have a replaceable filter with internal bypass and replaceable elements.
4. Provide engine coolant and oil drain extensions to outside of the mounting base for cleaner and more convenient engine servicing.
5. The engine fuel system shall be designed for operation on No. 2 diesel fuel. A secondary fuel filter, water separator, manual fuel priming pump, fuel shutoff solenoid and all fuel lines must be installed at the point of manufacture.
6. Sensing elements shall be located on the engine for low oil pressure shutdown, high coolant temperature shutdown, low coolant level shutdown, over speed shutdown and over crank shutdown. These sensors are to be connected to the control panel using a

wiring harness with the following features: wire number labeling on each end of the wire run for easy identification, a molded rubber boot to cover the electrical connection on each sensor to prevent corrosion and all wiring to be run in flexible conduit for protection from the environment and any moving objects.

7. Steel base for engine-generator with adjustable spring type vibration isolators.
8. Electronic governor capable of maintaining alternator frequency within 0.5% from no load to full load alternator output. Steady state regulation is to be 0.25% (Woodward 2301 Electro-Hydraulic governing system or equal by Barber-Coleman.)
9. Electric jacket water (block) heater(s) with 120 or 208 volt power source; each thermostatically controlled and used to aid in quick starting.

2.3 OVERCURRENT PROTECTION, INSTRUMENTATION AND ALARMS

A. The Main Line Breaker shall be molded case thermal magnetic trip 100% rated type for load circuit breaking and line protection. Breaker shall be sized for minimum 115 to 125% full capacity of generator output. Generator exciter field circuit breakers are not acceptable substitute.

B. Control instruments and alarms (NFPA-110) shall be microprocessor based and shall be mounted in an engine mounted control panel (with vibration isolators) and shall include the following:

1. Oil pressure gauge and alarm light (pressure gauge can mount on engine).
2. Water temperature gauge with high temperature alarm light (temperature gauge can mount on engine).
3. Running time meter.
4. Voltmeter with selector switch, phase to phase, phase to neutral and off.
5. Ammeter with selector switch, each line and off.
6. Frequency meter.
7. Battery charging ammeter.
8. Over speed shut down alarm light.
9. Unit auto-run-stop with remote start from automatic transfer switch.
10. Voltage level adjustment rheostat (can mount on engine).
11. Safety shut offs for high water temperature, low oil pressure, over speed and engine over crank; fault light and alarm contact for each.
12. Means for remote shutdown of generator per NEC 445.18(B) (provide maintained contact emergency stop button and means to wire button to unit).
13. Alarm light for main storage tank low fuel level.

14. Alarm light for intertank leak detection – for main belly tank.

15. Indication of all alarms required by NFPA 110; include provisions for remote annunciation.

16. Main line circuit breaker: Circuit breaker shall have means to lock in the open position per NEC 445.18(A).

17. Relay with normally closed contact for damper control.

18. Circuit breaker and motor starter for remote radiator motor; mount in same enclosure as main circuit breaker.

19. Ground fault indicator to comply with NEC 700.7(D) where system voltage to ground is more than 150 volts and output breaker is 1000 amps or more.

20. Manual/off/auto switch; four LED's to indicate: not in auto, alarm active, generator running, generator ready.

21. Provide monitoring of generator start signal control wiring as required by NEC 700.10(D)1, for Emergency Power Systems, to provide audible and visual annunciation, as well as start generator, upon loss of start circuit integrity.

C. Surface mounted remote annunciator(s) of all alarms required by NFPA 110; locate the annunciator(s) as shown on the floor plans. Include red and green lamps indicating position of each automatic transfer switch.

2.4 GENERATOR FEATURES

A. Features include the following:

1. The AC generator shall be synchronous, four pole, optimum pitch, revolving field, drip-proof construction, single prelubricated sealed bearing, air cooled by a direct drive centrifugal blower fan and directly connected to the engine with flexible drive disc or flexible steel coupling – provide guard.

2. Consult tank manufacturers about capacities available for size of set in Project.

3. All insulation system components shall meet NEMA MG1 temperature limits for Class H insulation system. Actual temperature rise measured by resistance method at full load shall not exceed 130 degrees Centigrade.

4. The generator shall be capable of delivering rated output (kVA) at rated frequency and power factor, at any voltage not more than 5% above or below rated voltage.

5. Determine applicable codes and regulations, and coordinate subparagraph below with Drawings.

6. Design and construction conforming to NEMA, AIEE and ASA standards.

7. Static excited and static regulated, 12 lead brushless revolving field.

8. A permanent magnet generator (PMG) shall be included to provide a reliable source of excitation power for optimum motor starting and short circuit performance. The PMG and controls shall be capable of sustaining and regulating current supplied to a single phase or controls shall be capable of sustaining and regulating current supplied to a single phase or three phase fault at approximately 300% of rated current for not more than 10 seconds.

9. Voltage regulation plus or minus 1%.

10. Radio interference suppression.

11. Capability to assume rated load in one step with less than 15% transient voltage dip with normal voltage recovery in one second.

12. Power factor 0.8; at 60 Hz.

2.5 ACCESSORIES AND WEATHERPROOF HOUSING

A. Furnish and connect the following engine accessories:

1. Heavy duty 12 volt or 24 volt lead acid starting batteries and charger. Battery charger shall be heavy duty potted assembly for waterproof and vibration resistance, designed for operation with an engine cranking battery. Universal voltage input with cord and plug connection and multi-stage charging modes of operation. The battery shall not be discharged through the battery charger.

2. Flexible stainless steel exhaust connection for each exhaust outlet.

3. Critical type exhaust silencer, Maxim #M51 or equal by Burgess, EM Products Inc., Universal “ENS”, York “Y4” or Cowl. Provide crossover manifold where engine has more than one exhaust outlet. Provide ventilated roof/wall thimble to accommodate exhaust piping; coordinate with General Contractor and HVAC Contractor to comply with specific installation requirements.

B. Sub-base mounted fuel oil tank shall be double wall constructed of steel plate of thickness required by applicable standards and shall be UL listed and constructed per NFPA requirements; manufactured by MO Trailers Corporation, Pryco, Victory Industrial Products or approved equal.

1. Tank shall include necessary vent, fill, fuel level gauge, supply and return openings, piping and accessories. Provide vent line to outside with approved cast iron screened rain shield; must be installed with proper clearance from all building openings.

2. Tank shall meet State of Ohio Fire Marshal requirements for venting, fuel fill spill containment, overfill protection, tank alarm, signage and associated specific requirements.

3. Fuel tank shall be sized for minimum 24 hour runtime at full load (less than 500 gallons).

4. Provide an intertank leak detector and alarm contact; connect alarm contact to control panel for local and remote annunciation.

5. Provide fuel level gauge with alarm contacts; connect alarm contacts to control panel for local and remote annunciation.

6. Base tank shall be fabricated separately from the base; after fabrication, tank shall be bolted to its base to form a complete unit that mates to the generator skid. Base tank shall not interfere with access to engine and generator for maintenance and shall be mounted to allow minimum 2 inches air space between bottom of tank and concrete floor.

7. Complete assembly shall be prime and finish painted to match color of engine generator set.

C. Return fuel cooler mounted to radiator fan housing and piped from return fuel outlet on generator.

D. Provide a factory installed weather protective type sound attenuating (75 db at 7 meters) housing around generator for outdoor installation (Skin-Tight Enclosure). Standard features associated with housing shall be as follows:

1. Hinged and removable side and rear panels for easy access to generator set.

2. Vertical outlet hoods with 90 degree angles and baffles or turning vanes to redirect air and reduce noise; UL 94 HF1 listed acoustic insulation for flame resistant standards.

3. Louvers on both the generator air intake and radiator air discharge ends for cooling; to prevent rain and snow entry.

4. Lockable latches on each removable or hinged panel; all parts of latches and higes and mounting hardware shall be stainless steel.

5. Rugged galvanized steel or aluminum construction; painted with accepted manufacturer’s painting process. Skid mounted. Color selected by Architect/Engineer.

6. Battery rack.

7. Insulated critical rated silencer with tail pipe and rain cap; mount silencer inside generator enclosure.

8. Rodent barriers and insect screens over all openings including louvered openings.

2.6 SUBMITTALS

A. Equipment supplier shall submit for approval with shop drawings, recommended fuel piping diagram, interconnection diagram showing all controls and alarms. Dimensioned drawings of the complete generator assembly including isolation pad, isolators, main breaker location and lug size, exhaust connections, inlet/exhaust shrouds, required clearances, exhaust assembly, batteries and rack, etc. Shop drawings submitted without all required information will be

rejected. At the completion of the project, these drawings shall be included as part of the maintenance manuals, these drawings shall be specific to the actual project installation and shall not be standard manufacturer model drawings.

B. Where engine fuel injectors are required to be cooled by engine fuel, the equipment supplier shall include in his costs all additional necessary equipment and labor to modify the fuel system design including fuel cooler and all other piping and electrical work as needed.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with packaged engine-generator manufacturers' written installation and alignment instructions and with NFPA 110. Confirm installation will allow full access, without removing connections or accessories, for periodic maintenance.

B. Secure necessary permits and inspections from the Authority Having Jurisdiction for the installation of Aboveground/Underground Fuel Storage Tank(s) that comply with Ohio Administrative Code 1301, Ohio Fire Code, NFPA 30 & 30A as applicable. Provide a copy of approval documentation of tank(s) installation to the Inspection Agency prior to installation and notify the Fire Marshal when ready for inspection for compliance with Ohio Fire Code when applicable.

C. Install packaged engine generator on 12” high steel reinforced concrete base (see seismic sentence below for base pad required sizing) with adjustable spring-type vibration dampeners or factory installed isolators between engine and skid. Bolt firmly to foundation. Where seismic restraint requirements are noted, the concrete base thickness and dimensions shall be either as recommended by the engine-generator manufacturer or as designed by the contractors retained specialty seismic consultant.

D. Make external connections to generator and engine thru flexible connections.

E. Connect auxiliary systems all in accordance with manufacturer’s specific instructions for automatic and manual operation.

F. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems." Neutral shall not be bonded to generator. Bonding of neutral and ground is accomplished in main switchgear. Provide signs at service entrance location and at grounding location per NEC 700.8.

G. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables." Furnish and install all control wiring and interlocking between the engine-generator, generator control panel, automatic transfer switch, fuel gauge for belly storage tank, remote annunciator, remote stop button (located adjacent to ATS’s), damper control, auxiliary systems, etc.

H. Fill radiator and cooling system with the necessary solution of ethylene glycol, additives and water for freeze and engine component/cooling system protection as recommended by the manufacturer. Provide freeze protection rated to -40 degrees F.

3.2 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections prior to start-up and to assist in testing.

B. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

C. Operational Test: After electrical circuitry has been energized, start unit(s) to confirm proper motor rotation and unit operation.

D. Coordinate tests with tests for automatic transfer switch and run them concurrently.

E. Operational/Load Test:

1. Adjust, test and demonstrate proper operation of the system after installation. Test shall demonstrate automatic operation, transfer, quick start and a minimum of 2 hours endurance under not less than 50% load, with not less than 4 hours at full load. Provide a resistance load bank for the test and all necessary temporary cabling, etc. Coordinate location of load bank with Owner and other trades to ensure safe operation of systems and protection of surrounding areas. Engineer/Associate Architect may require extended test time if system is deemed suspect.

2. Engine-generator system shall pick up full load in less than 10 seconds.

F. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.

G. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. The supplier shall furnish a certified full load test certificate verifying that the generator has been tested prior to delivery and found to be in satisfactory working condition under test loads.

H. All fuel piping and base mounted fuel tank shall be tested after installation and before filling with fuel. Tests shall comply with Ohio Administrative Code, Chapter 13.

I. The Electrical Contractor shall provide fuel for testing and top off the tank after completing all tests and demonstrations.

J. Exit and emergency lighting and power distribution wiring shall be run in a separate and independent conduit system.

K. Provide sign at the service entrance indicating type and location of on-site optional standby power sources per NEC 702.7(A). Coordinate with Authority Having Jurisdiction (AHJ).

3.3 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged engine generators, allow a minimum of 4 hours for training.

END OF SECTION 26 3213

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SECTION 26 3623A – AUTOMATIC TRANSFER SWITCH AND PORTABLE DOCKING STATION
FIRE STATION 15

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes automatic transfer switches rated 600 V and less.

B. The Automatic Transfer Switch shall be furnished as a part of the complete package from the Standby Power System, Pre-Purchased by the Owner and shall be installed/wired by the Electrical Contractor.

C. The Portable Generator Docking Station shall be furnished separately by the Electrical Contractor and shall be installed/wired by the Electrical Contractor.

1.2 GENERAL

A. Furnish and install electrically operated automatic switch to transfer loads to standby system upon failure of main source of electricity. Unit shall be complete with accessories in NEMA 1 enclosure as shown on the drawings.

B. Switch shall be electrically operated, mechanically held type with a mechanical interlock to prevent both sides closing simultaneously.

C. Furnish and install manually operated, double-throw switch with camlock power connections for portable generator connection per requirements of NEC 700.3(F).

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NEMA ICS 1.

C. Comply with NFPA 70.

D. Comply with NFPA 99.

E. Comply with NFPA 110.

F. Comply with UL 1008 unless requirements of these Specifications are stricter.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. As provided by the Owner. Voltage and ampere ratings as indicated on the drawings.

B. Generator Docking Station by Trystar, Berthold Electric, ASCO, Square D or Eaton.

2.2 GENERAL TRANSFER-SWITCH PRODUCT REQUIREMENTS

A. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including tungsten filament lamp loads not exceeding 30 percent of switch ampere rating, unless otherwise indicated.

B. Tested Fault-Current Closing and Withstand Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the available fault conditions indicated on the drawings, based on testing according to UL 1008.

C. Microprocessor Controls: Microprocessor based controller with Control and Display Panel mounted on face of door, panel shall have LED source and switch indication lights and membrane interface panel for test and time delay bypass controls.

D. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.41. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.

E. Electrical Operation: Accomplish by a nonfused, momentarily energized solenoid or electric-motor-operated mechanism, mechanically and electrically interlocked in both directions.

F. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.

1. Limitation: Switches using molded-case switches or circuit breakers or insulated-case circuit-breaker components are not acceptable.
2. Switch Action: Double throw; mechanically held in both directions.
3. Contacts: Silver composition or silver alloy for load-current switching. Conventional automatic transfer-switch units, rated 600 A and higher, shall have separate arcing contacts.

G. Neutral Switching. Where four-pole switches are indicated, provide neutral pole switched simultaneously with phase poles.

H. Neutral Terminal: Solid and fully rated with lugs, unless otherwise indicated.

I. Enclosures: General-purpose NEMA 250, Type 1 complying with NEMA ICS 6 and UL 508, unless otherwise indicated.

2.3 FEATURES AND ACCESSORIES

A. Comply with Level 1 equipment according to NFPA 110.

B. Switching Arrangement: Double-throw type, incapable of pauses or intermediate position stops during normal functioning, unless otherwise indicated.

C. Signal-Before-Transfer Contacts: Two sets of normally open/normally closed dry contacts (rated 3 amps at 480 volts AC) operates in advance of retransfer to normal source (and in advance of transfer to emergency source when in test mode). Timer intervals adjustable from 0 to 20 seconds for transfer in either direction and independently adjustable/programmable.

D. Transfer Switches Based on Molded-Case-Switch Components: Comply with NEMA AB 1, UL 489, and UL 869A.

E. Motor Disconnect and Timing Relay: Controls designate starters so they disconnect motors before transfer and reconnect them selectively at an adjustable time interval after transfer. Time delay for reconnecting individual motor loads is adjustable between 1 and 60 seconds, and settings are as indicated.

F. Programmed Neutral Switch Position: Switch operator has a programmed neutral position arranged to provide a midpoint between the two working switch positions, with an intentional, time-controlled pause at midpoint during transfer.

G. Features:

1. Undervoltage Sensing for Each Phase of Normal Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100 percent of nominal, and dropout voltage is adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.
2. Adjustable Time Delay: For override of normal-source voltage sensing to delay transfer and engine start signals. Adjustable from zero to six seconds, and factory set for one second.
3. Current Sensors for each phase and neutral of Load Source: Sensors shall be wired to LCD display to allow reading of current for each phase as well as RMS summary load.
4. Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.
5. Time Delay for Retransfer to Normal Source: Adjustable from 0 to 30 minutes, and factory set for 15 minutes to automatically defeat delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.
6. Test Switch: To simulate normal-source failure.
7. Switch-Position Pilot Lights: Indicate source to which load is connected.
8. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.

    a. Normal Power Supervision: Green light with nameplate indicating "Normal Source Available."
    b. Emergency Power Supervision: Red light with nameplate indicating "Emergency Source Available."

9. All pilot/indication lights shall be LED type for long life.

10. Unassigned Auxiliary Contacts: Two normally open/normally closed, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.
11. Load Priority/Shed Control and Contacts: For setting (programming) of priority level of transfer switch(es) where more than one transfer switch is connected to emergency/standby power source. Priority 1 Transfer Switch (Life-Safety) shall be first to transfer to emergency source and last to disconnect from emergency source upon return of normal power. Load shed signal(s) shall originate from the generator controller.
12. Terminal provisions for connection of remote test and serial communications port for remote monitoring/annunciation.
13. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10 A at 32-V dc minimum.
14. Engine Shutdown Contacts: Time delay adjustable from zero to five minutes, and factory set for five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.
15. Engine-Generator Exerciser: Microprocessor based, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 14 days. Running periods are adjustable from 10 to 30 minutes. Factory settings are for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:

    a. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
    b. Push-button programming control with digital display of settings.
    c. Integral battery operation of time switch when normal control power is not available.

2.4 SOURCE QUALITY CONTROL

A. Factory test and inspect components, assembled switches, and associated equipment. Ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.

2.5 GENERATOR DOCKING STATION GENERAL REQUIREMENTS

A. Docking Station Ampacity-Voltage requirements shall be as indicated on the drawings.

B. Enclosure shall be UL 1008 Listed, NEMA 3R rated with multiple single or 3-point latching and locking provisions, Factory applied finish in ANSI #61 Medium Light Grey. UL listed acrylic baked paint finish over a rust-inhibiting, corrosion-resistant primer on treated metal surface.

C. Station shall have auxiliary contacts for remote monitoring of switch position and contacts for connection of engine start signal wiring (field wired to associated A.T.S. by E.C.).

D. Station shall have provisions for Camlock cable connections. Spring-loaded or latching hinged flap for cable entry.

E. Where switch utilizes manual, double-throw action to transfer load, means shall be available to padlock switch in all positions.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Wall Mounted Switch: Utilize appropriate brackets or inserts.

B. Floor Mounted Switch: Anchor to concrete base by bolting.

1. Concrete Bases: 4 inches high, reinforced, with chamfered edges. Extend base no more than 4 inches in all directions beyond the maximum dimensions of switch, unless otherwise indicated or unless required for seismic support. Construct concrete bases according to Division 26 Section "Hangers and Supports for Electrical Systems."

C. Identify components according to Division 26 Section "Identification for Electrical Systems."

D. Set field-adjustable intervals and delays, relays, and engine exerciser clock.

3.2 CONNECTIONS

A. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

B. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

1. Connect automatic transfer switch(es) to initiate cranking of the emergency generator and to provide remote indication where specified or indicated on the drawings. Include installation of all wire and conduit associated with each automatic transfer switch.

2. Connect automatic transfer switch to signal elevator (if connected to emergency/standby system).

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.

B. Coordinate tests with tests of generator and run them concurrently.

C. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.

D. Remove and replace malfunctioning units and retest as specified above.

3.4 WARRANTY

A. Provide 5-year extended warranty (Parts and Labor). Provide the certificate directly to the Owner accompanied by a letter of transmittal. Provide a copy to the Architect/Engineer with shop drawings.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain transfer switch(es) and related standby equipment.

END OF SECTION 263601

SECTION 26 3623 – AUTOMATIC TRANSFER SWITCH AND PORTABLE DOCKING STATION **FIRE STATION 16**

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes automatic transfer switches rated 600 V and less.

B. The Automatic Transfer Switch shall be furnished, installed and wired by the Electrical Contractor. The existing 60 kW Caterpillar standby generator shall remain.

C. The Portable Generator Docking Station shall be furnished installed and wired by the Electrical Contractor.

1.2 GENERAL

A. Furnish and install electrically operated automatic switch to transfer loads to standby system upon failure of main source of electricity. Unit shall be complete with accessories in NEMA 1 enclosure as shown on the drawings.

B. Switch shall be electrically operated, mechanically held type with a mechanical interlock to prevent both sides closing simultaneously.

C. Furnish and install manually operated, double-throw switch with camlock power connections for portable generator connection per requirements of NEC 700.3(F).

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NEMA ICS 1.

C. Comply with NFPA 70.

D. Comply with NFPA 99.

E. Comply with NFPA 110.

F. Comply with UL 1008 unless requirements of these Specifications are stricter.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. ASCO or Russelectric. Voltage and ampere ratings as indicated on the drawings.

B. Generator Docking Station by Trystar, Berthold Electric, ASCO, Square D or Eaton.

2.2 GENERAL TRANSFER-SWITCH PRODUCT REQUIREMENTS

A. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including tungsten filament lamp loads not exceeding 30 percent of switch ampere rating, unless otherwise indicated.

B. Tested Fault-Current Closing and Withstand Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the available fault conditions indicated on the drawings, based on testing according to UL 1008.

C. Microprocessor Controls: Microprocessor based controller with Control and Display Panel mounted on face of door, panel shall have LED source and switch indication lights and membrane interface panel for test and time delay bypass controls.

D. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.41. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.

E. Electrical Operation: Accomplish by a nonfused, momentarily energized solenoid or electric-motor-operated mechanism, mechanically and electrically interlocked in both directions.

F. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.

1. Limitation: Switches using molded-case switches or circuit breakers or insulated-case circuit-breaker components are not acceptable.
2. Switch Action: Double throw; mechanically held in both directions.
3. Contacts: Silver composition or silver alloy for load-current switching. Conventional automatic transfer-switch units, rated 600 A and higher, shall have separate arcing contacts.

G. Neutral Switching. Where four-pole switches are indicated, provide neutral pole switched simultaneously with phase poles.

H. Neutral Terminal: Solid and fully rated with lugs, unless otherwise indicated.

I. Enclosures: General-purpose NEMA 250, Type 1 complying with NEMA ICS 6 and UL 508, unless otherwise indicated.

2.3 FEATURES AND ACCESSORIES

A. Comply with Level 1 equipment according to NFPA 110.

B. Switching Arrangement: Double-throw type, incapable of pauses or intermediate position stops during normal functioning, unless otherwise indicated.

C. Signal-Before-Transfer Contacts: Two sets of normally open/normally closed dry contacts (rated 3 amps at 480 volts AC) operates in advance of retransfer to normal source (and in advance of transfer to emergency source when in test mode). Timer intervals adjustable from 0 to 20 seconds for transfer in either direction and independently adjustable/programmable.

D. Transfer Switches Based on Molded-Case-Switch Components: Comply with NEMA AB 1, UL 489, and UL 869A.

E. Motor Disconnect and Timing Relay: Controls designate starters so they disconnect motors before transfer and reconnect them selectively at an adjustable time interval after transfer. Time delay for reconnecting individual motor loads is adjustable between 1 and 60 seconds, and settings are as indicated.

F. Programmed Neutral Switch Position: Switch operator has a programmed neutral position arranged to provide a midpoint between the two working switch positions, with an intentional, time-controlled pause at midpoint during transfer.

G. Features:

1. Undervoltage Sensing for Each Phase of Normal Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100 percent of nominal, and dropout voltage is adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.
2. Adjustable Time Delay: For override of normal-source voltage sensing to delay transfer and engine start signals. Adjustable from zero to six seconds, and factory set for one second.
3. Current Sensors for each phase and neutral of Load Source: Sensors shall be wired to LCD display to allow reading of current for each phase as well as RMS summary load.
4. Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.
5. Time Delay for Retransfer to Normal Source: Adjustable from 0 to 30 minutes, and factory set for 15 minutes to automatically defeat delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.
6. Test Switch: To simulate normal-source failure.
7. Switch-Position Pilot Lights: Indicate source to which load is connected.
8. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.

    a. Normal Power Supervision: Green light with nameplate indicating "Normal Source Available."
    b. Emergency Power Supervision: Red light with nameplate indicating "Emergency Source Available."

9. All pilot/indication lights shall be LED type for long life.

10. Unassigned Auxiliary Contacts: Two normally open/normally closed, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.
11. Load Priority/Shed Control and Contacts: For setting (programming) of priority level of transfer switch(es) where more than one transfer switch is connected to emergency/standby power source. Priority 1 Transfer Switch (Life-Safety) shall be first to transfer to emergency source and last to disconnect from emergency source upon return of normal power. Load shed signal(s) shall originate from the generator controller.
12. Terminal provisions for connection of remote test and serial communications port for remote monitoring/annunciation.
13. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10 A at 32-V dc minimum.
14. Engine Shutdown Contacts: Time delay adjustable from zero to five minutes, and factory set for five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.
15. Engine-Generator Exerciser: Microprocessor based, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 14 days. Running periods are adjustable from 10 to 30 minutes. Factory settings are for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:

    a. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
    b. Push-button programming control with digital display of settings.
    c. Integral battery operation of time switch when normal control power is not available.

2.4 SOURCE QUALITY CONTROL

A. Factory test and inspect components, assembled switches, and associated equipment. Ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.

2.5 GENERATOR DOCKING STATION GENERAL REQUIREMENTS

A. Docking Station Ampacity-Voltage requirements shall be as indicated on the drawings.

B. Enclosure shall be UL 1008 Listed, NEMA 3R rated with multiple single or 3-point latching and locking provisions, Factory applied finish in ANSI #61 Medium Light Grey. UL listed acrylic baked paint finish over a rust-inhibiting, corrosion-resistant primer on treated metal surface.

C. Station shall have auxiliary contacts for remote monitoring of switch position and contacts for connection of engine start signal wiring (field wired to associated A.T.S. by E.C.).

D. Station shall have provisions for Camlock cable connections. Spring-loaded or latching hinged flap for cable entry.

E. Where switch utilizes manual, double-throw action to transfer load, means shall be available to padlock switch in all positions.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Wall Mounted Switch: Utilize appropriate brackets or inserts.

B. Floor Mounted Switch: Anchor to concrete base by bolting.

1. Concrete Bases: 4 inches high, reinforced, with chamfered edges. Extend base no more than 4 inches in all directions beyond the maximum dimensions of switch, unless otherwise indicated or unless required for seismic support. Construct concrete bases according to Division 26 Section "Hangers and Supports for Electrical Systems."

C. Identify components according to Division 26 Section "Identification for Electrical Systems."

D. Set field-adjustable intervals and delays, relays, and engine exerciser clock.

E. **The E.C. shall enlist the services of Caterpillar (Olympian) Generator Service to re-configure the generator output voltage to 208Y/120V-3Ph-4W to match the new utility voltage for the facility. Coordinate start signal wiring thru the new portable docking station, annunciator wiring, etc.**

3.2 CONNECTIONS

A. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

B. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

1. Connect automatic transfer switch(es) to initiate cranking of the emergency generator and to provide remote indication where specified or indicated on the drawings. Include installation of all wire and conduit associated with each automatic transfer switch.

2. The E.C. shall intercept the existing standby power feed, start circuit, etc. from the generator to route thru the new portable docking station to the new service entrance ATS.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.

B. Coordinate tests with tests of generator and run them concurrently.

C. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.

D. Remove and replace malfunctioning units and retest as specified above.

3.4 WARRANTY

A. Provide 5-year extended warranty (Parts and Labor). Provide the certificate directly to the Owner accompanied by a letter of transmittal. Provide a copy to the Architect/Engineer with shop drawings.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain transfer switch(es) and related standby equipment.

END OF SECTION 263601

SECTION 26 4313 – SURGE PROTECTIVE DEVICES (SPD) FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes SPD's for low-voltage power equipment.

1.2 QUALITY ASSURANCE

A. Source Limitations: Obtain suppression devices and accessories through one source from a single manufacturer. Manufacturer shall have been engaged in the manufacture of SPD products specified and products shall have been in satisfactory service for not less than 5 years.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with IEEE C62.41, "IEEE Guide for Surge Voltages in Low Voltage AC Power Circuits," and test devices according to IEEE C62.45, "IEEE Guide on Surge Testing for Equipment Connected to Low-Voltage AC Power Circuits."

D. Comply with NEMA LS 1, "Low Voltage Surge Protection Devices."

E. Comply with UL 1283 5th Edition, "Electromagnetic Interference Filters," and UL 1449 3rd Edition, "Surge Protective Devices."

1.3 PROJECT CONDITIONS

A. Service Conditions: Rate surge protection devices for continuous operation under the following conditions, unless otherwise indicated:

1. Maximum Continuous Operating Voltage: Not less than 115 percent of nominal system operating voltage.
2. Operating Temperature: 30 to 120 deg F.
3. Humidity: 0 to 85 percent, non-condensing.
4. Altitude: Less than 20,000 feet above sea level.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advanced Protection Technologies, Inc. (ASCO)
2. Current Technology, Inc. (ABB)
3. Cutler-Hammer, Inc. (Clipper)
4. Liebert Corporation.
5. Thor Systems, Inc.
6. Siemens Energy & Automation, Inc.
7. Square D.
8. LEA International.

2.2 SERVICE ENTRANCE SUPPRESSORS

A. Surge Protection Device Description: Non-modular, sine-wave-tracking type with the following features and accessories:

1. LED indicator lights for power and protection status.
2. Audible alarm, with silencing switch, to indicate when protection has failed.
3. Fuses/circuit breaker, rated at 200-kA interrupting capacity.
4. Integral disconnect switch or circuit breaker to isolate entire suppressor components for repair/replacement.
5. Redundant suppression circuits.
6. Surge-event operations counter.

B. Peak Single-Impulse Surge Current Rating: 150kA per mode (300 kA per phase).

C. Connection Means: Permanently wired.

D. SPD and overcurrent/disconnect device shall have a short circuit current rating greater than that available on the electrical system.

E. Protection modes and UL 1449 voltage protection rating compatible with system voltage and configuration as indicated on the drawings for complete protection as follows:

1. Line to Neutral.
2. Line to Ground.
3. Neutral to Ground.

2.3 PANELBOARD SUPPRESSORS

A. Same characteristics and requirements as service entrance suppressors with the following exceptions:

B. Surge-event operations counter not required.

C. Peak Single-Impulse Surge Current Rating: 65kA per mode (130 kA per phase).

2.4 ENCLOSURES

A. NEMA 250 (or better), with type matching the enclosure of panel or device being protected.

PART 3 - EXECUTION

3.1 INSTALLATION OF SURGE PROTECTION DEVICES

A. Install devices at service entrance on load side, with ground lead bonded to service entrance ground.

B. Install devices for panelboard and auxiliary panels with conductors or buses between suppressor and points of attachment as short and straight as possible (not to exceed 18 inches). Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground. Twist input conductors together to reduce system inductance.

1. Provide multipole circuit breaker or fusible disconnect switch as a dedicated disconnect for suppressor, fuse size and type as recommended by SPD manufacturer.

3.2 PLACING SYSTEM INTO SERVICE

A. Do not energize or connect service equipment to their sources until surge protection devices are installed and connected.

3.3 FIELD QUALITY CONTROL

A. Testing: Perform the following field tests and inspections and document on test reports:

1. Complete startup checks according to manufacturer's written instructions.

END OF SECTION 26 4313

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SECTION 26 5113 - INTERIOR LIGHTING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Interior lighting fixtures, light engines (LED's) and drivers.
2. Emergency lighting units.
3. Exit signs.
4. Lighting fixture supports.

B. See Division 26 Section "Wiring Devices" for manual wall-box dimmers for LED fixtures or lamps.

C. See Division 26 Section "Lighting Control Devices" for automatic control of lighting, including occupancy sensors, and multi-pole lighting relays and contactors.

1.2 SUBMITTALS

A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes and photometric data.

B. Shop Drawings: Show details of nonstandard or custom lighting fixtures. Indicate dimensions, weights, methods of field assembly, components, features, and accessories.

C. LED Fixtures: Fixtures with LED light source are noted on lighting fixture schedule with advertised lumen output of light source for fixture/manufacturer specified and color temperature. Listed equal manufacturer shall provide fixture with equivalent lumen output as listed product. If insufficient information is provided, the Engineer may require Project Specific, point-by-point photometric calculations of sample areas utilizing the submitted fixture to prove equivalent performance.

D. Product Certificates: For each type of driver, signed by product manufacturer.

E. Field quality-control test reports.

1.3 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. All LED fixtures and components shall be tested and comply under the standards of IESNA LM-79-08, LM-80-08, LM-82-12 and TM-21-11for measurement and publication of projected long term lumen maintenance, color stability, photometric performance and LED source operating lifetime. Fixture submitted shall meet the listed lifetime rating of the fixture specified, as a minimum.

1.4 WARRANTY

A. Provide a written, five year replacement material warranty for defective or non-starting LED source assemblies. Warranty period shall begin on date of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In Lighting Fixture Schedule the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified on drawing schedule.

2.2 LIGHTING FIXTURES AND COMPONENTS, GENERAL REQUIREMENTS

A. Recessed Fixtures: Comply with UL 1598 and NEMA LE 4 for ceiling compatibility for recessed fixtures.

B. Metal Parts: Free of burrs and sharp corners and edges.

C. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.

D. Polymer Components: Plastic or polymer housing/components of fixture assemblies shall be rated for the temperature (or plenum) environment installed and shall not degrade in structural integrity, shape, color or finish for a minimum of 10 years.

E. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit servicing without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during servicing and when secured in operating position.

F. Plastic Diffusers, Covers, and Globes:

1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

a. Lens Thickness: At least 0.125 inch minimum unless different thickness is indicated.
b. UV stabilized.

2. Glass: Tempered glass, unless otherwise indicated.

G. Servicing Access: Fixtures specified for installation in inaccessible (gypsum/drywall) ceilings/walls, etc. shall be fully serviceable/accessible from the fixture aperture.

H. Disconnecting Means:

1. Lighting fixtures with luminaires that utilize double-ended lamps and contain driver(s) that can be serviced in place or luminaires that are supplied from multi-wire branch circuits and can be serviced in place shall have a local disconnecting means at/within the fixture complying with NEC Article 410.75.

2.3 DRIVERS

A. Drivers for LED Light Sources:

1. Driver shall be separate component from LED light source and shall be replaceable utilizing mounting screws, factory provided clips and electrical connector bodies.
2. Dimming (When noted or indicated on Fixture Schedule): 100 to 1 percent of rated lumens via separate 0-10V input (Dimmer) control. Line voltage dimming acceptable when noted on plans.
3. Level Control/Step-Dimming (When noted or indicated on Fixture Schedule): Minimum capability of bi-level control (100%-50%-Off) or 1/3-2/3-Full on, as noted.
4. Voltage input: 120-277 Volt multi-volt capability.

B. Internal-Type Emergency Fluorescent Power Unit: Self-contained, modular, battery-inverter unit, factory mounted within lighting fixture body and compatible with driver. Comply with UL 924.

1. Emergency Connection: Operate light source continuously at a minimum output of 1000 lumens. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture driver.
2. Test Push Button and Indicator Light: Visible and accessible without opening fixture or entering ceiling space.

    a. Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
    b. Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

3. Battery: Sealed, maintenance-free, nickel-cadmium type.
4. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.
5. Voltage input: 120-277 Volt multi-volt capability.

C. Where plans call for multi-level switching/lighting, provide appropriate driver in fixture as required to accommodate the switching level arrangement of fixture.

2.4 EXIT SIGNS

A. Internally Lighted Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

1. Light source for AC Operation: LEDs, 70,000 hours minimum rated lamp life.
2. Voltage input: 120-277 Volt multi-volt capability.

2.5 EMERGENCY LIGHTING UNITS

A. Description: Self-contained units complying with UL 924.

1. Battery: Sealed, maintenance-free, lead-acid type.
2. Charger: Fully automatic, solid-state type with sealed transfer relay.
3. Operation: Relay automatically turns luminaire on when power supply circuit voltage drops to 80 percent of nominal voltage or below. Luminaire automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects luminaire from battery, and battery is automatically recharged and floated on charger.
4. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
5. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
6. Voltage input: 120-277 Volt multi-volt capability.

2.6 LIGHTING FIXTURE SUPPORT COMPONENTS

A. Comply with Division 26 Section "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.

B. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gauge.

C. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

D. Recessed fixtures shall be supported at all 4 corners, independent of each other, from structure above with steel #12 single jack chains. Additionally, securely fasten each fixture to the ceiling framing member by mechanical means such as bolts, screws, rivets or approved clips; install a minimum of one on each four sides of fixture.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Lighting fixtures: Set level, plumb, and square with ceilings and walls.

B. Comply with NFPA 70 for minimum fixture supports.

C. Suspended Lighting Fixture Support:

1. Single or Continuous Rows: Provide manufacturer required quantity of suspension cables at minimum intervals to support continuous row fixtures. The E.C. shall support suspended fixtures independently from the ceiling system and as specified by the fixture manufacturer.

D. Surface or Flush Lighting Fixture Support:

1. The E.C. shall coordinate fixture locations with the trade installing the ceiling system to assure support members are oriented and located to accommodate the lighting fixture layout.

2. Surface or flush fixtures in ceilings of the suspended lay-in type shall be installed so that the long dimension of the fixture is supported on the main support members of the ceiling system.

E. Luminaires installed in exposed or concealed locations under metal corrugated sheet roof decking shall be installed and supported so there is not less than 1-1/2” measured from the lowest surface of the roof decking to the top of the luminaire.

F. Adjust aimable lighting fixtures to provide required light intensities.

G. Where fixtures are suspended in Mechanical/Electrical/Storage/Technology or Utility spaces with no suspended ceiling, coordinate mounting heights and locations with exposed ductwork, piping, conduit/data cabling racks, equipment, etc. to provide optimal and even light distribution to service equipment.

H. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.2 FIELD QUALITY CONTROL

A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Where applicable, verify transfer from normal power to battery and retransfer to normal.

3.3 SPARE LAMPS/FIXTURES

A. For LED fixtures with LED source integral to the fixture assembly, provide one spare fixture for each type as noted on lighting fixture schedule.

B. For fixtures with separate/replaceable LED luminaire (retrofit lamp), provide 5 spare lamps of each type utilized.

END OF SECTION 26 5113

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SECTION 26 5200 – EXIT AND EMERGENCY LIGHTING

PART 1 - GENERAL

1.1 Exit lighting and emergency lighting system wiring shall be run in conduit system which is completely independent of normal wiring systems.

PART 2 - PRODUCTS – N/A

PART 3 - EXECUTION

3.1 Install a green ground wire throughout the wiring system.

END OF SECTION

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SECTION 26 7000 - SUSPENDED CEILING MOUNTED CIRCULATION FANS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The fan shall be the models scheduled with the capacities indicated. The fan shall be furnished with mounting hardware and variable speed controls.

1.2 RELATED WORK

A. Installation of the fan, miscellaneous or structural metal work (if required), field electrical wiring, cable, conduit, fuses and disconnect switches shall be provided by this contractor.

1.3 GENERAL ELECTRICAL REQUIREMENTS

A. Wiring: Wiring practices, materials and coding shall be in accordance with the requirements of the National electrical Code NFPA 70 and other applicable codes and standards.

1.4 SUBMITTALS

A. Product Data: For each Fan type indicated.

B. Shop Drawings: Detail assemblies of equipment indicating dimensions, weights, components, and location and identification of each field connection. Show access, mounting, and clearance requirements; details of controls.

1. Include wiring and installation diagrams.

C. Operation and maintenance data.

D. Warranties.

E. WARRANTY

The manufacturer shall replace any products or components defective in material or workmanship, free of charge to the customer in accordance to the following schedule:

- Electrical 1 year (Minimum)
- Mechanical 10 year (Minimum)

PART 2 - PRODUCTS

2.1 Industrial Style, Large Area Fans (Type CF1)

A. Complete Unit:
The fan shall consist of entire unit with housing, motor, blades, drop rod, trim canopy, etc. Equal to RP Lighting #1091-WW Series. Coordinate drop rod length with other utilities in room. Fan to be suspended at same level as area lighting, or above.

B. Trim:
The fan shall be equipped with all White finish on housing with steel blades, minimum 56" diameter, maximum 60" diameter (White finish on blades).

C. Motor:
The fan motor shall be a permanent magnet brushless motor rated for continuous operation at maximum speed with the capability of modulating the fan speed at 3 preset speeds (Low/Medium/High) and reversing (from wall control switch) without the use of a gearbox or other mechanical means of control. The motor shall operate at 120V/60 Hz. The motor shall be a non-ventilated, heat sink design with the capability of continuous operation in -40°F to 131°F (-40°C to 55°C) ambient conditions.

D. Mounting System:
The fan mounting system shall be designed for quick and secure installation from a standard octagon ceiling fan electrical box rated for a minimum of 50 lbs.

For mounting through ceiling media, a factory supplied canopy is provided to maintain a professional, finished installation.

E. Wall Control:
The fans shall be capable of On/Off/3-Speed control from a remote wall control. The wall control shall be capable of controlling a minimum of 3 fans (where indicated) mounted in a standard single-gang box with cover plate (The E.C. shall provide stainless steel coverplate) RP Lighting #WC-4 Series for multiple fans, #WC-3 Series for single fan. The controller(s) shall be integrated and installed in Apparatus Bay Control Enclosure, refer to detail drawings.

2.3 Residential Style, Small Room/Small Diameter Fans (Type CF2)

A. Complete Unit:
The fan shall consist of entire unit with housing, motor, blades, trim canopy, etc. Equal to Hunter Presto Series. Contemporary, Low-Profile, Ceiling Hugger Style, maximum 10" depth.

B. Trim:
The fan shall be equipped with all White finish on housing with reversible wood blades, minimum 36" diameter, maximum 44" diameter (White finish on blades).

C. Motor:

The fan motor shall be a permanent magnet brushless motor rated for continuous operation at maximum speed with the capability of modulating the fan speed at 3 preset speeds (Low/Medium/High) and reversing (from switch on fan) without the use of a gearbox or other mechanical means of control. The motor shall operate at 120V/60 Hz. The motor shall be a non-ventilated, heat sink design with the capability of continuous operation in -40°F to 131°F (-40°C to 55°C) ambient conditions.

D. Mounting System:
The fan mounting system shall be designed for quick and secure installation from a standard octagon ceiling fan electrical box rated for a minimum of 50 lbs.

For mounting through ceiling media, a factory supplied canopy is provided to maintain a professional, finished installation.

E. Wall Control:
The fan shall be capable of On/Off/3-Speed control from a remote wall control. The wall control shall be capable of mounting in a standard single-gang box with cover plate (The E.C. shall provide Stainless Steel Coverplate to match other devices).

EXECUTION

2.1 INSTALLATION

A. Maintain minimum clearances and workspace at equipment according to manufacturer's written instructions and NFPA 70.

B. Follow manufacturer’s instructions regarding installation, wiring and testing system. Wiring shall be installed in conduit in accordance with manufacturer’s recommendations and in compliance with local, state and national codes.

C. Identify components and wiring according to Division 26 Section "Identification for Electrical Systems."

2.2 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain the fans.

END OF SECTION 26 70 00

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SECTION 26 7533 - RACEWAY AND BOXES FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for communications systems including voice, data, fire alarm and other remote-control, signaling and power-limited circuit systems.

1.2 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, cable trays, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, details, and attachments to other work.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

C. Comply with ANSI/EIA/TIA 569.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

A. Rigid Steel Conduit: ANSI C80.1.

B. IMC: ANSI C80.6.

C. EMT: ANSI C80.3.

D. FMC: Zinc-coated steel.

E. LFMC: Flexible steel conduit with PVC jacket.

F. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
2. Fittings for EMT: Steel only, set-screw or compression type.

2.2 NONMETALLIC CONDUIT AND TUBING

A. ENT: NEMA TC 13.

B. RNC: NEMA TC 2, unless otherwise indicated.

C. LFNC: UL 1660.

D. Fittings for ENT and RNC: NEMA TC 3; match to conduit or tubing type and material.

E. Fittings for LFNC: UL 514B.

2.3 SURFACE RACEWAYS

A. Surface Metal Raceways: Painted Steel with snap-on covers, white finish.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Thomas & Betts Corporation.
b. Walker Systems, Inc.; Wiremold Company (The).
c. Hubbell Wiring Systems.

2.4 BOXES, ENCLOSURES, AND CABINETS

A. Sheet Metal Outlet and Device Boxes: NEMA OS 1. Single-gang deep box for wall-phone, minimum two-gang box with single-gang extension ring for all others.

B. Cast-Metal Outlet and Device Boxes: NEMA FB 1, aluminum, Type FD, with gasketed cover.

C. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

D. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.

E. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.

F. Cabinets:

1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.

3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:

1. Exposed Conduit: Rigid steel conduit.
2. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Comply with the following indoor applications, unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: Surface Raceway.
2. Exposed, Not Subject to Severe Physical Damage: Surface Raceway.
3. Exposed and Subject to Severe Physical Damage: Rigid steel conduit. Includes raceways in the following locations:

    a. Mechanical rooms
    b. Apparatus Bay, 48” A.F.F. and below.

4. Concealed in Ceilings and Interior Walls and Partitions: EMT except FMC may be utilized in existing walls.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
6. Damp or Wet Locations: Rigid steel conduit.
7. Raceways for Optical Fiber or Communications Cable: EMT.
8. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, stainless steel in damp or wet locations.

C. Minimum Raceway Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

3.2 INSTALLATION

A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.

B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Support raceways as specified in Division 26 Section "Hangers and Supports for Electrical Systems."

E. Install no more than the equivalent of two 90-degree bends in any conduit run or .

F. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

G. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.

H. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.

I. Raceways for Data, Audio Visual and Communications Cable: Install as follows:

1. 1-Inch Trade Size and Smaller: Install raceways in maximum lengths of 75 feet.
2. Install with a maximum of two 90-degree bends or equivalent for each length of raceway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes where necessary to comply with these requirements.

3. Raceway shall be installed continuously from outlet box to above accessible ceiling.

J. Flexible Conduit Connections: Use maximum of 72 inches of flexible conduit for recessed and semirecessed lighting fixtures, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in all locations except MC may be used for lighting fixture whips.

K. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.

L. Set metal floor boxes level and flush with finished floor surface.

3.3 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

END OF SECTION

HELIX ENVIRONMENTAL, INC.

April 30, 2025

Mr. Curt Sparks, Associate AIA, LEED GA
App Architecture
615 Woodside Drive
Englewood, Ohio 45322

Telephone (937) 836-8898 ext. 110

RE: Pre-Renovation Asbestos Inspection of Fire Station 15, 2801 Wayne Avenue, Dayton, Ohio, March 11, 2025 AND April 1, 2025.
Helix Project No. 7347.

Dear Mr. Sparks:

App Architecture contracted with Helix Environmental, Inc. to perform a pre-renovation asbestos inspection of the accessible portions of the Fire Station 15 located at 2801 Wayne Avenue, Dayton, Ohio. The inspection was necessary to determine if asbestos-containing building materials were present so that plans could be made to remove them in accordance with current regulatory requirements prior to a planned renovation project at the building. This letter report summarizes the results of the inspection performed on March 11, 2025 and April 1, 2025 and the analytical results of samples collected on those dates. A separate report has been submitted to document the Preliminary Lead-Containing Paint Inspection.

INSPECTION AND ANALYTICAL PROCEDURES

Mr. Ralph Froehlich, CIH, CSP, QEP and Mr. Benjamin Froehlich, IH with Helix Environmental, Inc. performed bulk sampling for asbestos in the accessible renovation areas at the Fire Station 15 building located on 2801 Wayne Avenue in Dayton, Ohio. On March 11, 2025 and April 1, 2025, Mr. R. Froehlich and Mr. B. Froehlich collected samples in the areas of the accessible building where the majority of work is to occur. Mr. Ralph A. Froehlich is a Certified Industrial Hygienist with more than thirty years experience in the fields of occupational and environmental health, and is certified by the Ohio Department of Health as an Asbestos Hazard Evaluation Specialist and Asbestos Abatement Project Designer (Certification Nos. ES3074 and PD60148, respectively). Mr. Benjamin Froehlich has over fifteen years experience in the fields of occupational and environmental health and is also certified by the Ohio Department of Health as an

Asbestos Hazard Evaluation Specialist and Asbestos Abatement Project Designer (Cert. Nos. ES34739 and PD60827, respectively).

Helix Environmental, Inc. collected thirty-seven (37) bulk samples of suspect asbestos-containing building materials in the renovation areas on March 11, 2025. Helix Environmental, Inc. collected an additional twenty-three (23) bulk samples of suspect asbestos-containing building materials in the renovation area on April 1, 2025.

Sampling locations were determined in a manner "sufficient to determine" whether miscellaneous and non-friable materials contain more than 1% asbestos if they were not assumed to contain asbestos. No thermal system insulation or surfacing materials were identified during the inspection. Bulk samples of the suspect materials were collected using cleaned hand tools and packaged in labeled zip-lock plastic bags. The sample bags were placed into a larger zip-lock bag, with the original sample data/chain-of-custody and analytical request forms. Helix Environmental, Inc. retained copies of these forms.

Bulk samples were shipped by overnight courier to SanAir Technologies Laboratory, Inc., a National Voluntary Laboratory Accreditation Program (NVLAP) and Ohio Certified Professional accredited environmental lead laboratory, where they were analyzed via Polarized Light Microscopy (PLM) with dispersion staining in accordance with the U.S. Environmental Protection Agency's Interim Methods for the Determination of Asbestos in Bulk Insulation Samples (EPA-600/R-93/116). Under this method, the limit of detection for asbestos is about 1 percent by area. Samples containing smaller concentrations of asbestos are not reliably detected by this technique. Polarized light microscopes equipped with 10X eyepieces, 10X and 40X objective lenses and dispersion staining lenses were used to identify fibers present in the samples. This method has a reporting limit of 1%. Several samples were reanalyzed using EPA PLM 400 Point Counting technique, this method has a reporting limit of 0.25%. Additional samples were reanalyzed using EPA PLM with gravimetric reduction. This method has a reporting limit of 0.1%.

SanAir Technologies Laboratory, Inc. maintains accreditation from the American Industrial Hygiene Association as an environmental microbiology laboratory and has received accreditation through successful participation in the NIST National Voluntary Laboratory Accreditation Program (NVLAP) for bulk asbestos and as an environmental lead laboratory. AIHA-accredited laboratories are scrutinized on a regular basis to ensure that personnel, equipment, facilities and data are maintained. In addition, AIHA-accredited laboratories have well-developed assurance/quality control programs

to ensure that analytical results accurately reflect conditions present during the sampling periods.

APPLICABLE STANDARDS

Asbestos

The U. S. Environmental Protection Agency (EPA) has established regulations that apply to friable and potentially friable materials with asbestos content in excess of one percent, as determined by PLM. These regulations establish required notification, removal techniques, and disposal of regulated asbestos-containing materials. "Friable" means that a suspect material can be reduced to a powder by hand pressure when dry and denotes a material that is capable of releasing significant amounts of asbestos fibers to the air. Potentially friable materials are those that may release asbestos fibers to the air if they are extensively damaged during demolition operations, and include Category I Nonfriable materials in poor condition and Category II Nonfriable materials. Category I Nonfriable materials include bituminous roofing materials, resilient flooring materials, and gaskets, where the asbestos is mixed in a resilient matrix. Category I Nonfriable materials may be left in buildings when they are demolished by conventional methods, if the materials are not in poor condition. The Ohio EPA has established equivalent regulations for Ohio (Ohio Administrative Code 3745-20).

U. S. EPA has also recently banned certain uses of asbestos, and requires exposure monitoring to determine whether potentially-exposed persons exceed an airborne "Existing Chemical Exposure Limit" (ECEL) of 0.005 fibers/cc. The requirement for exposure monitoring and provision of respirators for persons whose exposures exceed 0.005 fibers/cc is currently in effect (40 CFR 751 Subpart F).

The Occupational Safety and Health Administration (OSHA) has promulgated an eight-hour Time-Weighted Average (TWA) Permissible Exposure Limit of 0.1 fibers/cc for airborne asbestos exposures while working in and around asbestos-containing materials (29 CFR 1910.1001, 29 CFR 1926.1101). A 30-minute Excursion Limit of 1.0 fibers/cc is also included with the standards. Asbestos-containing materials are defined as those that contain more than 1% asbestos. These regulations include complex requirements for asbestos abatement, dividing the work with and around asbestos into four classes, with varying requirements for each class. OSHA also requires building and facility owners to maintain records of information concerning the presence, location and

quantity of asbestos-containing material (ACM) and presumed asbestos-containing material (PACM) installed in their building or facility (29 CFR 1910.1001(j)(2)(ii)).

The U.S. Environmental Protection Agency (EPA) has established clearance criteria of 0.01 fibers/cc by PCM analyses for small-scale asbestos abatement projects in schools (40 CFR 763.91). In addition, EPA has established clearance criteria of 70 asbestos structures/mm^2 by Transmission Electron Microscopy (TEM) analyses. However, this clearance criteria is only required for large asbestos abatement projects in schools.

The American Conference of Governmental Industrial Hygienists (ACGIH) recommends an airborne eight-hour TWA Threshold Limit Value of 0.1 fibers/cc (ACGIH *2024 TLVs and BEIs*). ACGIH TLVs denote concentrations and conditions to which it is believed that nearly all workers may be repeatedly exposed day after day without adverse effect.

The National Institute for Occupational Safety and Health (NIOSH) identifies asbestos as an occupational carcinogen, and recommends that occupational exposures be "limited to the lowest feasible concentration" (NIOSH *Pocket Guide to Chemical Hazards*, 2007).

The Ohio Environmental Protection Agency (OEPA) has established additional regulations for asbestos abatement, including a certification program for asbestos supervisors, workers, hazard evaluation specialists, project designers, and air monitoring technicians. OEPA regulations also require contractors to be licensed, and require 10 working day advance notifications for asbestos abatement in amounts over 50 linear feet (LF) or 50 square feet (SF) of friable asbestos-containing material (Ohio Administrative Code 3745-20, 22).

ANALYTICAL RESULTS

TABLE 1: CONFIRMED AND ASSUMED ASBESTOS-CONTAINING MATERIALS AT FIRE STATION 15, 2801 WAYNE AVENUE, DAYTON, OHIO, COLLECTED MARCH 11, 2025 AND APRIL 1, 2025. HELIX PROJECT NO. 7347.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	PLM Result (% Asbestos)
7347-03-11-10 25016410-010 25017960-001	200 SF	1	Light Grey Insulation Sealant/ 1st Floor, West Vehicle Bay, Northwest Area, On Fiberglass Insulated Pipe, 5' Ht.	Non-Friable	**2% Chrysotile Asbestos Detected; 1.1% Chrysotile Asbestos by Point Count with Gravimetric Reduction**
7347-03-11-13 25016410-013	34 SF	1	Light Grey Insulation Sealant/ Basement, Central Tower, South Central Area, On Hot Water Storage Tank, East Side, Over Fiberglass Insulation, 4' Ht.	Non-Friable	**10% Chrysotile Asbestos Detected**
7347-03-11-25 25016410-025	-	1	Light Grey Insulation Sealant/ Basement, Central Tower, Southwest Area, On Hot Water Storage Tank, West End, Over Fiberglass Insulation, 4' Ht.	Non-Friable	**10% Chrysotile Asbestos Detected**
7347-03-11-14 25016410-014	80 SF	1	Light Grey Insulation Sealant/ 1st Floor, Central Tower, North Central Area, On Solar Hot Water Storage Tank, On Fiberglass Insulation Jacket, 1' Ht.	Non-Friable	**10% Chrysotile Asbestos Detected**
7347-03-11-26 25016410-026	-	1	Light Grey Insulation Sealant/ Basement, Central Tower, Northeast Area, In Pit, On Solar Hot Water Storage Tank, South Side, On Fiberglass Insulation Jacket, 2' Ht.	Non-Friable	**10% Chrysotile Asbestos Detected**

Ohio EPA REGULATED ASBESTOS-CONTAINING BUILDING MATERIAL **>1% Asbestos**
US EPA REGULATED ASBESTOS-CONTAINING BUILDING MATERIAL **>1% Asbestos**
OSHA REGULATED ASBESTOS-CONTAINING MATERIAL **>1% Asbestos**

TABLE 1 (CONTINUED): CONFIRMED AND ASSUMED ASBESTOS-CONTAINING MATERIALS AT FIRE STATION 15, 2801 WAYNE AVENUE, DAYTON, OHIO, COLLECTED MARCH 11, 2025 AND APRIL 1, 2025. HELIX PROJECT NO. 7347.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	PLM Result (% Asbestos)
7347-03-11-11 25016410-011 25017960-002	680 SF	1	Tan Insulation Sealant/ 1st Floor, Central Tower, North Central Area, On Fiberglass Insulated Pipe, On West Side of Solar Hot Water Storage Tank, 0' Ht.	Non-Friable	**2% Chrysotile Asbestos Detected; 2.7% Chrysotile Asbestos by Point Count with Gravimetric Reduction**
7347-03-11-12 25016410-012 25017960-003	-	1	Tan Insulation Sealant/ Basement, Central Tower, South Central Area, On Fiberglass Pipe Insulation, 5' Ht.	Non-Friable	**2% Chrysotile Asbestos Detected; 1.6% Chrysotile Asbestos by Point Count with Gravimetric Reduction**
7347-03-11-15 25016410-015	-	1	Tan Insulation Sealant/ 2nd Floor, Central Tower, East Central Area, On Fiberglass Pipe Insulation, 4' Ht.	Non-Friable	**No Asbestos Detected**
7347-03-11-27 25016410-027	-	1	Tan Insulation Sealant/ Basement, Central Tower, Northeast Area, Pit, On South Side of Solar Hot Water Storage Tank, On Fiberglass Pipe Insulation, 3' Ht.	Non-Friable	**No Asbestos Detected**

Ohio EPA REGULATED ASBESTOS-CONTAINING BUILDING MATERIAL **>1% Asbestos**
US EPA REGULATED ASBESTOS-CONTAINING BUILDING MATERIAL **>1% Asbestos**
OSHA REGULATED ASBESTOS-CONTAINING MATERIAL **>1% Asbestos**

TABLE 1 (CONTINUED): CONFIRMED AND ASSUMED ASBESTOS-CONTAINING MATERIALS AT FIRE STATION 15, 2801 WAYNE AVENUE, DAYTON, OHIO, COLLECTED MARCH 11, 2025 AND APRIL 1, 2025. HELIX PROJECT NO. 7347.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	PLM Result (% Asbestos)
7347-03-11-21 25016410-021 25017960-004	3100 SF	1	12″ x 12″ Light Grey Floor Tile with Black Horizontal Streaks, Floor Tile/ 1st Floor, Northeast Central Office - Bedroom, Southwest Central Area, 0′ Ht.	Non-Friable	**2% Chrysotile Asbestos Detected; 0.6% Chrysotile Asbestos by Point Count with Gravimetric Reduction**
		2	12″ x 12″ Light Grey Floor Tile with Black Horizontal Streaks, Black Mastic/ 1st Floor, NE Central Office - Bedroom, SW Central Area, 0′ Ht.	Non-Friable	**No Asbestos Detected**
7347-03-11-22 25016410-022 25017960-005	-	1	12″ x 12″ Light Grey Floor Tile with Black Horizontal Streaks, Floor Tile/ 1st Floor, Southeast Dormitory, Southeast Area (Exercise Area), 0′ Ht.	Non-Friable	**2% Chrysotile Asbestos Detected; 0.4% Chrysotile Asbestos by Point Count with Gravimetric Reduction**
		2	12″ x 12″ Light Grey Floor Tile with Black Horizontal Streaks, Black Mastic/ 1st Floor, Southeast Dormitory, Southeast Area (Exercise Area), 0′ Ht.	Non-Friable	**No Asbestos Detected**
7347-04-01-14 25021458-014	4 SF	1	Grey Pipe Penetration Caulk/ 2nd Floor, Central Tower, West Wall, North Central Area, 8′ Ht.	Non-Friable	**2% Chrysotile Asbestos Detected**
7347-04-01-15 25021458-015	-	1	Grey Pipe Penetration Caulk/ 2nd Floor, Central Tower, West Wall, Central Area, 8′ Ht.	Non-Friable	**2% Chrysotile Asbestos Detected**

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US EPA REGULATED ASBESTOS-CONTAINING BUILDING MATERIAL **>1% Asbestos**
OSHA REGULATED ASBESTOS-CONTAINING MATERIAL **>1% Asbestos**

TABLE 1 (CONTINUED): CONFIRMED AND ASSUMED ASBESTOS-CONTAINING MATERIALS AT FIRE STATION 15, 2801 WAYNE AVENUE, DAYTON, OHIO, COLLECTED MARCH 11, 2025 AND APRIL 1, 2025. HELIX PROJECT NO. 7347.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	PLM Result (% Asbestos)
ASSUMED Not Sampled	60 SF (3)	1	Fire Doors/ 1st Floor, At Entrance from the West Vehicle Bay, Throughout	Friable	**Assumed to Contain Asbestos**
ASSUMED Not Sampled	12 SF (1)	1	Fire Doors/ 2nd Floor, Central Tower, South Side, Roof Access Partial Door	Friable	**Assumed to Contain Asbestos**
ASSUMED Not Sampled	40 SF (2)	1	Fire Doors/ 3rd Floor, Central Tower, Roof Access Door and Southwest Door to Hose Drainage Area	Friable	**Assumed to Contain Asbestos**
ASSUMED Not Sampled	16 SF (3)	1	Vibration Isolator Cloth/ 1st Floor, West Vehicle Bay, Southeast Central Area, On Air Handler	Friable	**Assumed to Contain Asbestos**
ASSUMED Not Sampled	10 SF (2)	1	Vibration Isolator Cloth/ 3rd Floor, Central Tower, East Central Area, On AHU 3	Friable	**Assumed to Contain Asbestos**
ASSUMED Not Sampled	80 SF	1	Boiler Exhaust Flue Insulation/ 2nd Floor, Central Tower, North Central Area, On Boiler	Friable	**Assumed to Contain Asbestos**
ASSUMED Not Sampled	40 SF	1	Boiler Exhaust Flue Insulation/ 3rd Floor, Central Tower, North Central Area, On Boiler	Friable	**Assumed to Contain Asbestos**
ASSUMED Not Sampled	14 SF		Electrical Insulators in Switch Gear/ 1st Floor, Central Tower, East Wall,	Non-Friable	**Assumed to Contain Asbestos**

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TABLE 1 (CONTINUED): CONFIRMED AND ASSUMED ASBESTOS-CONTAINING MATERIALS AT FIRE STATION 15, 2801 WAYNE AVENUE, DAYTON, OHIO, COLLECTED MARCH 11, 2025 AND APRIL 1, 2025. HELIX PROJECT NO. 7347.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	PLM Result (% Asbestos)
ASSUMED Not Sampled	2 SF (2)	1	Electrical Insulators in Circuit Breaker/ 1st Floor, Central Tower, East Wall, South Area, 3' Ht.	Non-Friable	**Assumed to Contain Asbestos**
ASSUMED Not Sampled	8 SF (4)	1	Electrical Insulators in Circuit Breakers/ 1st Floor, Central Tower, Southeast Central Area, On Floating Panel Wall, 3' Ht.	Non-Friable	**Assumed to Contain Asbestos**
ASSUMED Not Sampled	0.25 SF (1)		Electrical Insulators in Safety Switch/ Exterior, West Side, Central Area, 12' Ht.	Non-Friable	**Assumed to Contain Asbestos**
ASSUMED Not Sampled	0.25 SF (1)		Electrical Insulators in Safety Switch/ 1st Floor, West Vehicle Bay, East Wall, South Central Area, 5' Ht.	Non-Friable	**Assumed to Contain Asbestos**
ASSUMED Not Sampled	0.5 SF (1)		Electrical Insulators in Safety Switch/ 2nd Floor, Central Tower, Central Area, South Wall, 4' Ht.	Non-Friable	**Assumed to Contain Asbestos**
ASSUMED Not Sampled	1 SF (2)		Electrical Insulators in Safety Switch/ 2nd Floor, Central Tower, South Wall and East Wall, Southeast Area, 4' Ht.	Non-Friable	**Assumed to Contain Asbestos**
ASSUMED Not Sampled	0.5 SF (2)		Electrical Insulators in Safety Switch/ 2nd Floor, Rooftop, South Central Area, West Wall, 2' Ht.	Non-Friable	**Assumed to Contain Asbestos**
ASSUMED Not Sampled	0.5 SF (1)		Electrical Insulators in Safety Switch/ 3rd Floor, Central Tower, Central Area, South Wall, 4' Ht.	Non-Friable	**Assumed to Contain Asbestos**

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US EPA REGULATED ASBESTOS-CONTAINING BUILDING MATERIAL **>1% Asbestos**
OSHA REGULATED ASBESTOS-CONTAINING MATERIAL **>1% Asbestos**

TABLE 1 (CONTINUED): CONFIRMED AND ASSUMED ASBESTOS-CONTAINING MATERIALS AT FIRE STATION 15, 2801 WAYNE AVENUE, DAYTON, OHIO, COLLECTED MARCH 11, 2025 AND APRIL 1, 2025. HELIX PROJECT NO. 7347.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	PLM Result (% Asbestos)
ASSUMED Not Sampled	9500 SF	1	Bituminous Roofing / Main Roofs on Building	Non-Friable	**Category I Nonfriable Asbestos Material**

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OSHA REGULATED ASBESTOS-CONTAINING MATERIAL >1% Asbestos

TABLE 2: CONFIRMED NON ASBESTOS-CONTAINING MATERIALS AT FIRE STATION 15, 2801 WAYNE AVENUE, DAYTON, OHIO, COLLECTED MARCH 11, 2025 AND APRIL 1, 2025. HELIX PROJECT NO. 7347.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	PLM Result (% Asbestos)
7347-03-11-01 25016410-001	780 SF	1	2′ x 2′ Ceiling Tile, Random Holes and Gouges, Rosette/ 1st Floor, Southeast Dormitory, Northwest Area, On Ceiling, 8′ Ht.	Friable	**No Asbestos Detected**
7347-03-11-02 25016410-002	-	1	2′ x 2′ Ceiling Tile, Random Holes and Gouges, Rosette/ 1st Floor, Southeast Dormitory, Southeast Central Area, On Ceiling, 8′ Ht.	Friable	**No Asbestos Detected**
7347-03-11-03 25016410-003	380 SF	1	2′ x 2′ Ceiling Tile, Directional Fissures and Holes/ 1st Floor, Southeast Central Women's Restroom, West Side, North Central Area, On Ceiling, 8′ Ht.	Friable	**No Asbestos Detected**
7347-03-11-04 25016410-004	-	1	2′ x 2′ Ceiling Tile, Directional Fissures and Holes/ 1st Floor, Break Room, Central Area, On Ceiling, 8′ Ht.	Friable	**No Asbestos Detected**
7347-03-11-05 25016410-005	8 SF	1	2′ x 2′ Ceiling Tile, Random Short Fissures and Holes/ 1st Floor, Break Room, Central Area, On Ceiling, 8′ Ht.	Friable	**No Asbestos Detected**
7347-03-11-06 25016410-006	-	1	2′ x 2′ Ceiling Tile, Random Short Fissures and Holes/ 1st Floor, Break Room, Central Area, On Ceiling, 8′ Ht.	Friable	**No Asbestos Detected**
7347-03-11-07 25016410-007	-	1	2′ x 2′ Ceiling Tile, Random Short Fissures and Holes/ 1st Floor, Break Room, South Central Area, On Ceiling, 8′ Ht.	Friable	**No Asbestos Detected**

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TABLE 2 (CONTINUED): CONFIRMED NON ASBESTOS-CONTAINING MATERIALS AT FIRE STATION 15, 2801 WAYNE AVENUE, DAYTON, OHIO, COLLECTED MARCH 11, 2025 AND APRIL 1, 2025. HELIX PROJECT NO. 7347.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	PLM Result (% Asbestos)
7347-03-11-16 25016410-016	5900 SF	1	Drywall, Drywall/ 1st Floor, Break Room, East Wall, Center, Above Ceiling Tile, On Soffit, 8' Ht.	Non-Friable	**No Asbestos Detected**
		2	Drywall, Joint Compound/ 1st Floor, Break Room, East Wall, Center, Above Ceiling Tile, On Soffit, 8' Ht.	Non-Friable	**No Asbestos Detected**
7347-03-11-17 25016410-017	-	1	Drywall, Drywall/ 1st Floor, South Central Laundry Room, Northwest Area, At Ceiling Hole, 8' Ht.	Non-Friable	**No Asbestos Detected**
		2	Drywall, Joint Compound/ 1st Floor, South Central Laundry Room, Northwest Area, At Ceiling Hole, 8' Ht.	Non-Friable	**No Asbestos Detected**
7347-03-11-23 25016410-023	-	1	Drywall, Drywall/ 1st Floor, Southeast Dormitory, Southeast Central Area, Above Ceiling Tile, On Soffit, 8.5' Ht.	Non-Friable	**No Asbestos Detected**
		2	Drywall, Joint Compound/ 1st Floor, Southeast Dormitory, Southeast Central Area, Above Ceiling Tile, On Soffit, 8.5' Ht.	Non-Friable	**No Asbestos Detected**
7347-03-11-24 25016410-024	-	1	Drywall, Drywall/ 1st Floor, Southeast Dormitory, Northwest Area, Above Ceiling Tile, On Soffit, 8.5' Ht.	Non-Friable	**No Asbestos Detected**
		2	Drywall, Joint Compound/ 1st Floor, Southeast Dormitory, Northwest Area, Above Ceiling Tile, On Soffit, 8.5' Ht.	Non-Friable	**No Asbestos Detected**

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OSHA REGULATED ASBESTOS-CONTAINING MATERIAL **>1% Asbestos**

TABLE 2 (CONTINUED): CONFIRMED NON ASBESTOS-CONTAINING MATERIALS AT FIRE STATION 15, 2801 WAYNE AVENUE, DAYTON, OHIO, COLLECTED MARCH 11, 2025 AND APRIL 1, 2025. HELIX PROJECT NO. 7347.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	PLM Result (% Asbestos)
7347-03-11-18 25016410-018	590 SF + outside stucco	1	Stucco, White Rough Coat/ 1st Floor, Southeast Central Men's Restroom, North Central Shower Stall, South Area, East Central Area, On Ceiling, 8' Ht.	Non-Friable	**No Asbestos Detected**
		2	Stucco, Grey Base Coat/ 1st Floor, Southeast Central Men's Restroom, North Central Shower Stall, South Area, East Central Area, On Ceiling, 8' Ht.	Non-Friable	**No Asbestos Detected**
7347-03-11-19 25016410-019	-	1	Stucco, White Rough Coat/ 1st Floor, Southeast Central Women's Restroom, Shower Stall, South Area, West Area, On Ceiling, 8' Ht.	Non-Friable	**No Asbestos Detected**
		2	Stucco, Grey Base Coat/ 1st Floor, Southeast Central Women's Restroom, Shower Stall, South Area, West Area, On Ceiling, 8' Ht.	Non-Friable	**No Asbestos Detected**
7347-03-11-20 25016410-020		1	Stucco, White Rough Coat/ 1st Floor, Southeast Central Women's Restroom, West Side, At North Wall, Above Ceiling Tile, 8' Ht.	Non-Friable	**No Asbestos Detected**
7347-04-01-01 25021458-001	>2000 SF	1	White Coating on Concrete Block/ 1st Floor, Men's Locker Room, Restroom, North Wall, East Area, 0.5' Ht.	Non-Friable	**No Asbestos Detected**
7347-04-01-02 25021458-002	-	1	White Coating on Concrete Block/ 1st Floor, Men's Locker Room, West Shower, West Wall, Center, 0.5' Ht.	Non-Friable	**No Asbestos Detected**
7347-04-01-03 25021458-003	-	1	White Coating on Concrete Block/ 1st Floor, Men's Locker Room, Restroom, South Wall, East of door, 0.5' Ht.	Non-Friable	**No Asbestos Detected**

Ohio EPA REGULATED ASBESTOS-CONTAINING BUILDING MATERIAL **>1% Asbestos**
US EPA REGULATED ASBESTOS-CONTAINING BUILDING MATERIAL **>1% Asbestos**
OSHA REGULATED ASBESTOS-CONTAINING MATERIAL **>1% Asbestos**

TABLE 2 (CONTINUED): CONFIRMED NON ASBESTOS-CONTAINING MATERIALS AT FIRE STATION 15, 2801 WAYNE AVENUE, DAYTON, OHIO, COLLECTED MARCH 11, 2025 AND APRIL 1, 2025. HELIX PROJECT NO. 7347.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	PLM Result (% Asbestos)
7347-04-01-04 25021458-004	80 SF	1	Tan Ceramic Baseboard Tile, Ceramic Tile/ 1st Floor, Men's Locker Room, Restroom, North Wall, East Area, 0.5' Ht.	Non-Friable	**No Asbestos Detected**
		2	Tan Ceramic Baseboard Tile, Tan Adhesive/ 1st Floor, Men's Locker Room, Restroom, North Wall, East Area, 0.5' Ht.	Non-Friable	**No Asbestos Detected**
		3	Tan Ceramic Baseboard Tile, Grey Grout/ 1st Floor, Men's Locker Room, Restroom, N. Wall, E. Area, 0.5' Ht.	Non-Friable	**No Asbestos Detected**
7347-04-01-05 25021458-005	-	1	Tan Ceramic Baseboard Tile, Ceramic Tile/ 1st Floor, Men's Locker Room, West Shower, West Wall, Center, 0.5' Ht.	Non-Friable	**No Asbestos Detected**
		2	Tan Ceramic Baseboard Tile, Tan Adhesive/ 1st Floor, Men's Locker Room, W. Shower, W. Wall, 0.5' Ht.	Non-Friable	**No Asbestos Detected**
		2	Tan Ceramic Baseboard Tile, Grey Grout/ 1st Floor, Men's Locker Room, W. Shower, W. Wall, Center, 0.5' Ht.	Non-Friable	**No Asbestos Detected**
7347-04-01-06 25021458-006	360 SF	1	Grey Ceramic Shower Tile, Ceramic Tile/ 1st Floor, Men's Locker Room, West Shower, South Wall, At Damaged Edge, 7' Ht.	Non-Friable	**No Asbestos Detected**
		2	Grey Ceramic Shower Tile, Tan Adhesive/ 1st Floor, Men's Locker Room, W. Shower, S. Wall, At Damaged Edge, 7' Ht.	Non-Friable	**No Asbestos Detected**
		3	Grey Ceramic Shower Tile, White Mortar/ 1st Floor, Men's Locker Room, West Shower, South Wall, At Damaged Edge, 7' Ht.	Non-Friable	**No Asbestos Detected**

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TABLE 2 (CONTINUED): CONFIRMED NON ASBESTOS-CONTAINING MATERIALS AT FIRE STATION 15, 2801 WAYNE AVENUE, DAYTON, OHIO, COLLECTED MARCH 11, 2025 AND APRIL 1, 2025. HELIX PROJECT NO. 7347.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	PLM Result (% Asbestos)
7347-04-01-07 25021458-007	360 SF	1	Grey Ceramic Shower Tile, Ceramic Tile/ 1st Floor, Women's Restroom, Shower, South Wall, At Edge, 5' Ht.	Non-Friable	**No Asbestos Detected**
		2	Grey Ceramic Shower Tile, Tan Adhesive/ 1st Floor, Women's Restroom, Shower, South Wall, At Edge, 5' Ht.	Non-Friable	**No Asbestos Detected**
		3	Grey Ceramic Shower Tile, White Mortar/ 1st Floor, Women's Restroom, Shower, South Wall, At Edge, 5' Ht.	Non-Friable	**No Asbestos Detected**
7347-04-01-08 25021458-008	600 SF	1	Tan Ceramic Floor Tile, Ceramic Tile/ 1st Floor, Men's Locker Room, Northwest Area, At Entrance, 0' Ht.	Non-Friable	**No Asbestos Detected**
		2	Tan Ceramic Floor Tile, Tan Adhesive/ 1st Floor, Men's Locker Room, Northwest Area, At Entrance, 0' Ht.	Non-Friable	**No Asbestos Detected**
		3	Tan Ceramic Floor Tile, Grey Mortar/ 1st Floor, Men's Locker Room, Northwest Area, At Entrance, 0' Ht.	Non-Friable	**No Asbestos Detected**
7347-04-01-09 25021458-009	-	1	Tan Ceramic Floor Tile, Ceramic Tile/ 1st Floor, Locker Room Entrance Area, Southeast Corner, 0' Ht.	Non-Friable	**No Asbestos Detected**
		2	Tan Ceramic Floor Tile, Tan Adhesive/ 1st Floor, Locker Room Entrance Area, SE Corner, 0' Ht.	Non-Friable	**No Asbestos Detected**
		3	Tan Ceramic Floor Tile, Grey Mortar/ 1st Floor, Locker Room Entrance Area, SE Corner, 0' Ht.	Non-Friable	**No Asbestos Detected**

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US EPA REGULATED ASBESTOS-CONTAINING BUILDING MATERIAL >1% Asbestos
OSHA REGULATED ASBESTOS-CONTAINING MATERIAL >1% Asbestos

TABLE 2 (CONTINUED): CONFIRMED NON ASBESTOS-CONTAINING MATERIALS AT FIRE STATION 15, 2801 WAYNE AVENUE, DAYTON, OHIO, COLLECTED MARCH 11, 2025 AND APRIL 1, 2025. HELIX PROJECT NO. 7347.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	PLM Result (% Asbestos)
7347-03-11-08 25016410-008	1800 SF	1	Dark Brown Faux Wood Sheet Flooring, Flooring/ 1st Floor, Break Room, Northwest Area, At North Wall, 0' Ht.	Non-Friable	**No Asbestos Detected**
		2	Dark Brown Faux Wood Sheet Flooring, Green Mastic/ 1st Floor, Break Room, Northwest Area, At North Wall, 0' Ht.	Non-Friable	**No Asbestos Detected**
7347-03-11-09 25016410-009	-	1	Dark Brown Faux Wood Sheet Flooring, Flooring/ 1st Floor, Southwest Central Hallway, Northwest Area, 0' Ht.	Non-Friable	**No Asbestos Detected**
		2	Dark Brown Faux Wood Sheet Flooring, Green Mastic/ 1st Floor, Southwest Central Hallway, Northwest Area, 0' Ht.	Non-Friable	**No Asbestos Detected**
7347-03-11-32 25016410-032	30 SF	1	4" Brown Cove Base, Cove Base/ 1st Floor, South Central Laundry Room, West Wall, South Area, 0' Ht.	Non-Friable	**No Asbestos Detected**
		2	4" Brown Cove Base, Brown Mastic/ 1st Floor, South Central Laundry Room, West Wall, South Area, 0' Ht.	Non-Friable	**No Asbestos Detected**
7347-03-11-33 25016410-033	-	1	4" Brown Cove Base, Brown Mastic/ 1st Floor, South Central Laundry Room, West Wall, South Area, 0' Ht.	Non-Friable	**No Asbestos Detected**
7347-03-11-34 25016410-034	-	1	4" Brown Cove Base, Brown Mastic/ 1st Floor, South Central Laundry Room, West Wall, South Area, 0' Ht.	Non-Friable	**No Asbestos Detected**

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OSHA REGULATED ASBESTOS-CONTAINING MATERIAL **>1% Asbestos**

TABLE 2 (CONTINUED): CONFIRMED NON ASBESTOS-CONTAINING MATERIALS AT FIRE STATION 15, 2801 WAYNE AVENUE, DAYTON, OHIO, COLLECTED MARCH 11, 2025 AND APRIL 1, 2025. HELIX PROJECT NO. 7347.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	PLM Result (% Asbestos)
7347-03-11-37 25016410-037	30 SF	1	4" Brown Cove Base, Cove Base/ 1st Floor, North Central Office, West Wall, Southwest Corner, 0' Ht.	Non-Friable	**No Asbestos Detected**
		2	4" Brown Cove Base, Brown Mastic/ 1st Floor, North Central Office, West Wall, Southwest Corner, 0' Ht.	Non-Friable	**No Asbestos Detected**
7347-03-11-35 25016410-035	110 SF	1	6" Black Cove Base, Cove Base/ 1st Floor, Southeast Central Hallway, East Wall, South Central Area, 0' Ht.	Non-Friable	**No Asbestos Detected**
		2	6" Black Cove Base, Tan Mastic/ 1st Floor, Southeast Central Hallway, East Wall, South Central Area, 0' Ht.	Non-Friable	**No Asbestos Detected**
7347-03-11-36 25016410-036	-	1	6" Black Cove Base, Cove Base/ 1st Floor, Break Room, West Wall, North Area, 0' Ht.	Non-Friable	**No Asbestos Detected**
		2	6" Black Cove Base, Tan Mastic/ 1st Floor, Break Room, West Wall, North Area, 0' Ht.	Non-Friable	**No Asbestos Detected**

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US EPA REGULATED ASBESTOS-CONTAINING BUILDING MATERIAL **>1% Asbestos**
OSHA REGULATED ASBESTOS-CONTAINING MATERIAL **>1% Asbestos**

TABLE 2 (CONTINUED): CONFIRMED NON ASBESTOS-CONTAINING MATERIALS AT FIRE STATION 15, 2801 WAYNE AVENUE, DAYTON, OHIO, COLLECTED MARCH 11, 2025 AND APRIL 1, 2025. HELIX PROJECT NO. 7347.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	PLM Result (% Asbestos)
7347-03-11-28 25016410-028	7 SF (2)	1	Tan Vibration Isolator Cloth/ 2nd Floor, Central Tower, Northeast Central Area, On AH-2, On Ductwork, Northwest Corner, 5' Ht.	Friable	**No Asbestos Detected**
7347-03-11-29 25016410-029	-	1	Tan Vibration Isolator Cloth/ 2nd Floor, Central Tower, Southeast Area, On AH-2, On Ductwork, 2.5' Ht.	Friable	**No Asbestos Detected**
7347-03-11-30 25016410-030	2 SF	1	Black Sweatwrap/ 2nd Floor, Central Tower, Central Area, On AH-2, West Side, On Pipe, 2' Ht.	Non-Friable	**No Asbestos Detected**
7347-03-11-31 25016410-031	-	1	Black Sweatwrap/ 2nd Floor, Central Tower, Central Area, On AH-2, West Side, On Pipe, 1' Ht.	Non-Friable	**No Asbestos Detected**
7347-04-01-10 25021458-010	65 SF	1	Black Sink Soundproofing/ 1st Floor, Kitchen, South Central Area, Under Sink, East Side, 2' Ht.	Non-Friable	**No Asbestos Detected**
7347-04-01-11 25021458-011	-	1	Black Sink Soundproofing/ 1st Floor, Kitchen, South Central Area, Under Sink, West Side, 2' Ht.	Non-Friable	**No Asbestos Detected**
7347-04-01-16 25021458-016	6 SF	1	Pipe Penetration Mortar/ Basement, Central Tower, West Wall, South Central Area, 8' Ht.	Non-Friable	**No Asbestos Detected**
7347-04-01-17 25021458-017	-	1	Pipe Penetration Mortar/ Basement, Central Tower, South Wall, East Area, 8' Ht.	Non-Friable	**No Asbestos Detected**

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US EPA REGULATED ASBESTOS-CONTAINING BUILDING MATERIAL **>1% Asbestos**
OSHA REGULATED ASBESTOS-CONTAINING MATERIAL **>1% Asbestos**

TABLE 2 (CONTINUED): CONFIRMED NON ASBESTOS-CONTAINING MATERIALS AT FIRE STATION 15, 2801 WAYNE AVENUE, DAYTON, OHIO, COLLECTED MARCH 11, 2025 AND APRIL 1, 2025. HELIX PROJECT NO. 7347.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	PLM Result (% Asbestos)
7347-04-01-12 25021458-012	35 SF	1	Brown Interior Caulk/ 1st Floor, East Central Entrance Door Frame, South Side, 4' Ht.	Non-Friable	**No Asbestos Detected**
7347-04-01-13 25021458-013	-	1	Brown Interior Caulk/ 1st Floor, Northeast Central Entrance Door Frame, East Side, 43' Ht.	Non-Friable	**No Asbestos Detected**
7347-04-01-18 25021458-018	80 SF	1	Grey Exterior Caulk/ Exterior, 2nd Floor Level, East Roof, Central Area, At Tower, North Side, East Central Area, 4' Ht.	Non-Friable	**No Asbestos Detected**
7347-04-01-19 25021458-019	-	1	Grey Exterior Caulk/ Exterior, 3rd Floor Level, East Roof, Central Area, At Tower, North Side, Central Area, 4' Ht.	Non-Friable	**No Asbestos Detected**
7347-04-01-21 25021458-021	-	1	Grey Exterior Caulk/ Exterior, South Side, East Dormitory Area, South Window Frame, East Edge, 7' Ht.	Non-Friable	**No Asbestos Detected**
7347-04-01-22 25021458-022	-	1	Grey Exterior Caulk/ Exterior, South Side, East Dormitory Area, South Window Frame, West Edge, 7' Ht.	Non-Friable	**No Asbestos Detected**
7347-04-01-20 25021458-020	8 SF	1	Black Exterior Caulk/ Exterior, East Side, North Central Area, Dining Room Windows, South Edge, 5' Ht.	Non-Friable	**No Asbestos Detected**
7347-04-01-23 25021458-023	-	1	Black Exterior Caulk/ Exterior, East Side, North Central Area, Dining Room Windows, South Edge, 4' Ht.	Non-Friable	**No Asbestos Detected**

Ohio EPA REGULATED ASBESTOS-CONTAINING BUILDING MATERIAL **>1% Asbestos**
US EPA REGULATED ASBESTOS-CONTAINING BUILDING MATERIAL **>1% Asbestos**
OSHA REGULATED ASBESTOS-CONTAINING MATERIAL **>1% Asbestos**

DISCUSSION AND RECOMMENDATIONS

A total of sixty (60) total bulk samples of suspect asbestos-containing materials, some containing multiple layers, were collected from the Fire Station 15 Building located at 2801 Wayne Avenue renovation areas. Samples were collected from all accessible suspect asbestos-containing building materials in the accessible renovation areas with the exception of roofing materials, fire doors, window sills, ceramic tile adhesive, boilers which were in use and energized electrical insulation materials.

Analytical results confirmed that the following suspect asbestos-containing building materials at Fire Station 15, 2801 Wayne Avenue in Dayton, Ohio contain or were assumed to contain more than 1% asbestos:

- Grey Insulation Sealant, Throughout Building, From the Basement to the 2nd Floor, On Some Pipe Fittings (200 SF)
- Grey Insulation Sealant, Basement, On Abandoned Hot Water Storage Tank (34 SF)
- Grey Insulation Sealant, Basement to 1st Floor, On Abandoned Solar Hot Water Storage Tank (80 SF)
- Tan Insulation Sealant, Throughout Building, From the Basement to the 2nd Floor, On Both Hot Water Storage Tanks, And on Some Pipe Fittings (680 SF)
- Pipe Penetration Caulk, Basement, Throughout, At Pipe and Duct Penetrations (8 SF)
- Vibration Isolator Clothes, Roof, In All Large Air Handlers (26 SF Total, Not Sampled, Assumed to Contain Asbestos)
- Fire Doors, Throughout All Levels (112 SF, 6 Not Sampled, Assumed to Contain Asbestos)
- Boiler Exhaust Flues, 2nd Floor and 3rd Floor, Central Tower, North Area, Extending into the Top of the Central Tower Roof, (120 SF Total, Not Sampled, Assumed to Contain Asbestos)
- Electrical Insulators, Throughout, All Electrical Insulators within Switch Gears, Circuit Breakers and Safety Switches (27 SF Total, Not Sampled, Assumed to Contain Asbestos)
- Bituminous Roofing, All Roofing on Building (9500 SF Total, Not Sampled, Assumed to Contain Asbestos)

One type of sampled floor tile was reported to contain 2% asbestos by PLM visual area estimation, but were reported to contain less than 1% by PLM 400 Point Count with Gravimetric Reduction analytical methods:

- 12″ x 12″ Light Grey Floor Tile with Black Streaks, 1st Floor, Throughout, Including under the Ceramic Tile in the NE Bathroom and under the Brown Faux Wood Sheet Flooring (3100 SF, Less than 1% Asbestos with Gravimetric Reduction and Point Counting)

OSHA has interpreted its regulations to require wet methods for the removal of materials containing less than 1% asbestos, with prompt cleanup of debris in leak tight containers. Helix Environmental, Inc. recommends the use of a licensed asbestos abatement company to perform this work since they have the equipment, experience, and knowledge to safely remove materials containing trace amounts of asbestos without creating a potential hazard.

Additional sampled suspect materials were reported contain no detectable asbestos. No special asbestos requirements are necessary for their removal and disposal of sampled suspect materials which were found to contain no detectable asbestos.

Current Federal and State regulations require special asbestos abatement procedures prior to building demolition that will disturb confirmed or assumed friable or potentially-friable asbestos-containing materials. Helix Environmental, Inc. recommends that the identified asbestos-containing materials be removed using a licensed asbestos abatement contractor. Helix Environmental, Inc. also strongly recommends that the abatement work be competitively bid using specifications developed by a licensed Asbestos Project Designer to ensure that the regulatory requirements are met by the contractor and that the work is properly documented in the event of future legal action.

Trained workers and supervisors certified by OEPA must be used to remove the identified asbestos-containing building materials using special procedures and protective equipment to ensure that the workers are not overexposed to airborne asbestos. Advance notification may need to be provided to both the Regional Air Pollution Control Agency (RAPCA) and OEPA at least ten working days in advance of the start of abatement on site, depending on the quantity of materials removed. The fact that asbestos-containing materials were observed in or on the building should be noted on the demolition notification form along with the name and certification number of the

inspectors (Mr. Benjamin Froehlich, Ohio Certification Cert. No. ES34739). In addition, approximately 4,000 SF of bituminous roofing materials on the Main Building and 800 SF of bituminous roofing materials on the East Addition were also observed by the inspectors, and were Category I Non-Friable materials. Under current EPA regulations, Category I Non-Friable materials, including bituminous roofing materials, resilient flooring material, and non-friable gaskets, do not need to be removed from buildings prior to their demolition. The quantities of these Category I Non-Friable materials must be noted on the demolition/renovation notification form which must be sent to the Ohio EPA at least 10-working days prior to the start of demolition or asbestos abatement.

Additional suspect asbestos-containing materials may be hidden in uninspected or inaccessible locations, such as pipe chases, duct chases or wall cavities. If any additional suspect materials are encountered in these locations, they should be kept intact and undisturbed until they can be inspected and sampled by a licensed Asbestos Hazard Evaluation Specialist. Helix Environmental, Inc. will also be happy to return to the site if additional suspect materials are encountered during the renovation.

Since the building was built prior to 1978 when lead was banned for interior coatings, it was assumed that all paint present in the renovation area contains detectable levels of lead. Demolition contractors which will disturb assumed lead-containing painted surfaces must comply with the requirements of the OSHA Construction Industry Lead regulations prior to and during any work which may disturb lead-containing coatings. A separate report was submitted to document the results of a Preliminary Lead-Containing Paint inspection in the building.

Other potential environmental issues may also be present in the renovation area, including mercury-containing materials, suspect PCB-containing fluorescent light ballasts, and Freon®-containing refrigerants.

Mercury-containing fluorescent light bulbs in the building have sufficient concentrations of mercury to be considered universal hazardous waste. In addition, thermostats in the buildings may contain small amounts of mercury, and one mercury-containing thermostat was observed during inspection. Batteries associated with emergency lighting may also contain mercury, and are considered to be universal hazardous waste. These universal waste materials should be carefully removed from the building and recycled in accordance with current regulations.

Fluorescent light ballasts were made with PCBs until 1979. Ballasts made after that date are required to be marked with the legend "No PCBs". Given the age of the building, PCB-containing fluorescent light ballasts and other PCB-containing electrical capacitors and transformers may be present in the building, and each ballast, capacitor or transformer should be examined to determine if it is labeled "No PCBs". If necessary, ballasts, capacitors and transformers that are not so labeled should be carefully removed from the building and packaged and labeled for recycling or incineration in accordance with current regulations.

Refrigerated cooling systems in the buildings, including water coolers, window air-conditioners, and refrigerators, typically contain Freon® refrigerants that must be recovered by licensed refrigerant recycler if removed, in accordance with current regulations. No unauthorized venting of Freon® refrigerants to the atmosphere is permitted under current regulations, since these materials deplete the stratospheric ozone layer (Ozone Depleting Substances).

Finally, no significant accumulations of hazardous waste were observed during the building inspection that could require special remediation, although small amounts of maintenance and custodial chemicals including interior paint were observed in or near the renovation area. It was assumed that the remaining maintenance and custodial chemicals present in the renovation area will be relocated for use during normal custodial and maintenance operations. If not, then these materials may need to be labeled, packaged and transported to a licensed hazardous waste Treatment, Storage and Disposal site in compliance with federal and state hazardous waste regulations.

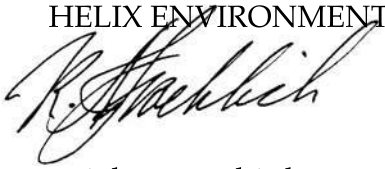
The results of this inspection can only reflect the condition of the property at the date and time of the site visit within the limits of the proposed work. There are limitations to asbestos inspections without dismantling or destroying the building or its systems. No inspection was performed in inaccessible locations. Recommendations are based on the professional judgment of the inspectors, and the results of the samples collected and analyzed. Helix Environmental, Inc. and its agents are neither responsible nor liable for the non-discovery of any defects in materials, craftsmanship, or other conditions, or any problems that may be discovered or manifest after the site visit date and time. Helix Environmental, Inc. and its agents make no warranty, expressed or implied, and accept no liability for the presence absence of asbestos or other hazardous materials in or on building products, materials, or areas. Helix Environmental, Inc. and its agents assume no responsibility

for the cost of repairing, replacing, or removing any undiscovered or unreported condition or defect, or any future condition or defect.

If you have any questions or comments concerning the inspection or analytical results, please call me at (937) 226-0650.

Sincerely,

HELIX ENVIRONMENTAL, INC.



Ralph A. Froehlich, CIH, CSP, QEP
President
Attach.

ATTACHMENTS

- **ANALYTICAL RESULTS AND SAMPLE DATA SHEETS**
- **SAMPLE LOCATIONS**
- **PHOTOGRAPHS**

SanAir Technologies Laboratory

The Identification Specialists

Analysis Report
prepared for
Helix Environmental Inc

Report Date: 3/13/2025

Project Name: Fire Station 15, 2801 Wayne Avenue

Project #: 7347

SanAir ID#: 25016410

NVLAP TESTING

NVLAP LAB CODE 200870-0

10501 Trade Court, North Chesterfield, Virginia 23236
888.895.1177 | 804.897.1177 | fax: 804.897.0070 | LabReports@SanAir.com | SanAir.com

SanAir ID Number
25016410
FINAL REPORT
3/13/2025 10:30:24 AM

Name: Helix Environmental Inc
Address: 1 Elizabeth Place
Suite 160
Dayton, OH 45417
Phone: 937-226-0650

Project Number: 7347
P.O. Number:
Project Name: Fire Station 15, 2801 Wayne Avenue
Collected Date: 3/11/2025
Received Date: 3/12/2025 10:25:00 AM

Dear Benjamin Froehlich,

We at SanAir would like to thank you for the work you recently submitted. The 37 sample(s) were received on Wednesday, March 12, 2025 via UPS. The final report(s) is enclosed for the following sample(s): 7347-03-11-01, 7347-03-11-02, 7347-03-11-03, 7347-03-11-04, 7347-03-11-05, 7347-03-11-06, 7347-03-11-07, 7347-03-11-08, 7347-03-11-09, 7347-03-11-10, 7347-03-11-11, 7347-03-11-12, 7347-03-11-13, 7347-03-11-14, 7347-03-11-15, 7347-03-11-16, 7347-03-11-17, 7347-03-11-18, 7347-03-11-19, 7347-03-11-20, 7347-03-11-21, 7347-03-11-22, 7347-03-11-23, 7347-03-11-24, 7347-03-11-25, 7347-03-11-26, 7347-03-11-27, 7347-03-11-28, 7347-03-11-29, 7347-03-11-30, 7347-03-11-31, 7347-03-11-32, 7347-03-11-33, 7347-03-11-34, 7347-03-11-35, 7347-03-11-36, 7347-03-11-37.

These results only pertain to this job and should not be used in the interpretation of any other job. This report is only complete in its entirety. Refer to the listing below of the pages included in a complete final report.

Sincerely,

Sandra Sobrino
Asbestos & Materials Laboratory Manager
SanAir Technologies Laboratory

Final Report Includes:
- Cover Letter
- Analysis Pages
- Disclaimers and Additional Information

Sample conditions:
- 37 samples in Good condition.

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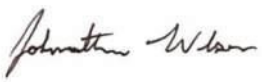
Project Number: 7347
P.O. Number:
Project Name: Fire Station 15, 2801 Wayne Avenue
Collected Date: 3/11/2025
Received Date: 3/12/2025 10:25:00 AM

Analyst: Hogrefe, Sarah

Asbestos Bulk PLM EPA 600/R-93/116

	Stereoscopic	Components		
SanAir ID / Description	Appearance	% Fibrous	% Non-fibrous	Asbestos Fibers
7347-03-11-01 / 25016410-001 1st Fl (SE) Dormitory NW Area On Ceiling	White Fibrous Homogeneous	70% Cellulose	30% Other	None Detected
7347-03-11-02 / 25016410-002 1st Fl (SE) Dormitory SE Central Area, On Ceiling	White Fibrous Homogeneous	70% Cellulose	30% Other	None Detected
7347-03-11-03 / 25016410-003 1st Fl SE Central Womens Restroom, West of N Central Area	White Fibrous Homogeneous	40% Cellulose 30% Glass	30% Other	None Detected
7347-03-11-04 / 25016410-004 1st Fl Break Room , Center E Ceiling	White Fibrous Homogeneous	40% Cellulose 30% Glass	30% Other	None Detected
7347-03-11-05 / 25016410-005 Break Room, Center Ceiling	White Fibrous Homogeneous	40% Cellulose 30% Glass	30% Other	None Detected
7347-03-11-06 / 25016410-006 Break Room, Center Ceiling	White Fibrous Homogeneous	40% Cellulose 30% Glass	30% Other	None Detected
7347-03-11-07 / 25016410-007 Break Room Center Ceiling	White Fibrous Homogeneous	40% Cellulose 30% Glass	30% Other	None Detected
7347-03-11-08 / 25016410-008 Break Room N Area W Center On Floor, Sheet Flooring	Brown Non-Fibrous Heterogeneous		100% Other	None Detected
7347-03-11-08 / 25016410-008 Break Room N Area W Center On Floor, Mastic	Green Non-Fibrous Homogeneous		100% Other	None Detected
7347-03-11-09 / 25016410-009 1st Fl SW Central Hallway NW Area On Floor, Sheet Flooring	Brown Non-Fibrous Heterogeneous		100% Other	None Detected

Analyst: 
Analysis Date: 3/13/2025

Approved Signatory: 
Date: 3/13/2025

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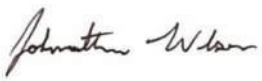
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Asbestos Bulk PLM EPA 600/R-93/116

	Stereoscopic	Components		
SanAir ID / Description	Appearance	% Fibrous	% Non-fibrous	Asbestos Fibers
7347-03-11-09 / 25016410-009 1st Fl SW Central Hallway NW Area On Floor, Mastic	Green Non-Fibrous Homogeneous		100% Other	None Detected
7347-03-11-10 / 25016410-010 1st Fl West Vehicle Bay (Garage) NW Area on Fiberglass	Grey Non-Fibrous Homogeneous		98% Other	2% Chrysotile
7347-03-11-11 / 25016410-011 1st Fl Central Tower Solar Hot Water Storage Tank West Area	Tan Non-Fibrous Homogeneous		98% Other	2% Chrysotile
7347-03-11-12 / 25016410-012 Basement Central Area Central Tower	Tan Non-Fibrous Homogeneous		98% Other	2% Chrysotile
7347-03-11-13 / 25016410-013 Basement S Central Area On Hot Water Storage Tank East Side	Grey Non-Fibrous Homogeneous	5% Glass	85% Other	10% Chrysotile
7347-03-11-14 / 25016410-014 1st Fl NW Central Utility Tower, Solar Hot Water Storage	Grey Non-Fibrous Homogeneous	5% Glass	85% Other	10% Chrysotile
7347-03-11-15 / 25016410-015 Level 2 Central Tower East Central Area On Fiberglass	Tan Non-Fibrous Homogeneous		100% Other	None Detected
7347-03-11-16 / 25016410-016 1st Fl Break Room E Central Area Above Soffitt, Drywall	White Non-Fibrous Homogeneous	5% Cellulose	95% Other	None Detected
7347-03-11-16 / 25016410-016 1st Fl Break Room E Central Area Above Soffitt, Joint Compound	Off-White Non-Fibrous Homogeneous		100% Other	None Detected
7347-03-11-17 / 25016410-017 1st Fl SW Central laundry Room NW Area, Drywall	White Non-Fibrous Homogeneous	5% Cellulose	95% Other	None Detected

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Asbestos Bulk PLM EPA 600/R-93/116

	Stereoscopic	Components		
SanAir ID / Description	Appearance	% Fibrous	% Non-fibrous	Asbestos Fibers
7347-03-11-17 / 25016410-017 1st Fl SW Central laundry Room NW Area, Joint Compound	Off-White Non-Fibrous Homogeneous		100% Other	None Detected
7347-03-11-18 / 25016410-018 1st Fl SE Central Mens Restroom N Central Shower Stall, Stucco	White Non-Fibrous Heterogeneous		100% Other	None Detected
7347-03-11-18 / 25016410-018 1st Fl SE Central Mens Restroom N Central Shower Stall, Base	Grey Non-Fibrous Heterogeneous		100% Other	None Detected
7347-03-11-19 / 25016410-019 1st Fl SE Central Womens Restroom East Side, W Area on Ceili, Stucco	White Non-Fibrous Heterogeneous		100% Other	None Detected
7347-03-11-19 / 25016410-019 1st Fl SE Central Womens Restroom East Side, W Area on Ceili, Base	Grey Non-Fibrous Heterogeneous		100% Other	None Detected
7347-03-11-20 / 25016410-020 1st Fl SE Central Womens Restroom West Side, N Wall	White Non-Fibrous Homogeneous		100% Other	None Detected
7347-03-11-21 / 25016410-021 1st Fl NE Central Office/Bedroom SW Central Area On Floor, Floor Tile	Grey Non-Fibrous Homogeneous		98% Other	2% Chrysotile
7347-03-11-21 / 25016410-021 1st Fl NE Central Office/Bedroom SW Central Area On Floor, Mastic	Black Non-Fibrous Homogeneous		100% Other	None Detected
7347-03-11-22 / 25016410-022 1st Fl SE Dormitory, SE Area/Exercise Area On Floor, Floor Tile	Grey Non-Fibrous Homogeneous		98% Other	2% Chrysotile

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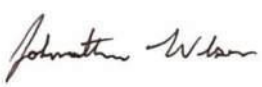
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Asbestos Bulk PLM EPA 600/R-93/116

	Stereoscopic	Components		
SanAir ID / Description	Appearance	% Fibrous	% Non-fibrous	Asbestos Fibers
7347-03-11-22 / 25016410-022 1st Fl SE Dormitory, SE Area/Exercise Area On Floor, Mastic	Black Non-Fibrous Homogeneous		100% Other	None Detected
7347-03-11-23 / 25016410-023 1st Fl SE Dormitory SE Central Area Above CT, On Soffitt, Drywall	Grey Non-Fibrous Homogeneous	5% Cellulose	95% Other	None Detected
7347-03-11-23 / 25016410-023 1st Fl SE Dormitory SE Central Area Above CT, On Soffitt, Joint Compound	Off-White Non-Fibrous Homogeneous		100% Other	None Detected
7347-03-11-24 / 25016410-024 1st Floor SE Dormitory NW Area Above Ceiling Tile, Drywall	Grey Non-Fibrous Homogeneous	5% Cellulose	95% Other	None Detected
7347-03-11-24 / 25016410-024 1st Floor SE Dormitory NW Area Above Ceiling Tile, Joint Compound	Off-White Non-Fibrous Homogeneous		100% Other	None Detected
7347-03-11-25 / 25016410-025 Basement Central Tower SW Area On Hot Water Storage Tank	Grey Non-Fibrous Homogeneous	5% Glass	85% Other	10% Chrysotile
7347-03-11-26 / 25016410-026 Basement Central Tower Solar Water Tank	Grey Non-Fibrous Homogeneous	5% Glass	85% Other	10% Chrysotile
7347-03-11-27 / 25016410-027 Basement Central Tower NE Area	Tan Non-Fibrous Homogeneous		100% Other	None Detected
7347-03-11-28 / 25016410-028 2nd Fl Central Tower, NE Central Area on AH2	Tan Fibrous Homogeneous	80% Glass	20% Other	None Detected
7347-03-11-29 / 25016410-029 2nd Fl Central Tower SE Area On AH-02	Tan Fibrous Homogeneous	80% Glass	20% Other	None Detected

Analyst: 
Analysis Date: 3/13/2025

Approved Signatory: 
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Analyst: Hogrefe, Sarah

Asbestos Bulk PLM EPA 600/R-93/116

	Stereoscopic	Components		
SanAir ID / Description	Appearance	% Fibrous	% Non-fibrous	Asbestos Fibers
7347-03-11-30 / 25016410-030 2nd Fl Central Tower Central Area on AH-2 West Side	Black Non-Fibrous Homogeneous		100% Other	None Detected
7347-03-11-31 / 25016410-031 2nd Fl Central Tower, Central Area On AH-27	Black Non-Fibrous Homogeneous		100% Other	None Detected
7347-03-11-32 / 25016410-032 1st Fl laundry Room W Wall, Cove Base	Brown Non-Fibrous Homogeneous		100% Other	None Detected
7347-03-11-32 / 25016410-032 1st Fl laundry Room W Wall, Mastic	Brown Non-Fibrous Homogeneous		100% Other	None Detected
7347-03-11-33 / 25016410-033 1st Fl Laundry N Wall Center	Brown Non-Fibrous Homogeneous		100% Other	None Detected
7347-03-11-34 / 25016410-034 1st Fl Laundry W Wall SW Corner	Brown Non-Fibrous Homogeneous		100% Other	None Detected
7347-03-11-35 / 25016410-035 1st Fl SE Central Hallway, E Wall, Cove Base	Black Non-Fibrous Homogeneous		100% Other	None Detected
7347-03-11-35 / 25016410-035 1st Fl SE Central Hallway, E Wall, Mastic	Tan Non-Fibrous Homogeneous		100% Other	None Detected
7347-03-11-36 / 25016410-036 1st Fl Break Room West Wall N Area, Cove Base	Black Non-Fibrous Homogeneous		100% Other	None Detected
7347-03-11-36 / 25016410-036 1st Fl Break Room West Wall N Area, Mastic	Tan Non-Fibrous Homogeneous		100% Other	None Detected

Analyst: Sthogh
Analysis Date: 3/13/2025

Approved Signatory: Johnathan Wilson
Date: 3/13/2025

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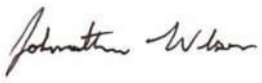
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Analyst: Hogrefe, Sarah

Asbestos Bulk PLM EPA 600/R-93/116

	Stereoscopic	Components		
SanAir ID / Description	Appearance	% Fibrous	% Non-fibrous	Asbestos Fibers
7347-03-11-37 / 25016410-037 1st Fl N Central Office, SW Corner West Wall, Cove Base	Brown Non-Fibrous Homogeneous		100% Other	None Detected
7347-03-11-37 / 25016410-037 1st Fl N Central Office, SW Corner West Wall, Mastic	Brown Non-Fibrous Homogeneous		100% Other	None Detected

Analyst: 
Analysis Date: 3/13/2025

Approved Signatory: 
Date: 3/13/2025

Disclaimer and Additional Information:
Asbestos Bulk PLM EPA 600/R-93/116

This report is the sole property of the client named on the chain-of-custody (COC) submitted to SanAir Technologies Laboratory, Inc. (SanAir). Results in the report are confidential information intended only for the use by the customer listed on the COC. Neither results nor reports will be discussed with or released to any third party without our client's written permission. The final report shall not be reproduced, except in full, without written approval of the laboratory to assure that parts of the report are not taken out of context. This report and any information contained within shall not be edited, altered, or modified in any way by any persons or agencies receiving, viewing, distributing, or otherwise possessing a copy of this final report. The laboratory reserves the right to perform amendments to any finalized report, of which shall supersede and make obsolete any previous editions. Such changes, modifications, additions, or deletions shall be effective immediately upon notice thereof, which may be given by means including but not limited to posting on the SanAir client portal website, electronic or conventional mail, or by any other means.

The information provided in this report applies only to the samples submitted and is relevant only for the date, time, and location of sampling. The accuracy of the results is dependent upon the client's sampling procedure and information provided to the laboratory by the client on the COC. SanAir assumes no responsibility for the sampling procedure and will provide evaluation reports based solely on the sample(s) in the condition received at the laboratory and information provided by the client on the COC, such as: project number, project name, collection dates, P.O. number, special instructions, samples collected by, sample numbers, sample identifications, sample type, selected analysis type, flow rate, total volume or area, and start-stop times that may affect the validity of the results in this report. Samples were received in good condition unless otherwise noted on the report. When the client requires samples to be tested that deviates from a specific method or condition, all reported results may be affected by the deviation. SanAir assumes no responsibility or liability for the manner in which the results are used or interpreted.

This report does not constitute nor shall not be used by the client to claim product, process, system, or person certification, approval, or endorsement by NVLAP, NIST, NELAC, AIHA LAP, LLC or any other U.S. governmental agencies; all or somet tests contained in this report may not be accredited by every local, state, and federal regulatory agencies. Refer to the SanAir website at www.sanair.com for copies of current certificates and scopes of various accreditations, certifications, and licenses or contact the laboratory for inquiries regarding the status or scope of an accreditation or certification.

Samples are held for a period of 60 days. Fibers smaller than 5 microns cannot be seen with this method due to scope limitations. For NY state samples, method EPA 600/M4-82-020 is performed.

NYELAP Disclaimer:
Polarized-light microscopy is not consistently reliable in detecting asbestos in floor covering and similar non-friable organically bound materials. Quantitative transmission electron microscopy is currently the only method that can be used to determine if this material can be considered or treated as non-asbestos containing.

Asbestos Accreditations, Certifications, and Licenses
National Voluntary Laboratory Accreditation Program (NVLAP) Lab Code 200870-0
City of Philadelphia Department of Public Health Air Management Services, Certification#ALL-460
Commonwealth of Pennsylvania Department of Environmental Protection Number 68-05397
California State Environmental Laboratory Accreditation Program Certificate Number 2915
Colorado Department of Public Health and Environment Registration Number AL-23143
Connecticut Department of Public Health Environmental Laboratory Registration Number PH-0105
Massachusetts Department of Labor Standards Asbestos Analytical Services License Number: AA000222
State of Maine Department of Environmental Protection License Number: LB-0075
New York State Department of Health Laboratory ID: 11983
State of Rhode Island Department of Health Certification No.: PLM00126
Texas Department of State Health Services License Number: 300440
Commonwealth of Virginia Department of Professional and Occupational Regulation Number: 3333000323
State of Washington Department of Ecology Laboratory ID: C989
State of West Virginia Bureau for Public Health Analytical Laboratory Number: LT000616
Vermont Department of Health License Number: Asb-Co-An-000006
Louisiana Department of Environmental Quality AI Number 212253, LELAP Lab ID #05088

25016410

HELIX ENVIRONMENTAL, INC.
1 Elizabeth Place, Suite 160 • Dayton, Ohio 45417-3445
Phone: (937) 226-0650 Fax: (937) 226-0653 Email: helix@helixenv.com

LABORATORY: San Air
RUSH - YES OR NO (NO) DATE SAMPLED: 3/11/25
DATE REQUIRED: 24 HR TAT
JOB NO./LOCATION: 7347 | Dayton, OH
CLIENT: App Architecture
BUILDING: Fire Station 15, 2801 Wayne Avenue
INSPECTOR: Ben Froehlich
JOB NUMBER: 7347

BULK SAMPLE DATA SHEET | ANALYSES REQUESTED: Asbestos PLM

HELIX SAMPLE ID NUMBER	AMOUNT	REPRESENTATIVE SAMPLE LOCATION	MATERIAL DESCRIPTION	FRIABLE/ NON	CONDITION	COMMENTS
7347-03-11-01	180 SF	1st Fl. (SE) Dormitory, NW Area, On Ceiling, 8' Ht.	2'x2' Rad Ceiling Tile, Random Holes and Gouges, Fissures Present	F	F	26×30 = 180+ (13×15) 600
7347-03-11-02	"	1st Fl, SE Dormitory, SE Central Area, On Ceiling 8' Ht	2'x2' Ceiling Tile, Random Holes and Gouges, Fissures, Present	F	F	
7347-03-11-03	380 SF	1st Fl., SE Central Women's Restroom, West side, N. Central Area, 8' Ht.	2x2' Ceiling Tile, Horizontal Fissures and Holes Directional	F	F	56+
7347-03-11-04	—	1st Fl., Break Room, Center E Ceiling 8' Ht	2'x2' Ceiling Tile, Directional Fissures and Holes,	F	F	
7347-03-11-05	8 SF	Break Room, Center Ceiling 8' Ht	2'x2' Ceiling Tile, Random Shot Fissures	F	G	Holes replacement
7347-03-11-06	—	Break Room, Center Ceiling 8' Ht	2'x 2' Ceiling Tile Random Shot Fissures &	F	G	holes replacement
7347-03-11-07	—	Break Room, Center S Ceiling 8' Ht	2'x2' Ceiling Tile, Random Shot Fissures & holes	F	G	replacement
7347-03-11-08	11005F	Break Room, 1st Fl., N. Area, W. center, On floor, 0' Ht.	Dark Brown Faux wood Sheet Flooring, Green Mastic	N	F	12×12 = FT A below
7347-03-11-09	—	1st Fl, SW Central Hallway, NW Area, on Floor, 0' Ht.	Dark Brown Faux wood Sheet Flooring, Green Mastic	N	F	"
7347-03-11-10		1st Fl., West Vehicle Bay (Garage), NW Area, on Fiberglass Insulated pipe, 5' Ht	Light Grey Pipe Insulation & Sealant	N	F	
7347-03-11-11		1st Fl., Central Tower, Solar Hot water Storage Tank, West side, on Plastic Pipe Fitting, 0' Ht.	Tan Pipe Insulation sealant	N	F	
7347-03-11-12		Concrete, Central Area Central Tower	Tan Pipe Insulation sealant	N	F	

THIS IS A CHAIN OF CUSTODY DOCUMENT. PLEASE COMPLETE, SIGN, AND DATE. PLEASE RETURN ORIGINAL TO HELIX ENVIRONMENTAL, INC.

REC'D 1	Relinquished by: Ben Froehlich	Company: Helix Env. Inc.	Date/Time: 3/11/25, 12:00	REC'D 3	Relinquished by:	Company:	Date/Time:
REC'D 2	Received by: ESC 3-12-25 10:25 Am	Company:	Date/Time:	REC'D 4	Relinquished by:	Company:	Date/Time:

3-12-25 10:25 Am
3-12-25 ESC

HELIX ENVIRONMENTAL, INC.

1 Elizabeth Place, Suite 160 • Dayton, Ohio 45417-3445
Phone: (937) 226-0650 Fax: (937) 226-0653 Email: helix@helixenv.com

25016410

LABORATORY: Sun Air
DATE SAMPLED: 3/11/25
RUSH - YES OR (NO) DATE REQUIRED: 24 HR TAT
JOB NO./LOCATION: 7347 | Dayton, OH
CLIENT: Agg Architecture
BUILDING: Fire Station, 15, 2801 Wayne Avenue
INSPECTOR: Ben Froehlich
JOB NUMBER: 7347

BULK SAMPLE DATA SHEET | **ANALYSES REQUESTED:** Asbestos PLM

HELIX SAMPLE ID NUMBER	AMOUNT	REPRESENTATIVE SAMPLE LOCATION	MATERIAL DESCRIPTION	FRIABLE/ NON	CONDITION	COMMENTS
7347-03-11-13	24 ~~110~~ SF	Basement, S. Central Area, on Hot water storage Tank, East side, 4' Ht.	Light Grey ~~Pipe~~ Tank insulation sealant	N	F	Fiberglass Insulation under Metal Jacket
7347-03-11-14	16 SF	1st Fl, NW central Utility Tower, solar Hot water storage Tank, west side, 7' Ht.	Light Grey ~~Pipe~~ Tank insulation sealant	N	F	
7347-03-11-15		Level 2, Central Tower, East central Area, On Fiberglass Insulated Pipe, 4' Ht.	Tan Pipe Insulation sealant	N	F	
7347-03-11-16		1st Fl., break room, E. central Area, Above CT, on soffit, 8' Ht.	Drywall and Joint compound	N	F	
7347-03-11-17		1st Fl., SW central Laundry Room, NW Area, 4' Hole, 8' Ht.	Drywall and Joint compound	N	F	
7347-03-11-18	110 SF	1st Fl., SE Central Mens Restroom, N. central shower stall, S. Area, E. ~~central~~ Area on Ceiling, 8' Ht.	Rough Stucco; Base Layer (Dark Grey)	N	F	15x7=
7347-03-11-19	~~110~~ SF	1st Fl., SE Central Womens Restroom, ~~East~~ side, N. ~~Wall~~ ~~Above Ceiling tiles~~ Area, on Ceiling, 8' Ht.	Stucco, Base Layer (Dark Grey), Rough	N	F	6x7=56 x3=
7347-03-11-20	-	1st Fl., SE Central Womens Restroom, West side, N. wall, Above Ceiling tiles, 8' Ht.	Rough Block coat	N	F	Remains of Stucco?
7347-03-11-21	615 SF 1839 SF total	1st Fl., NE Central office/Bedroom, SW Central Area, on Floor, Ht.	12"x12" Light Grey Floor tile w/ Horizontal black streaks black mastic	N	F	Textured +
7347-03-11-22	1224 SF 3000 SF	1st Fl., SE Dormitory, SE Area (Exercise Area) On Floor, 0' Ht.	12"x12" Light Grey Floor tile, Horizontal black streaks black mastic	N	F	36'x34'=
7347-03-11-23		1st Fl., SE Dormitory, SE Central Area, Above CT, on soffit 8.5' Ht.	Drywall and Joint compound	N	~~F~~ G	4' on Perimeter of Dormitory
7347-03-11-24		1st Fl., SE Dormitory, NW Area, Above Ceiling Tile, 8.5' Ht.	Drywall and Joint Compound	N	G	

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REC'D 1	Relinquished by: Ben Froehlich	Company: Helix Env., Inc.	Date/Time: 3/11/25 18:00	REC'D 3	Relinquished by:	Company:	Date/Time:
REC'D 2	Received by: ESC 3-12-25 10:25 AM	Company:	Date/Time:	REC'D 4	Relinquished by:	Company:	Date/Time:

ESC 3-12-25
~~ESC 3-12-25 10:25 AM~~

25016410

HELIX ENVIRONMENTAL, INC.
1 Elizabeth Place, Suite 160 • Dayton, Ohio 45417-3445
Phone: (937) 226-0650 Fax: (937) 226-0653 Email: helix@helixenv.com

RUSH - YES OR (NO)

LABORATORY: Sun AhV
DATE SAMPLED: 3/11/25
DATE REQUIRED: 24 HR TAT
JOB NO./LOCATION: 7347 | Dayton, OH
CLIENT: Agg Architecture
BUILDING: Fire Station 15, 2801 Wayne Avenue
INSPECTOR: Ben Froehlich
JOB NUMBER: 7347

BULK SAMPLE DATA SHEET | **ANALYSES REQUESTED:** Asbestos PLM

HELIX SAMPLE ID NUMBER	AMOUNT	REPRESENTATIVE SAMPLE LOCATION	MATERIAL DESCRIPTION	FRIABLE/ NON	CONDITION	COMMENTS
7347-03-11-25	34 SF	Basement, Central Tower, SW Central Area, on Hot water storage Tank, West end, AH-1,	Light Grey Tank Insulation sealant	N	F	
7347-03-11-26	76 SF	Basement, central Tower, P.T, NE Area, S. side of Bottom, 2'Hl.	Light Grey Tank insulation sealant	N	F	Top and Bottom
7347-03-11-27	—	Basement, Central Tower, P.T, NE Area, S. Central Area, Solar Hot water storage Tank, on pipe insulation, 3'Hl.	Tan Pipe Insulation sealant	N	F	
7347-03-11-28	7 SF (2)	2nd Fl, Central Tower, NE Central Area, on AH-2, on Ductwork, NW Corner, 5'Hl.	Tan Canvas Vibration Isolator cloth	F	F	
7347-03-11-29	—	2nd Fl, Central Tower, SE Area, on AH-2, On Ductwork, 2.5'Hl.	Tan Canvas Vibration isolator cloth.	F	F	3 SF
7347-03-11-30	2 SF	2nd Fl, Central Tower, Central Area, on AH-2, West Side, At Refrigeat Pipe, 2'Hl.	Black Sweat Wrap	N	F	
7347-03-11-31	—	2nd Fl, Central Tower, Central Area, on AH-2, West Side, At water Pipe, 1'Hl.	Black sweat wrap.	N	F	
7347-03-11-32	3 LF	1st Fl, Laundry Room, W Wall Safe door 0'Hl.	4" Brown Cove Base & Mastic	N	F	1 SF Brown Mastic
7347-03-11-33	~~6 SF~~	1st Fl, Laundry, N Wall Center 0'Hl.	Brown Mastic behind Cove Base	N	F	18 LF
7347-03-11-34	—	1st Fl, Laundry, W Wall SW Corner, 0'Hl.	Brown Mastic behind Cove Base	N	F	
7347-03-11-35	100 SF	1st Fl, SE Central Hallway, E. wall, S. Central Area,	6" Black Cove Base, Tan Mastic	N	G	
7347-03-11-36	—	1st Fl, Break Room, West Wall, N. Area, 0'Hl.	6" Black Cove Base, Tan Mastic	N	G	

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REC'D 1	Relinquished by: Ben Froehlich	Company: Helix Env., Inc	Date/Time: 3/11/25 18:00	REC'D 3	Relinquished by:	Company:	Date/Time:
REC'D 2	Received by: ESC 3-12-25 10:25 AM	Company:	Date/Time:	REC'D 4	Relinquished by:	Company:	Date/Time:

ESC 3-12-25 AM
3-12-25 10:25 AM

25016410

HELIX ENVIRONMENTAL, INC.

1 Elizabeth Place, Suite 160 • Dayton, Ohio 45417-3445
Phone: (937) 226-0650 Fax: (937) 226-0653 Email: helix@helixenv.com

RUSH - YES OR (NO)

LABORATORY: Sun AIV
DATE SAMPLED: 3/11/25
DATE REQUIRED: 24 HR TAT
JOB NO./LOCATION: 7347 | Dayton, OH
CLIENT: App Architecture
BUILDING: Fire Station 15, 2801 Wayne Avenue
INSPECTOR: Ben Frechlich
JOB NUMBER: 7347

BULK SAMPLE DATA SHEET | **ANALYSES REQUESTED:** Asbestos PLM

HELIX SAMPLE ID NUMBER	AMOUNT	REPRESENTATIVE SAMPLE LOCATION	MATERIAL DESCRIPTION	FRIABLE/ NON	CONDITION	COMMENTS
7347-03-11-37	5Z	1st Fl, N. Central Bldg Office, SW corner, west wall, 0'FL	4" Brown Cove Base and Brown Mastic	N	F	
7347-03-11-38						
7347-03-11-39						
7347-03-11-40						
7347-03-11-41						
7347-03-11-42						
7347-03-11-43						
7347-03-11-44						
7347-03-11-45						
7347-03-11-46						
7347-03-11-47						
7347-03-11-48						

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REC'D 1	Relinquished by: Ben Frechlich	Company: Helix Env, Inc.	Date/Time: 3/11/25 15:00	REC'D 3	Relinquished by:	Company:	Date/Time:
REC'D 2	Received by: ESC 3-12-25 10:25 AM	Company:	Date/Time:	REC'D 4	Relinquished by:	Company:	Date/Time:

ESC 3-12-25 AM
~~ESC 3-12-25 10:25 AM~~

SanAir Technologies Laboratory

The Identification Specialists

Analysis Report
prepared for
Helix Environmental Inc

Report Date: 3/21/2025

Project Name: Fire Station 15, 2801 Wayne Avenue

Project #: 7347

SanAir ID#: 25017960

NVLAP TESTING

NVLAP LAB CODE 200870-0

10501 Trade Court, North Chesterfield, Virginia 23236
888.895.1177 | 804.897.1177 | fax: 804.897.0070 | LabReports@SanAir.com | SanAir.com

SanAir ID Number
25017960
FINAL REPORT
3/21/2025 10:55:46 AM

Name: Helix Environmental Inc
Address: 1 Elizabeth Place
Suite 160
Dayton, OH 45417
Phone: 937-226-0650

Project Number: 7347
P.O. Number:
Project Name: Fire Station 15, 2801 Wayne Avenue
Collected Date: 3/11/2025
Received Date: 3/19/2025 9:53:00 AM

Dear Benjamin Froehlich,

We at SanAir would like to thank you for the work you recently submitted. The 5 sample(s) were received on Wednesday, March 19, 2025 via Fax or Email request. The final report(s) is enclosed for the following sample(s): 7347-03-11-10, 7347-03-11-11, 7347-03-11-12, 7347-03-11-21, 7347-03-11-22.

These results only pertain to this job and should not be used in the interpretation of any other job. This report is only complete in its entirety. Refer to the listing below of the pages included in a complete final report.

Sincerely,

Sandra Sobrino
Asbestos & Materials Laboratory Manager
SanAir Technologies Laboratory

Final Report Includes:
- Cover Letter
- Analysis Pages
- Disclaimers and Additional Information

Sample conditions:
- 5 samples in Good condition.

SanAir ID Number
25017960
FINAL REPORT
3/21/2025 10:55:46 AM

Name: Helix Environmental Inc
Address: 1 Elizabeth Place
Suite 160
Dayton, OH 45417
Phone: 937-226-0650

Project Number: 7347
P.O. Number:
Project Name: Fire Station 15, 2801 Wayne Avenue
Collected Date: 3/11/2025
Received Date: 3/19/2025 9:53:00 AM

Analyst: Mayes, Jean

Asbestos Bulk EPA PLM NOB EPA 600/R-93/116

SanAir ID / Description	Appearance	% Fibrous	% Non Fibrous	Asbestos Types	% Total Asbestos
25017960-001 / 7347-03-11-10 1st Fl., West Vehicle Bay (Garage), NW Area, On Fiberglass	Grey Non-Fibrous Homogeneous		98.9 %	Chrysotile	1.1 %
25017960-002 / 7347-03-11-11 1st Fl., Central Tower, Solar Hot Water Storage Tank, West	Tan Non-Fibrous Homogeneous		97.3 %	Chrysotile	2.7 %
25017960-003 / 7347-03-11-12 Basement Central Tower S. Central Area Pipe Insulation	Tan Non-Fibrous Homogeneous		98.4 %	Chrysotile	1.6 %
25017960-004 / 7347-03-11-21 1st Fl., NE Central Office/ Bedroom/ SW Central, Floor Tile	Grey Non-Fibrous Homogeneous		99.4 %	Chrysotile	0.6 %
25017960-005 / 7347-03-11-22 1st Fl., SE Dormitory, SE Area (Exercise Area), Floor Tile	Grey Non-Fibrous Homogeneous		99.6 %	Chrysotile	0.4 %

EPA 400 Point Count with Gravimetric Reduction.

Analyst: Jean Mayes
Analysis Date: 3/20/2025

Approved Signatory: Johnathan Wilson
Date: 3/20/2025

Disclaimer and Additional Information:
Method for the Determination of Asbestos in Bulk Building Materials
EPA 600/R-93/116, July 1993 PLM EPA NOB

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This report does not constitute and shall not be used to claim product, process, system, or person certification, approval, or endorsement by NVLAP, NIST, NELAC, AIHA LAP, LLC or any other U.S. governmental agencies; all or some tests contained in this report may not be certified or accredited by every local, state, and federal regulatory agency. Refer to the SanAir website at www.sanair.com for copies of current certificates and scopes of various accreditations, certifications, and licenses or contact the laboratory for inquiries regarding the status or scope of an accreditation or certification.

Samples are held for a period of 60 days. Fibers smaller than 5 microns cannot be seen with this method due to scope limitations.

Revision #03, 10/3/2024

25017960

Outlook

Fw: Analysis Report for Job 25016410 is complete.

From Maria E. Coker <mcoker@sanair.com>
Date Wed 3/19/2025 10:13 AM
To Maria E. Coker <mcoker@sanair.com>

From: Benjamin Froehlich <bfroehlich@helixenv.com>
Sent: Wednesday, March 19, 2025 9:53 AM
To: Support <support@sanair.com>
Subject: Re: Analysis Report for Job 25016410 is complete.

EXTERNAL EMAIL: DO NOT CLICK on links or attachments unless you recognize the sender and know the content is safe.

Yes,

Please analyze the samples for PLM EPA NOB for 48 hour turn around.

Thanks,
Ben Froehlich
Helix Environmental, Inc.
(937) 226-0650

On Mar 18, 2025, at 4:27 PM, Support <support@sanair.com> wrote:

Good Afternoon,

I am following up on this point count request. The samples will need to be analyzed ABBEN (PLM EPA NOB), which requires your approval. Please confirm this is acceptable so we can proceed.

Please let me know if you have any questions.

Respectfully,

Cecelia Toler
Customer Service Representative
SanAir Technologies Laboratory, Inc.
10501 Trade Court
N. Chesterfield, VA 23236
Phone 804-897-1177 Ext 208
Fax 804-897-0070
www.SanAir.com
<Outlook-x5zefhif.png>
Asbestos, Lead & Metals, Microbiology, Legionella, Materials Science Testing

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2018, 2019, 2020, and 2021 Winner of Top work places in Richmond

MC 3/19/25 9:53AM

25017960

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From: Benjamin Froehlich <bfroehlich@helixenv.com>
Sent: Thursday, March 13, 2025 4:50 PM
To: Lab Reports <labreports@sanair.com>
Subject: Re: Analysis Report for Job 25016410 is complete.

EXTERNAL EMAIL: DO NOT CLICK on links or attachments unless you recognize the sender and know the content is safe.

Hello,

May I please have 48-hour turn-around point counts on the following samples?

7347-03-11-10 (25016410-010)
7347-03-11-11 (25016410-011)
7347-03-11-12 (25016410-012)
7347-03-11-21 (25016410-021), floor tile only
7347-03-11-22 (25016410-022), floor tile only

Thanks,
Ben Froehlich
Helix Environmental, Inc,
(937) 226-0650

> On Mar 13, 2025, at 10:30 AM, SanAir Technologies Laboratory <labreports@sanair.com> wrote:
>
> <25016410_Fire Station 15, 2801 Wayne Avenue_2025313103024.pdf>

MC 3/19/25 9:53AM

25017960 NOB

25016410 PLM

HELIX ENVIRONMENTAL, INC.

1 Elizabeth Place, Suite 160 • Dayton, Ohio 45417-3445
Phone: (937) 226-0650 Fax: (937) 226-0653 Email: helix@helixenv.com

LABORATORY: Sun Air
RUSH - YES OR NO (NO)
DATE SAMPLED: 3/11/25
DATE REQUIRED: 24 HR TAT
JOB NO./LOCATION: 7347 | Dayton, OH
CLIENT: App Architecture
BUILDING: Fire Station 15, 2801 Wayne Avenue
INSPECTOR: Ben Froehlich
JOB NUMBER: 7347

BULK SAMPLE DATA SHEET | ANALYSES REQUESTED: Asbestos PLM

HELIX SAMPLE ID NUMBER	AMOUNT	REPRESENTATIVE SAMPLE LOCATION	MATERIAL DESCRIPTION	FRIABLE/ NON	CONDITION	COMMENTS
7347-03-11-01	760 SF	1st Fl. (SE) Dormitory, NW Area, On Ceiling, 8' Ht.	2'X2' Ceiling Tile, Random Holes and Gouges, Some Fissures	F	F	6×30 = 180+ (13+5) 600
7347-03-11-02	~	1st Fl, SE Dormitory, SE Central Area On Ceiling, 8' Ht	2'X2' Ceiling Tile, Random Holes and Gouges, Some Fissures	F	F	
7347-03-11-03	380 SF	1st Fl., SE Central Women's Restroom, West Wall, N. Central Area, 8' Ht.	2X2 Ceiling Tile, Directional Fissures and Holes Directional	F	F	56+
7347-03-11-04	—	1st Fl, Break Room, Center E Ceiling 8' Ht	2'X2' Ceiling Tile, Directional Fissures and Holes,	F	F	
7347-03-11-05	8 SF	Break Room, Center Ceiling 8' Ht	2'X2' Ceiling Tile, Random Shot Fissures	F	G	Holes replacement
7347-03-11-06	—	Break Room, Center Ceiling 8' Ht	2'X2' Ceiling Tile, Random Shot Fissures	F	G	Holes replacement
7347-03-11-07	—	Break Room, Center S Ceiling 8' Ht	2'X2' Ceiling Tile, Random Shot Fissures & Holes	F	G	replacement
7347-03-11-08	11005F	Break Room, N. Wall, W center, On floor, 1st Fl. 0' Ht.	Dark Brown Faux wood Sheet Flooring, Green Mastic	N	F	12×12 = FT A Below
7347-03-11-09	—	1st Fl, SW Central Hallway, NW Area, on Floor, 0' Ht.	Dark Brown Faux wood Sheet Flooring, Green Mastic	N	F	"
7347-03-11-10		1st Fl., West Vehicle Bay (Garage), NW Area, on Fiberglass Insulated Pipe, 5' Ht	Light Grey Pipe Insulation Sealant	N	F	
7347-03-11-11		1st Fl, Central Tower, Solar Hot water storage Tank, West Side, on Plastic Pipe Fitting, 0' Ht	Tan Pipe Insulation sealant	N	F	
7347-03-11-12		Basement, Central Area Central Tower	Tan Pipe Insulation sealant	N	F	

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REC'D 1	Relinquished by: Ben Froehlich	Company: Helix Environmental	Date/Time: 3/11/25 18:00	REC'D 3	Relinquished by	Company	Date/Time
REC'D 2	Received by: ESC 3-12-25 10:25 AM	Company	Date/Time:	REC'D 4	Relinquished by	Company	Date/Time

3-12-25 10:25 AM
3-12-25 ESC

2501796C NOB
2501641O PLM

HELIX ENVIRONMENTAL, INC.

1 Elizabeth Place, Suite 160 • Dayton, Ohio 45417-3445
Phone: (937) 226-0650 Fax: (937) 226-0653 Email: helix@helixenv.com

LABORATORY: Sun Air
RUSH - YES OR (NO)
DATE SAMPLED: 3/11/25
DATE REQUIRED: 24 HR TAT
JOB NO./LOCATION: 7347 | Dayton, OH
CLIENT: AGE Architecture
BUILDING: Fire Station 15, 2801 Wayne Avenue
INSPECTOR: Ben Frechlich
JOB NUMBER: 7347

BULK SAMPLE DATA SHEET | **ANALYSES REQUESTED:** Asbestos PLM

HELIX SAMPLE ID NUMBER	AMOUNT	REPRESENTATIVE SAMPLE LOCATION	MATERIAL DESCRIPTION	FRIABLE/ NON	CONDITION	COMMENTS
7347-03-11-13	30 SF	Basement, S. Central Area, on Hot water storage Tank, East side, 4' Ht.	Light Grey Tan Fiberglass Insulation sealant	N	F	Fiberglass Insulation under Metal Jacket
7347-03-11-14	16 SF	1st Fl, SW central Utility Tower, Solar Hot water storage tank, west side, 1' Ht.	Light Grey Insulation Tank sealant	N	F	
7347-03-11-15		Level 2, Central Tower, East central Area, On Fiberglass Insulated Pipe, 4' Ht.	Tan Pipe Insulation sealant	N	F	
7347-03-11-16		1st Fl., Break Room, E. central Area, Above CT, on Soffit, 8' Ht.	Drywall and Joint compound	N	F	
7347-03-11-17		1st Fl., SW Central Laundry Room, NW Area, At Hole, 8' Ht.	Drywall and Joint compound	N	F	
7347-03-11-18	110 SF	1st Fl, SE Central Men's Restroom, N. central shower stall, S. Area, E Central Area, on Ceiling 8' Ht.	Rough Stucco; Base Layer (Grey)	N	F	15x7=
7347-03-11-19	~~110 SF~~	1st Fl, SE Central Women's Restroom, East side, N. ~~Above Ceiling tiles~~ Area, On Ceiling 8' Ht.	Stucco, Base Layer (Dark Grey), Rough	N	F	8x7=56 x 2=
7347-03-11-20	-	1st Fl, SE Central Women's Restroom, West side, N. wall, Above Ceiling tiles, 8' Ht.	Rough Block coat	N	F	Remnants of Stucco?
7347-03-11-21	215 SF 1839 SF total	1st Fl. NE Central office/Bedroom, SW central Area, on Floor, 0' Ht.	12"x12" Light Grey Floor tile w/ Horizontal black streaks, Black mastic	N	F	Textured +
7347-03-11-22	1224 SF 3060 SF	1st Fl, SE Dormitory, SE Area (Exercise Area) 1st Floor, 0' Ht.	12"x12" Light Grey, Floor tile, Horizontal black streaks, black mastic	N	F	36'x34'=
7347-03-11-23		1st Fl, SE Dormitory, SE Central Area, Above CT, on soffit 8.5' Ht.	Drywall and Joint compound	N	F	4' on Perimeter of Dormitory
7347-03-11-24		1st Fl, SE Dormitory, NW Area, Above Ceiling tile, 8.5' Ht.	Drywall and Joint Compound	N	F	

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	Relinquished by	Company	Date/Time		Relinquished by	Company	Date/Time
REC'D 1	Ben Frechlich	Helix Env, Inc.	3/11/25 18:00	REC'D 3			
REC'D 2	ESC 3-12-25 10:25 AM			REC'D 4			

ESC 3-12-25
~~ESC 3-12-25 10:25 AM~~

25077960 NAB

25016410 PLM

HELIX ENVIRONMENTAL, INC.

1 Elizabeth Place, Suite 160 • Dayton, Ohio 45417-3445
Phone: (937) 226-0650 Fax: (937) 226-0653 Email: helix@helixenv.com

RUSH - YES OR (NO)

LABORATORY: Sun AIV
DATE SAMPLED: 3/11/25
DATE REQUIRED: 24 HR TAT
JOB NO./LOCATION: 7347 | Dayton, OH
CLIENT: AGE Architecture
BUILDING: Fire Station 15, 2801 Wayne Avenue
INSPECTOR: Ben Froehlich
JOB NUMBER: 7347

BULK SAMPLE DATA SHEET — ANALYSES REQUESTED: Asbestos PLM

HELIX SAMPLE ID NUMBER	AMOUNT	REPRESENTATIVE SAMPLE LOCATION	MATERIAL DESCRIPTION	FRIABLE/ NON	CONDITION	COMMENTS
7347-03-11-25	54 SF	Basement, Central Tower, SW Central Area, on Hot water storage tank, West end, 4' Ht.	Light Grey Tank Insulation sealant	N	F	
7347-03-11-26	76 SF	Basement, Central Tower, Pit, S. side of Pit, Bottom, 2' Ht.	Light Grey Tank Insulation sealant	N	F	Top and Bottom
7347-03-11-27	—	Basement, Central Tower, Pit, NE Area, S. Central Area, solar Hot water storage tank on pipe insulation 3' Ht	Tan Pipe Insulation sealant	N	F	
7347-03-11-28	7 SF (2)	2nd Fl, Central Tower, NE Central Area on AH-2, on Ductwork, NW Corner, 5' Ht.	Tan Canvas Vibration Isolator cloth	F	F	
7347-03-11-29	—	2nd Fl, Central Tower, SE Area, on AH-2, on Ductwork, 2.5' Ht.	Tan Canvas Vibration Isolator cloth	F	F	3 SF
7347-03-11-30	2 SF	2nd Fl, Central Tower, Central Area, on AH-2, West side, At Refrigent Pipe, 2' Ht.	Black Sweat Wrap	N	F	
7347-03-11-31	—	2nd Fl, Central Tower, Central Area on AH-2, West Side, At water Pipe, 1' Ht.	Black sweat wrap	N	F	
7347-03-11-32	3 LF	1st Fl, Laundry Room, W Wall Sadoor 0' Ht.	4" Brown Cove Base & Mastic	N	F	1 SF Brown Mastic
7347-03-11-33	6 SF	1st Fl, Laundry, N Wall Center 0' Ht.	Brown mastic behind cove Base	N	F	18 LF
7347-03-11-34	—	1st Fl, Laundry, W Wall SW Corner, 0' Ht.	Brown mastic behind Cove Base	N	F	
7347-03-11-35	100 SF	1st Fl, SE Central Hallway, E. wall, S. Central Area,	6" Black cove Base, Tan Mastic	N	G	
7347-03-11-36	—	1st Fl; Break Room, West Wall, N. Area, 0' Ht.	6" Black cove Base, Tan Mastic	N	G	

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REC'D 1	Relinquished by: Ben Froehlich	Company: Helix Env., Inc	Date/Time: 3/11/25 18:00	REC'D 3	Relinquished by:	Company:	Date/Time:
REC'D 2	Received by: ESC 3-12-25 10:25 AM	Company:	Date/Time:	REC'D 4	Relinquished by:	Company:	Date/Time:

ESC 3-12-25 AM
3-12-25 10:25

25017960 NOB

25016410 PLM

HELIX ENVIRONMENTAL, INC.

1 Elizabeth Place, Suite 160 • Dayton, Ohio 45417-3445
Phone: (937) 226-0650 Fax: (937) 226-0653 Email: helix@helixenv.com

RUSH - YES OR (NO)

LABORATORY: Sun AhV
DATE SAMPLED: 3/11/25
DATE REQUIRED: 24 HR TAT
JOB NO./LOCATION: 7347 | Dayton, OH
CLIENT: App Architecture
BUILDING: Fire Station 15, 2801 Wayne Avenue
INSPECTOR: Ben Froehlich
JOB NUMBER: 7347

BULK SAMPLE DATA SHEET — ANALYSES REQUESTED: Asbestos PLM

HELIX SAMPLE ID NUMBER	AMOUNT	REPRESENTATIVE SAMPLE LOCATION	MATERIAL DESCRIPTION	FRIABLE/ NON	CONDITION	COMMENTS
7347-03-11-37	SF	1st Fl, N. Central Bldg Office, SW Corner, west wall, 0'-11"	4" Brown Cove Base and Brown Mastic	N	F	
7347-03-11-38						
7347-03-11-39						
7347-03-11-40						
7347-03-11-41						
7347-03-11-42						
7347-03-11-43						
7347-03-11-44						
7347-03-11-45						
7347-03-11-46						
7347-03-11-47						
7347-03-11-48						

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	Relinquished by	Company	Date/Time		Relinquished by	Company	Date/Time
REC'D 1	Ben Froehlich	Helix Environmental	3/11/25 15:00	REC'D 3			
REC'D 2	Received by: ESC 3-12-25 10:25	Company	Date/Time	REC'D 4	Relinquished by:	Company	Date/Time

ESC 3-12-25 AM
~~ESC 3-12-25 10:25 AM~~

SanAir Technologies Laboratory

The Identification Specialists

Analysis Report
prepared for
Helix Environmental Inc

Report Date: 4/4/2025

Project Name: App Architecture, Fire Station 15, 2801 Wayne Ave

Project #: 7347

SanAir ID#: 25021458

NVLAP TESTING

NVLAP LAB CODE 600227-0

11709 Chesterdale Road, Cincinnati, Ohio 45246
888.895.1177 | 513.438.6066 | LabReports@SanAir.com | SanAir.com

SanAir ID Number
25021458
FINAL REPORT
4/4/2025 10:47:38 AM

Name: Helix Environmental Inc
Address: 1 Elizabeth Place
Suite 160
Dayton, OH 45417
Phone: 937-226-0650

Project Number: 7347
P.O. Number: Amended Report CAT 04.04.25
Project Name: App Architecture, Fire Station 15, 2801 Wayne Ave
Collected Date: 4/1/2025
Received Date: 4/2/2025 10:10:00 AM

Dear Benjamin Froehlich,

We at SanAir would like to thank you for the work you recently submitted. The 23 sample(s) were received on Wednesday, April 02, 2025 via UPS. The final report(s) is enclosed for the following sample(s): 7347-04-01-01, 7347-04-01-02, 7347-04-01-03, 7347-04-01-04, 7347-04-01-05, 7347-04-01-06, 7347-04-01-07, 7347-04-01-08, 7347-04-01-09, 7347-04-01-10, 7347-04-01-11, 7347-04-01-12, 7347-04-01-13, 7347-04-01-14, 7347-04-01-15, 7347-04-01-16, 7347-04-01-17, 7347-04-01-18, 7347-04-01-19, 7347-04-01-20, 7347-04-01-21, 7347-04-01-22, 7347-04-01-23.

These results only pertain to this job and should not be used in the interpretation of any other job. This report is only complete in its entirety. Refer to the listing below of the pages included in a complete final report.

Sincerely,

Maureen Y. Haley
Asbestos Laboratory Manager
SanAir Technologies Laboratory

Final Report Includes:
- Cover Letter
- Analysis Pages
- Disclaimers and Additional Information

Sample conditions:
- 23 samples in Good condition.

SanAir ID Number
25021458
FINAL REPORT
4/4/2025 10:47:38 AM

Name: Helix Environmental Inc
Address: 1 Elizabeth Place
Suite 160
Dayton, OH 45417
Phone: 937-226-0650

Project Number: 7347
P.O. Number: Amended Report CAT 04.04.25
Project Name: App Architecture, Fire Station 15, 2801 Wayne Ave
Collected Date: 4/1/2025
Received Date: 4/2/2025 10:10:00 AM

Analyst: Hedge, Emily

Asbestos Bulk PLM EPA 600/R-93/116

	Stereoscopic	Components		
SanAir ID / Description	Appearance	% Fibrous	% Non-fibrous	Asbestos Fibers
7347-04-01-01 / 25021458-001 Coating on Concrete, 1st Fl, Men's Locker Room, N Wall	White Non-Fibrous Homogeneous		100% Other	None Detected
7347-04-01-02 / 25021458-002 Coating on Concrete, 1st Fl, Men's Locker Room, W Shower	White Non-Fibrous Homogeneous		100% Other	None Detected
7347-04-01-03 / 25021458-003 Coating on Concrete, 1st Fl, Men's Restroom, S Wall E	White Non-Fibrous Homogeneous		100% Other	None Detected
7347-04-01-04 / 25021458-004 Ceramic Tile Adhesive/ Grout, 1st Fl, Men's Restroom, S Wall, Ceramic Tile	Grey Non-Fibrous Homogeneous		100% Other	None Detected
7347-04-01-04 / 25021458-004 Ceramic Tile Adhesive/ Grout, 1st Fl, Men's Restroom, S Wall, Adhesive	Tan Non-Fibrous Homogeneous	2% Cellulose	98% Other	None Detected
7347-04-01-04 / 25021458-004 Ceramic Tile Adhesive/ Grout, 1st Fl, Men's Restroom, S Wall, Grout	Grey Non-Fibrous Homogeneous	2% Cellulose	98% Other	None Detected
7347-04-01-05 / 25021458-005 Ceramic Tile Adhesive/ Grout, 1st Fl, Men's Restroom, W, Ceramic Tile	Grey Non-Fibrous Homogeneous		100% Other	None Detected
7347-04-01-05 / 25021458-005 Ceramic Tile Adhesive/ Grout, 1st Fl, Men's Restroom, W, Adhesive	Tan Non-Fibrous Homogeneous	2% Cellulose	98% Other	None Detected
7347-04-01-05 / 25021458-005 Ceramic Tile Adhesive/ Grout, 1st Fl, Men's Restroom, W, Grout	Grey Non-Fibrous Homogeneous	2% Cellulose	98% Other	None Detected

Amended: Revised sample identification due to transcription error CAT 04.04.25

Analyst: Approved Signatory:

Analysis Date: 4/2/2025 Date: 4/4/2025

SanAir Technologies Laboratory

SanAir ID Number
25021458
FINAL REPORT
4/4/2025 10:47:38 AM

Name: Helix Environmental Inc
Address: 1 Elizabeth Place
Suite 160
Dayton, OH 45417
Phone: 937-226-0650

Project Number: 7347
P.O. Number: Amended Report CAT 04.04.25
Project Name: App Architecture, Fire Station 15, 2801 Wayne Ave
Collected Date: 4/1/2025
Received Date: 4/2/2025 10:10:00 AM

Analyst: Hedge, Emily

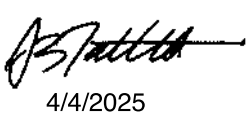
Asbestos Bulk PLM EPA 600/R-93/116

	Stereoscopic	Components		
SanAir ID / Description	Appearance	% Fibrous	% Non-fibrous	Asbestos Fibers
7347-04-01-06 / 25021458-006 Ceramic Tile Adhesive/ Mortar, 1st Fl, Men's Restoom, W, Ceramic Tile	Grey Non-Fibrous Homogeneous		100% Other	None Detected
7347-04-01-06 / 25021458-006 Ceramic Tile Adhesive/ Mortar, 1st Fl, Men's Restoom, W, Adhesive	Tan Non-Fibrous Homogeneous	2% Cellulose	98% Other	None Detected
7347-04-01-06 / 25021458-006 Ceramic Tile Adhesive/ Mortar, 1st Fl, Men's Restoom, W, Mortar	White Non-Fibrous Homogeneous	2% Cellulose	98% Other	None Detected
7347-04-01-07 / 25021458-007 Ceramic Tile Adhesive/ Mortar, 1st Fl, Women's Restroom, Ceramic Tile	Grey Non-Fibrous Homogeneous		100% Other	None Detected
7347-04-01-07 / 25021458-007 Ceramic Tile Adhesive/ Mortar, 1st Fl, Women's Restroom, Adhesive	Tan Non-Fibrous Homogeneous	2% Cellulose	98% Other	None Detected
7347-04-01-07 / 25021458-007 Ceramic Tile Adhesive/ Mortar, 1st Fl, Women's Restroom, Mortar	White Non-Fibrous Homogeneous	2% Cellulose	98% Other	None Detected
7347-04-01-08 / 25021458-008 Ceramic Tile Adhesive/ Mortar, 1st Fl, Men's Restroom-Floor, Ceramic Tile	Grey Non-Fibrous Homogeneous		100% Other	None Detected
7347-04-01-08 / 25021458-008 Ceramic Tile Adhesive/ Mortar, 1st Fl, Men's Restroom-Floor, Adhesive	Tan Non-Fibrous Homogeneous	2% Cellulose	98% Other	None Detected
7347-04-01-08 / 25021458-008 Ceramic Tile Adhesive/ Mortar, 1st Fl, Men's Restroom-Floor, Mortar	Grey Non-Fibrous Homogeneous	2% Cellulose	98% Other	None Detected

Amended: Revised sample identification due to transcription error CAT 04.04.25

Analyst: 

Analysis Date: 4/2/2025

Approved Signatory: 

Date: 4/4/2025

SanAir Technologies Laboratory

SanAir ID Number
25021458
FINAL REPORT
4/4/2025 10:47:38 AM

Name: Helix Environmental Inc
Address: 1 Elizabeth Place
Suite 160
Dayton, OH 45417
Phone: 937-226-0650

Project Number: 7347
P.O. Number: Amended Report CAT 04.04.25
Project Name: App Architecture, Fire Station 15, 2801 Wayne Ave
Collected Date: 4/1/2025
Received Date: 4/2/2025 10:10:00 AM

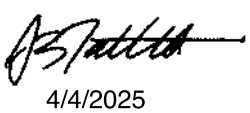
Analyst: Hedge, Emily

Asbestos Bulk PLM EPA 600/R-93/116

	Stereoscopic	Components		
SanAir ID / Description	Appearance	% Fibrous	% Non-fibrous	Asbestos Fibers
7347-04-01-09 / 25021458-009 Ceramic Tile Adhesive/ Mortar, 1st Fl, Door to Women's, Ceramic Tile	Grey Non-Fibrous Homogeneous		100% Other	None Detected
7347-04-01-09 / 25021458-009 Ceramic Tile Adhesive/ Mortar, 1st Fl, Door to Women's, Adhesive	Tan Non-Fibrous Homogeneous	2% Cellulose	98% Other	None Detected
7347-04-01-09 / 25021458-009 Ceramic Tile Adhesive/ Mortar, 1st Fl, Door to Women's, Mortar	Grey Non-Fibrous Homogeneous	2% Cellulose	98% Other	None Detected
7347-04-01-10 / 25021458-010 Sink Soundproofing, 1st Fl, Kitchen Area, Under SS Sink	Black Non-Fibrous Homogeneous	2% Cellulose	98% Other	None Detected
7347-04-01-11 / 25021458-011 Sink Soundproofing, 1st Fl, Kitchen Area, Under SS Sink	Black Non-Fibrous Homogeneous	2% Cellulose	98% Other	None Detected
7347-04-01-12 / 25021458-012 Interior Caulk, 1st Fl, E Entrance Door, Interior Door S	Brown Non-Fibrous Homogeneous	2% Cellulose	98% Other	None Detected
7347-04-01-13 / 25021458-013 Interior Caulk, Entrance E Wall, East Side	Brown Non-Fibrous Homogeneous	2% Cellulose	98% Other	None Detected
7347-04-01-14 / 25021458-014 Pipe Penetration Caulk, 2nd Fl, Tower, W Wall	Grey Non-Fibrous Homogeneous	5% Cellulose	93% Other	2% Chrysotile
7347-04-01-15 / 25021458-015 Pipe Penetration Caulk, 2nd Fl, Tower, W Wall	Grey Non-Fibrous Homogeneous	5% Cellulose	93% Other	2% Chrysotile
7347-04-01-16 / 25021458-016 Pipe Penetration Mortar, Basement, Tower, W Wall	Grey Non-Fibrous Homogeneous	2% Cellulose	98% Other	None Detected

Amended: Revised sample identification due to transcription error CAT 04.04.25

Analyst: 

Approved Signatory: 

Analysis Date: 4/2/2025

Date: 4/4/2025

SanAir ID Number
25021458
FINAL REPORT
4/4/2025 10:47:38 AM

Name: Helix Environmental Inc
Address: 1 Elizabeth Place
Suite 160
Dayton, OH 45417
Phone: 937-226-0650

Project Number: 7347
P.O. Number: Amended Report CAT 04.04.25
Project Name: App Architecture, Fire Station 15, 2801 Wayne Ave
Collected Date: 4/1/2025
Received Date: 4/2/2025 10:10:00 AM

Analyst: Hedge, Emily

Asbestos Bulk PLM EPA 600/R-93/116

	Stereoscopic	Components		
SanAir ID / Description	Appearance	% Fibrous	% Non-fibrous	Asbestos Fibers
7347-04-01-17 / 25021458-017 Pipe Penetration Mortar, Basement, Tower, S Wall	Grey Non-Fibrous Homogeneous	2% Cellulose	98% Other	None Detected
7347-04-01-18 / 25021458-018 Exterior Caulk, 2nd Fl, Roof, NW Central Area	Grey Non-Fibrous Homogeneous	2% Cellulose	98% Other	None Detected
7347-04-01-19 / 25021458-019 Exterior Caulk, 3rd Fl, Roof, N Center at Tower	Grey Non-Fibrous Homogeneous	2% Cellulose	98% Other	None Detected
7347-04-01-20 / 25021458-020 Exterior Caulk, 1st Fl Exterior, NW Windows S Edge	Black Non-Fibrous Homogeneous	2% Cellulose	98% Other	None Detected
7347-04-01-21 / 25021458-021 Exterior Caulk, 1st Fl Exterior, S Windows East Edge	Grey Non-Fibrous Homogeneous	2% Cellulose	98% Other	None Detected
7347-04-01-22 / 25021458-022 Exterior Caulk, 1st Fl Exterior, S Windows West Edge	Grey Non-Fibrous Homogeneous	2% Cellulose	98% Other	None Detected
7347-04-01-23 / 25021458-023 Exterior Caulk, 1st Fl Exterior, NW Windows S Edge	Black Non-Fibrous Homogeneous	2% Cellulose	98% Other	None Detected

Amended: Revised sample identification due to transcription error CAT 04.04.25

Analyst: 
Approved Signatory: 

Analysis Date: 4/2/2025
Date: 4/4/2025

Disclaimer and Additional Information

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Fibers smaller than 5-microns cannot be seen with this method due to scope limitations. Polarized- light microscopy is not consistently reliable in detecting asbestos in floor covering and similar non-friable organically bound materials. Quantitative transmission electron microscopy is currently the only method that can be used to determine if this material can be considered or treated as non-asbestos containing. Samples are held for a period of 60 days.

Asbestos Accreditations, Certifications, and Licenses
National Voluntary Laboratory Accreditation Program (NVLAP) Lab Code 600227-0
State of Connecticut Department of Public Health Registration Number: PH-0817
State of Rhode Island Department of Health, Certification Number: PLM00144, TEM00144
State of West Virginia Bureau for Public Health, Analytical Laboratory Number: LT000637
Texas Department of State Health Services License Number: 300510

HELIX ENVIRONMENTAL, INC.

1 Elizabeth Place, Suite 160 • Dayton, Ohio 45417-3445
Phone: (937) 226-0650 Fax: (937) 226-0653 Email: helix@helixenv.com

2502145 8

LABORATORY: San AV
DATE SAMPLED: 4/01/25
RUSH - YES OR (NO) DATE REQUIRED: 24 HR TAT
JOB NO./LOCATION: 7347 | Dayton, OH
CLIENT: AFF Architecture
BUILDING: Fire Station 15, 2801 Wayne Avenue
INSPECTOR: Ben Froehlich, BA Froehlich
JOB NUMBER: 7347

BULK SAMPLE DATA SHEET | ANALYSES REQUESTED: Asbestos PLM

HELIX SAMPLE ID NUMBER	AMOUNT	REPRESENTATIVE SAMPLE LOCATION	MATERIAL DESCRIPTION	FRIABLE/ NON	CONDITION	COMMENTS
7347-04-01-01	200 SF	1st Fl, Men's Locker room, N Wall of Toilet Area 0.5'Ht	White Coating on Concrete Block	N	G	
7347-04-01-02	—	1st Fl, Men's Locker room, W Shower W Wall Center 0.5'Ht	White Coating on Concrete Block	N	G	
7347-04-01-03	—	1st Fl, Men's Restroom, S Wall E of Door 0.5'Ht	White Coating on Concrete Block	N	G	
7347-04-01-04	600 SF	1st Fl, Men's Restroom, N Wall of Toilet Area 0.5'Ht	Ceramic Tile Adhesive/Grout	N	F	Baseboard
7347-04-01-05	—	1st Fl., Men's Restroom, W Shower W Wall Center 0.5'Ht	Ceramic Tile Adhesive/Grout	N	G	Baseboard
7347-04-01-06	300 SF	1st Fl, Men's Restroom, W Shower S Wall 7' Ht	Ceramic Tile Adhesive/Mortar	N	G	Wall of Shower
7347-04-01-07	—	1st Fl, Women's Restroom, Shower N Wall, to door 5' Ht	Ceramic Tile Adhesive/Mortar	N	G	Wall of Shower
7347-04-01-08	600 SF	1st Fl, Men's Restroom - Floor behind door 0' Ht	Ceramic Tile Adhesive/Mortar	N	G	Floor
7347-04-01-09	—	1st Fl, Door to Women's Restroom/Men's Restroom, SW 0' Ht	Ceramic Tile Adhesive/Mortar	N	G	Floor
7347-04-01-10	60+ SF	1st Fl, Kitchen Area, under SS Sink East Sink 2' Ht	Black Sink Sound-proofing	N	G	
7347-04-01-11	—	1st Fl, Kitchen Area, under SS Sink West Sink 2' Ht	Black Sink Sound-proofing	N	G	
7347-04-01-12	300+ LF	1st Fl, E Entrance Door, Interior Door S side 6' Ht	Interior Caulk	N	G	300 LF x 0.25" = 6 SF

THIS IS A CHAIN OF CUSTODY DOCUMENT. PLEASE COMPLETE, SIGN, AND DATE. PLEASE RETURN ORIGINAL TO HELIX ENVIRONMENTAL, INC.

REC'D 1	Relinquished by: [signature]	Company: Helix Env. Inc	Date/Time: 4/1/2025 1730	REC'D 3	Relinquished by: RMB	APR	Company: 02 2025	10:10 am	Date/Time:
REC'D 2	Received by:	Company:	Date/Time:	REC'D 4	Relinquished by:		Company:		Date/Time:

HELIX ENVIRONMENTAL, INC.
1 Elizabeth Place, Suite 160 • Dayton, Ohio 45417-3445
Phone: (937) 226-0650 Fax: (937) 226-0653 Email: helix@helixenv.com

25021458

LABORATORY: San AR
DATE SAMPLED: 4/01/25
RUSH - YES OR (NO) DATE REQUIRED: 24 HR TAT
JOB NO./LOCATION: 7347 | Dayton, OH
CLIENT: App Architecture
BUILDING: Fire Station 15, 2801 Wayne Avenue
INSPECTOR: Ben Froehlich, RA Froehlich
JOB NUMBER: 7347

BULK SAMPLE DATA SHEET

ANALYSES REQUESTED: Asbestos PLM

HELIX SAMPLE ID NUMBER	AMOUNT	REPRESENTATIVE SAMPLE LOCATION	MATERIAL DESCRIPTION	FRIABLE/ NON	CONDITION	COMMENTS
7347-04-01-13	—	~~1st Fl, Tower, W Middle~~ Entrance E Wall, East Side 3'Hf	~~Exterior Brown Pipe Penetration~~ Caulk	N	G	
7347-04-01-14	2 SF	2nd Fl, Tower, W Wall 8'Hf	Pipe Penetration Caulk Grey	N	F	
7347-04-01-15		2nd Fl, Tower, W Wall 8'Hf	Pipe Penetration Caulk, Grey	N	F	
7347-04-01-16	6 SF	Basement, Tower, W Wall 8'Hf	Pipe Penetration Mortar	N	G	
7347-04-01-17	—	Basement, Tower, S Wall 8'Hf	Pipe Penetration Mortar	N	G	
7347-04-01-18	50+ LF	2nd Fl, Roof, NW Central Area 4'Hf	Grey Exterior caulk	N	F	50 x 1' = 50 SF
7347-04-01-19	—	3rd Fl, Roof, N Center of Tower 4'Hf	Grey Exterior Caulk	N	G	
7347-04-01-20	12 LF	1st Fl Exterior, NW Windows, S edge 5'Hf	Black Exterior Caulk	N	G	Replacement 12 x 0.25 =
7347-04-01-21	—	1st Fl Exterior, S Windows East edge 7'Hf	Grey Exterior Caulk	N	F	
7347-04-01-22	—	1st Fl Exterior, S Windows West Edge 7'Hf	Grey Exterior Caulk	N	F	
7347-04-01-23	—	1st Fl Exterior, NW Windows, S edge 4'Hf	Black Exterior Caulk	N	G	
7347-04-01-24						

THIS IS A CHAIN OF CUSTODY DOCUMENT. PLEASE COMPLETE, SIGN, AND DATE. PLEASE RETURN ORIGINAL TO HELIX ENVIRONMENTAL, INC.

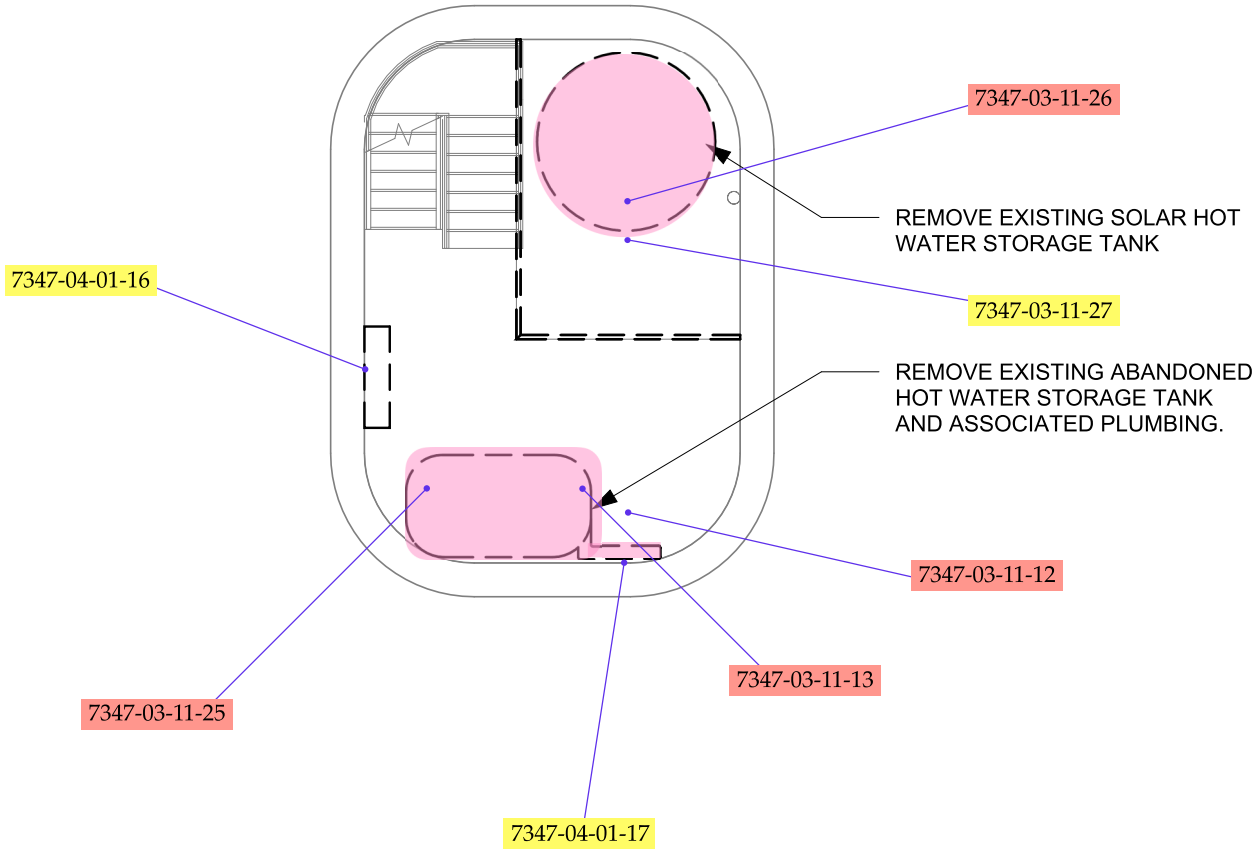
REC'D 1	Relinquished by:	Company: Helix Env. Inc.	Date/Time: 4/1/2025 1730	REC'D 3	Relinquished by: RMB	APR 02 2025	Company:	Date/Time: 10:10am
REC'D 2	Received by:	Company:	Date/Time:	REC'D 4	Relinquished by:		Company:	Date/Time:

LEGEND

- Asbestos-Containing Material
- Non Asbestos-Containing Material
- Asbestos-Containing Material (Insulation, Flooring, Etc.)
- Assumed Asbestos-Containing Material Present (Electrical Insulators, Fire Doors, Etc.)

ASBESTOS SAMPLE LOCATIONS, BASEMENT, FIRE STATION 156, 2801 WAYNE AVENUE, DAYTON, OH

HELIX ENVIRONMENTAL, INC.
1 ELIZABETH PLACE, SUITE 160H
DAYTON, OHIO 45417
937-226-0650

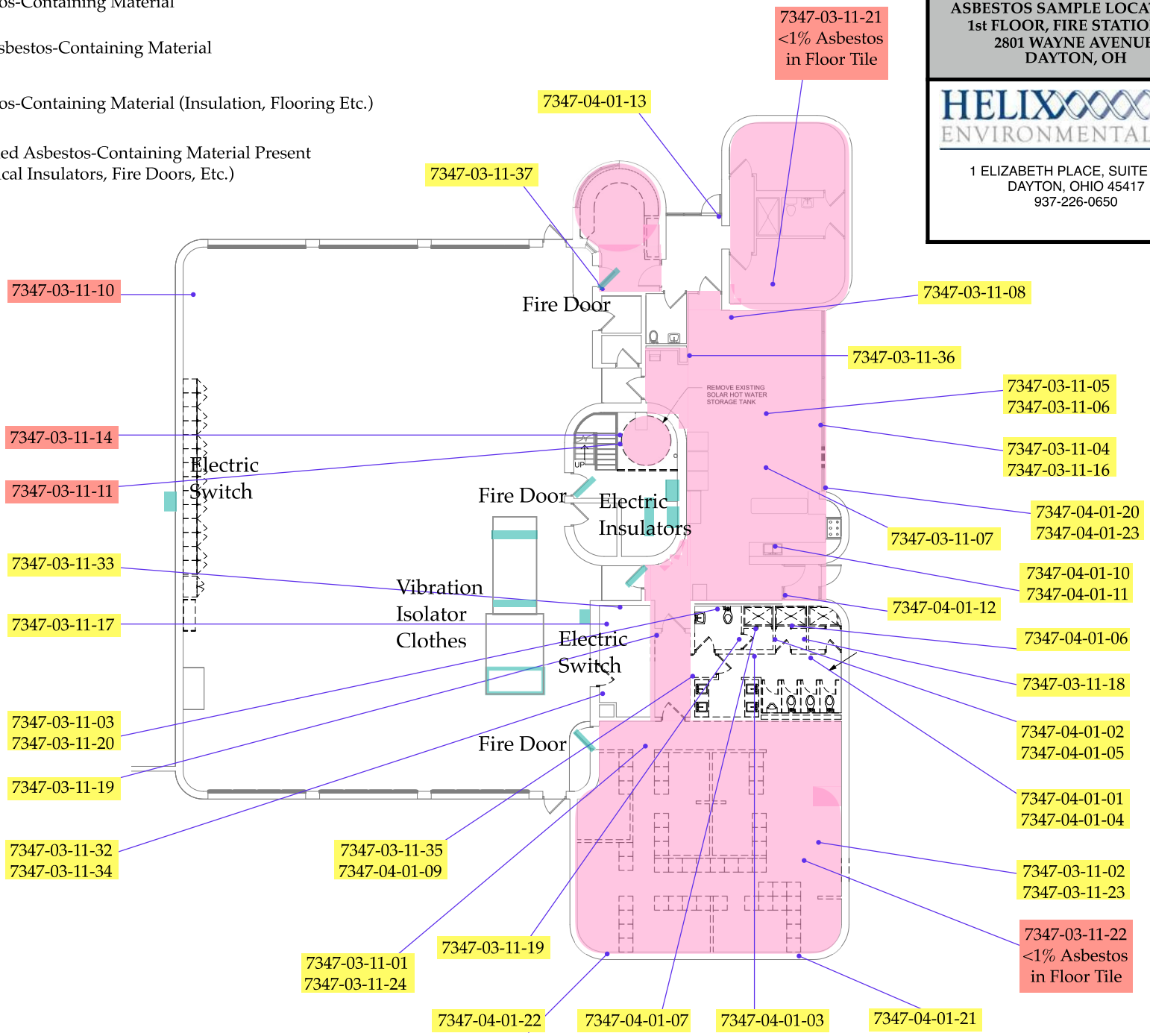


LEGEND

- Asbestos-Containing Material
- Non Asbestos-Containing Material
- Asbestos-Containing Material (Insulation, Flooring Etc.)
- Assumed Asbestos-Containing Material Present (Electrical Insulators, Fire Doors, Etc.)

ASBESTOS SAMPLE LOCATIONS,
1st FLOOR, FIRE STATION 15,
2801 WAYNE AVENUE,
DAYTON, OH

HELIX ENVIRONMENTAL, INC.
1 ELIZABETH PLACE, SUITE 160H
DAYTON, OHIO 45417
937-226-0650

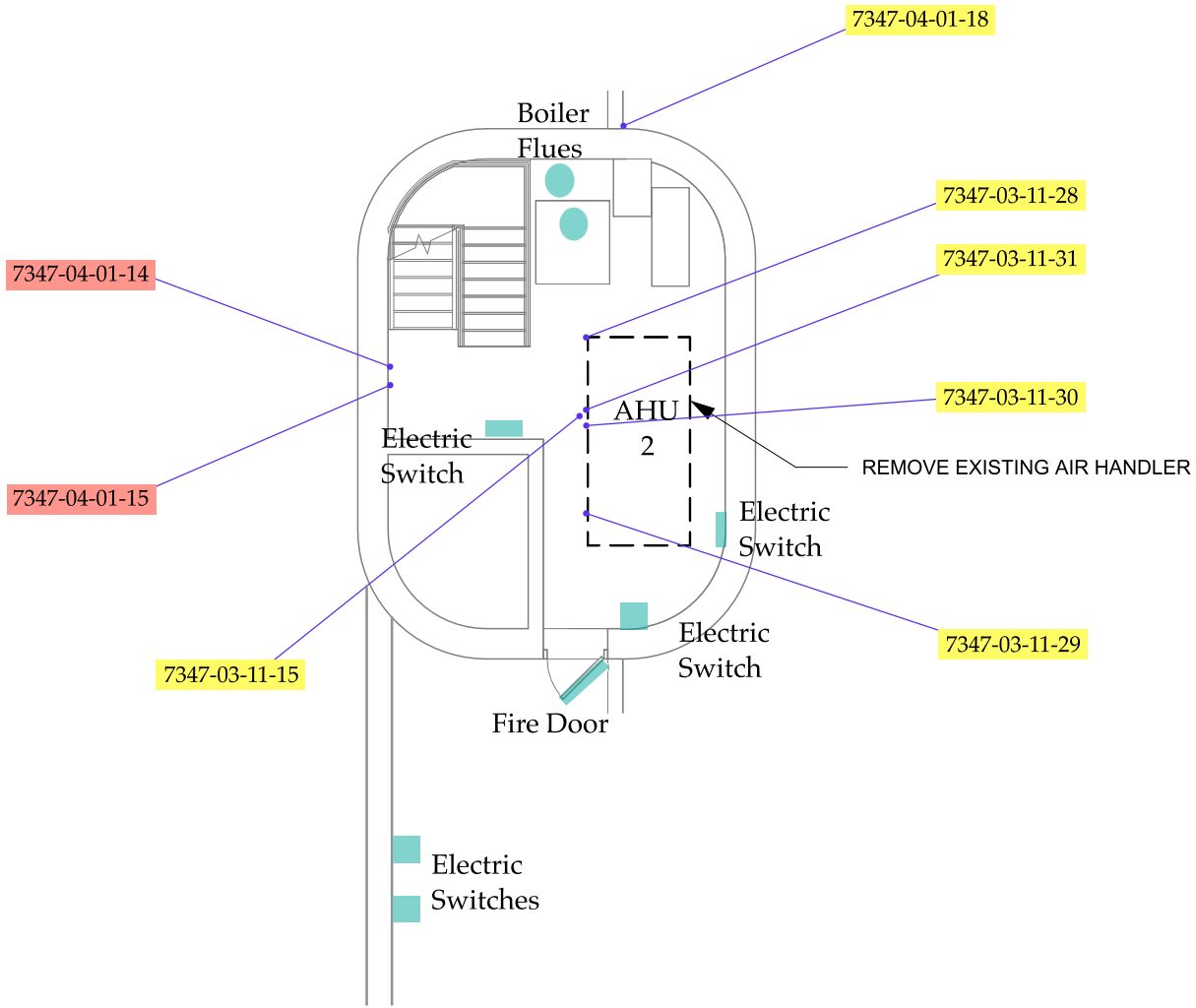


LEGEND

- Asbestos-Containing Material
- Non Asbestos-Containing Material
- Asbestos-Containing Material (Insulation, Flooring Etc.)
- Assumed Asbestos-Containing Material Present (Electrical Insulators, Fire Doors, Etc.)

ASBESTOS SAMPLE LOCATIONS, 2nd FLOOR, FIRE STATION 15, 2801 WAYNE AVENUE, DAYTON, OH

HELIX ENVIRONMENTAL, INC.
1 ELIZABETH PLACE, SUITE 160H
DAYTON, OHIO 45417
937-226-0650



LEGEND

- Asbestos-Containing Material
- Non Asbestos-Containing Material
- Asbestos-Containing Material (Insulation, Flooring Etc.)
- Assumed Asbestos-Containing Material Present (Electrical Insulators, Fire Doors, Etc.)

ASBESTOS SAMPLE LOCATIONS, 3rd FLOOR, FIRE STATION 156, 2801 WAYNE AVENUE, DAYTON, OH

HELIX ENVIRONMENTAL, INC.
1 ELIZABETH PLACE, SUITE 160H
DAYTON, OHIO 45417
937-226-0650

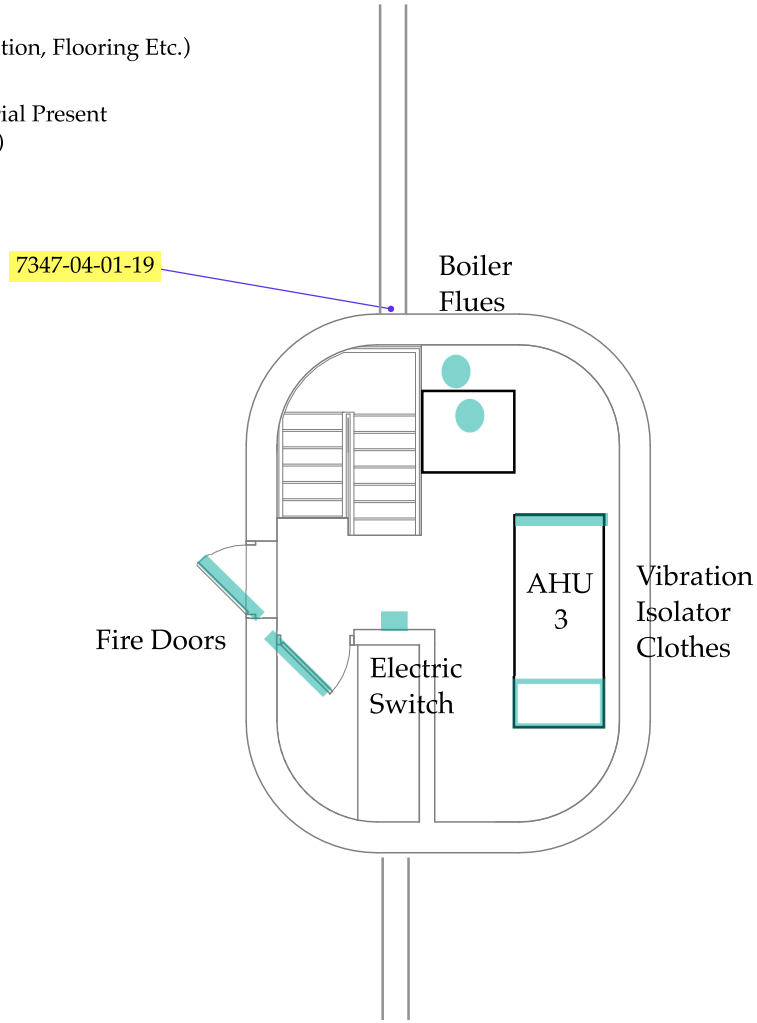




Photo 01- Sample# 7347-03-11-01, No Asbestos Detected in 2' x 2' Ceiling Tile



Photo 02- Sample# 7347-03-11-02, No Asbestos Detected in 2' x 2' Ceiling Tile



Photo 03- Sample# 7347-03-11-03, No Asbestos Detected in 2' x 2' Ceiling Tile



Photo 04- Sample# 7347-03-11-04, No Asbestos Detected in 2' x 2' Ceiling Tile



Photo 05- Sample# 7347-03-11-05, No Asbestos Detected in 2' x 2' Ceiling Tile



Photo 06- Sample# 7347-03-11-06, No Asbestos Detected in 2' x 2' Ceiling Tile

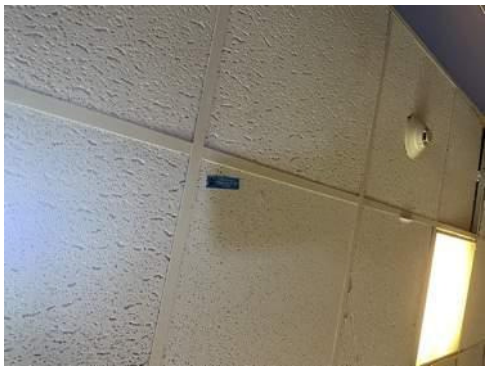


Photo 07- Sample# 7347-03-11-07, No Asbestos Detected in 2' x 2' Ceiling Tile



Photo 08- Sample# 7347-03-11-08, No Asbestos Detected in Sheet Flooring and Green Mastic



Photo 09- Sample# 7347-03-11-09, No Asbestos Detected in Sheet Flooring and Green Mastic



Photo 10- Sample# 7347-03-11-10, 1.1% Chrysotie Asbestos Detected in Grey Pipe Insulation Sealant



Photo 11- Sample# 7347-03-11-11, 2.7% Chrysotie Asbestos Detected in Tan Pipe Insulation Sealant



Photo 12- Sample# 7347-03-11-12, 1.6% Chrysotie Asbestos Detected in Tan Pipe Insulation Sealant



Photo 13- Sample# 7347-03-11-13, 10% Chrysotie Asbestos Detected in Grey Tank Insulation Sealant



Photo 14- Sample# 7347-03-11-14, 10% Chrysotie Asbestos Detected in Grey Tank Insulation Sealant



Photo 15- Sample# 7347-03-11-15, No Asbestos Detected in Tan Pipe Insulation Sealant



Photo 16- Sample# 7347-03-11-16, No Asbestos Detected in Drywall and Joint Compound



Photo 17- Sample# 7347-03-11-17, No Asbestos Detected in Drywall and Joint Compound



Photo 18- Sample# 7347-03-11-18, No Asbestos Detected in Stucco and Base Layer



Photo 19- Sample# 7347-03-11-19, No Asbestos Detected in Stucco and Base Layer



Photo 20- Sample# 7347-03-11-20, No Asbestos Detected in Stucco



Photo 21- Sample# 7347-03-11-21, 0.6% Chrysotie Asbestos Detected in 12"x12" Grey Streaked Floor Tile, No Asbestos in Black Mastic



Photo 22- Sample# 7347-03-11-21, 0.4% Chrysotie Asbestos Detected in 12"x12" Grey Streaked Floor Tile, No Asbestos in Black Mastic



Photo 23- Sample# 7347-03-11-23, No Asbestos Detected in Drywall and Joint Compound



Photo 24- Sample# 7347-03-11-24, No Asbestos Detected in Drywall and Joint Compound



Photo 25- Sample# 7347-03-11-25, 10% Chrysotie Asbestos Detected in Grey Tank Insulation Sealant



Photo 26- Sample# 7347-03-11-26, 10% Chrysotie Asbestos Detected in Grey Tank Insulation Sealant



Photo 27- Sample# 7347-03-11-27, No Asbestos Detected in Tan Pipe Insulation Sealant



Photo 28- Sample# 7347-03-11-28, No Asbestos Detected in Vibration Isolator Cloth



Photo 29- Sample# 7347-03-11-29, No Asbestos Detected in Vibration Isolator Cloth



Photo 30- Sample# 7347-03-11-30, No Asbestos Detected in Black Sweat Wrap



Photo 31- Sample# 7347-03-11-31, No Asbestos Detected in Black Sweat Wrap



Photo 32- Sample# 7347-03-11-32, No Asbestos Detected in 4" Brown Cove Base and Mastic



Photo 33- Sample# 7347-03-11-33, No Asbestos Detected in Brown Cove Base Mastic



Photo 34- Sample# 7347-03-11-34, No Asbestos Detected in Brown Cove Base Mastic



Photo 35- Sample# 7347-03-11-35, No Asbestos Detected in 6" Cove Base and Mastic



Photo 36- Sample# 7347-03-11-36, No Asbestos Detected in 6" Cove Base and Mastic



Photo 37- Sample# 7347-03-11-37, No Asbestos Detected in 4" Cove Base and Mastic



Photo 38- Sample# 7347-04-01-01, No Asbestos Detected in White Concrete Block Coating



Photo 39- Sample# 7347-04-01-02, No Asbestos Detected in White Concrete Block Coating



Photo 40- Sample# 7347-04-01-05, No Asbestos Detected in Ceramic Tile, Tan Adhesive, and Grout



Photo 41- Sample# 7347-04-01-05, No Asbestos Detected in Ceramic Tile, Tan Adhesive, and Grout



Photo 42- Sample# 7347-04-01-06, No Asbestos Detected in Ceramic Tile, Tan Adhesive, and Grout



Photo 43- Sample# 7347-04-01-07, No Asbestos Detected in Ceramic Tile, Tan Adhesive, and Grout



Photo 44- Sample# 7347-04-01-08, No Asbestos Detected in Ceramic Tile, Tan Adhesive, and Grout



Photo 45- Sample# 7347-04-01-09, No Asbestos Detected in Ceramic Tile, Tan Adhesive, and Grout



Photo 46- Sample# 7347-04-01-10, No Asbestos Detected in Sink Soundproofing



Photo 47- Sample# 7347-04-01-11, No Asbestos Detected in Sink Soundproofing



Photo 48- Sample# 7347-04-01-12, No Asbestos Detected in Brown Interior Caulk



Photo 49- Sample# 7347-04-01-13, No Asbestos Detected in Brown Interior Caulk



Photo 50- Sample# 7347-04-01-14, 2% Chrysotille Asbestos Detected in Pipe Penetration Caulk



Photo 51- Sample# 7347-04-01-15, 2% Chrysotille Asbestos Detected in Pipe Penetration Caulk



Photo 52- Sample# 7347-04-01-16, No Asbestos Detected in Pipe Penetration Mortar



Photo 53- Sample# 7347-04-01-17, No Asbestos Detected in Pipe Penetration Mortar



Photo 54- Sample# 7347-04-01-18, No Asbestos Detected in Grey Exterior Caulk



Photo 55- Sample# 7347-04-01-19, No Asbestos Detected in Grey Exterior Caulk



Photo 56- Sample# 7347-04-01-20, No Asbestos Detected in Black Exterior Caulk



Photo 57- Sample# 7347-04-01-21, No Asbestos Detected in Grey Exterior Caulk



Photo 58- Sample# 7347-04-01-22, No Asbestos Detected in Grey Exterior Caulk



Photo 59- 1st Floor, West Vehicle Bay, Northeast Door, All Fire Doors are Assumed to Contain Asbestos



Photo 60- 1st Floor, West Vehicle Bay, Southeast Door, All Fire Doors are Assumed to Contain Asbestos



Photo 61- 3rd Floor, Roof Access Door, Visible Insulation, All Insulated Doors are Assumed to Contain Asbestos



Photo 62- 1st floor, West Vehicle Bay, Southeast Area, All Vibration Isolator Cloths are Assumed to Contain Asbestos, Unless confirmed not to



Photo 63- 1st Floor, Central Tower, East Wall, Switch Gear, All Electrical Insulators are Assumed to Contain Asbestos



Photo 64- 1st Floor, Central Tower, East Wall, Switch and Circuit Breaker, All Electrical Insulators are Assumed to Contain Asbestos



Photo 65- 1st Floor, Central Tower, SE Area, Circuit Breakers, All Electrical Insulators are Assumed to Contain Asbestos



Photo 66- 1st Floor, Central Tower, SE Area, Circuit Breakers, All Electrical Insulators are Assumed to Contain Asbestos



Photo 67- 2nd Floor, Central Tower, SE Area, Safety Switches, All Electrical Insulators are Assumed to Contain Asbestos



Photo 68- 2nd Floor, Rooftop, S Central Area, Safety Switches, All Electrical Insulators are Assumed to Contain Asbestos



Photo 69- Exterior, West Side, Central Area, Safety Switch, All Electrical Insulators are Assumed to Contain Asbestos



Photo 70- Boiler, Boiler Exhaust Flue is Assumed to Contain Asbestos



Photo 71- Boiler, Boiler Exhaust Flue is Assumed to Contain Asbestos



Photo 72- Boiler, Boiler Exhaust Flue is Assumed to Contain Asbestos



Photo 73- 2nd Floor, Rooftop, All Bituminous Roofing is Assumed to Contain Asbestos



Photo 74- 3rd Floor, Rooftop, All Bituminous Roofing is Assumed to Contain Asbestos



Photo 75- 3rd Floor, Hot Water Heater, Fiberglass Insulation



Photo 76- No Visible Hard Pipe Fittings, All Pipe Insulation Sealant is Confirmed to Contain Greater than 1% Asbestos



Photo 77- No Visible Hard Pipe Fittings, All Pipe Insulation Sealant is Confirmed to Contain Greater than 1% Asbestos



Photo 78- 1st Floor, NE Bathroom, Ceramic Tile over <1% Grey 12" x 12" Floor Tile



Photo 79- 1st Floor, East Dining Room, Sheet Flooring over <1% Grey 12" x 12" Floor Tile



Photo 80- 1st Floor, East Central Janitor's Closet, No Reflector Paper



Photo 81- Inside of AHU 2, No Suspect Material



Photo 82- Exterior, Northeast Corner of Fire Station 15

HELIX ENVIRONMENTAL, INC.

March 20, 2025

Mr. Curt Sparks, Associate AIA, LEED GA
App Architecture
615 Woodside Drive
Englewood, Ohio 45322

Telephone (937) 836-8898 ext. 110

RE: Pre-Renovation Preliminary Lead-Containing Paint Inspection of Fire Station 15, 2801 Wayne Avenue, Dayton, Ohio, March 11, 2025.
Helix Project No. 7347.

Dear Mr. Sparks:

App Architecture recently contracted with Helix Environmental, Inc. to perform a pre-renovation preliminary lead-containing paint inspection of the accessible portions of the Fire Station 15 located at 2801 Wayne Avenue, Dayton, Ohio. The inspection was necessary to determine if lead-containing paint materials were present so that plans could be made to remove them in accordance with current regulatory requirements prior to a planned renovation project at the building. This letter report summarizes the results of the inspection performed on March 11, 2025 and the analytical results of samples collected on that date. A companion report documents the asbestos inspection of the fire station building.

INSPECTION AND ANALYTICAL PROCEDURES

Mr. Ralph Froehlich, CIH, CSP, QEP performed preliminary lead paint film sampling at representative locations in the accessible renovation areas at the Fire Station 15 building, 2801 Wayne Avenue in Dayton, Ohio. Mr. Ralph A. Froehlich is a Certified Industrial Hygienist with more than thirty years experience in the fields of occupational and environmental health, and is certified by the Ohio Department of Health as an Asbestos Hazard Evaluation Specialist and Asbestos Abatement Project Designer (Certification Nos. ES3074 and PD60148, respectively).

Painted surfaces will be disturbed during the planned renovation, and were assumed to contain lead given the ages of the building (approximately 50 years). Helix Environmental, Inc. collected fourteen (14) paint film samples in representative locations to evaluate the accuracy of this assumption.

Paint film samples were collected using cleaned hand tools and packaged in labeled zip-lock plastic bags. The sample bags were placed into a larger zip-lock bag, with the original sample data/chain-of-custody and analytical request forms. Helix Environmental, Inc. retained copies of these forms.

The samples were shipped by overnight courier to SanAir Technologies Laboratory, Inc., a National Voluntary Laboratory Accreditation Program (NVLAP) and Ohio Certified Professional accredited environmental lead laboratory, where they were analyzed for lead in accordance with the U.S. Environmental Protection Agency's SW846/M 050B/ 7000B Method. Under this method, the limit of detection for lead is 10 μg/sample.

SanAir Technologies Laboratory, Inc. maintains accreditation from the American Industrial Hygiene Association as an environmental lead laboratory and has received accreditation through successful participation in the NIST National Voluntary Laboratory Accreditation Program (NVLAP) for bulk asbestos and as an environmental microbiology laboratory. AIHA-accredited laboratories are scrutinized on a regular basis to ensure that personnel, equipment, facilities and data are maintained. In addition, AIHA-accredited laboratories have well-developed assurance/quality control programs to ensure that analytical results accurately reflect conditions present during the sampling periods.

APPLICABLE STANDARDS

Lead

The U. S. Environmental Protection Agency (EPA) has established regulations that identify paint with lead content in excess of 0.5 percent as "Lead-Based Paint", as determined by chemical testing methods or more than 1.0 mg/cm2 as determined by approved X-Ray Fluorescence monitor. These regulations establish required notification, removal techniques, and disposal of Lead-Based Paint. The Ohio Department of Health has established equivalent regulations for Ohio (Ohio Administrative Code 3745-20, 22).

The Occupational Safety and Health Administration (OSHA) has promulgated an eight-hour Time-Weighted Average (TWA) Permissible Exposure Limit of 0.050 mg/m^3 (50 $\mu g/m^3$) for airborne lead exposures (29 CFR 1910.1025, 29 CFR 1926.62). An Action Level of 0.030 mg/m^3 ($30\mu g/m^3$) has also been included with the standards. Lead-containing materials are defined as those that contain any detectable concentration of lead. These regulations include complex requirements for Lead-Based Paint abatement. OSHA requires employers to monitor employee exposures to lead and to protect worker health until lead exposure levels are measured by requiring lead training, blood lead testing, respiratory protection, protective clothing, hand-washing facility and clean change areas (29 CFR 1926.62(d)(2)(v)).

The U.S. Environmental Protection Agency (EPA) has established clearance criteria for for lead-based paint abatement projects in residences, child education facilities and child education facilities (40 CFR 763.91).

The American Conference of Governmental Industrial Hygienists (ACGIH) recommends an airborne eight-hour TWA Threshold Limit Value of 0.050 mg/m^3 (ACGIH, *2024 TLVs and BEIs*). ACGIH TLVs denote concentrations and conditions to which it is believed that nearly all workers may be repeatedly exposed day after day without adverse effect.

The National Institute for Occupational Safety and Health (NIOSH) recommends and eight-hour TWA Recommended Exposure Limit of 0.050 mg/m^3 (NIOSH *Pocket Guide to Chemical Hazards*, 2007). NIOSH also identifies 100 mg/m^3 as the Immediately Dangerous to Life or Health concentration for lead.

ANALYTICAL RESULTS

TABLE 1: LEAD-CONTENT OF PAINT AT FIRE STATION 15, 2801 WAYNE AVENUE, DAYTON, OHIO, COLLECTED MARCH 11, 2025. HELIX PROJECT NO. 7347.

Helix Sample No. Lab Sample No.	Sample Location	Description	Lead Concentration (% Lead)
7347-03-11-61 25016382-1	1st Floor, Central Tower, South Central Area, 5′ Ht.	Beige Paint on Metal Ductwork	ND <0.010
7347-03-11-62 25016382-2	1st Floor, Central Tower, Northeast Area, On Top of Solar Hot Water Storage Tank	Red Paint on Solar Hot Water Storage Tank	**0.648**
7347-03-11-63 25016382-3	1st Floor, Central Tower, Northwest Area, Stairwell, Stair Riser	Brown over Blue Paint on Metal	**0.062**
7347-03-11-64 25016382-4	1st Floor, West Vehicle Bay, South Central Area, On Concrete Floor	Yellow Paint Line on Concrete Floor	**0.138**
7347-03-11-65 25016382-5	1st Floor, West Vehicle Bay, East Wall, North Area, 3′ Ht.	Beige Paint on Concrete Block Wall	ND <0.009
7347-03-11-66 25016382-6	1st Floor, West Vehicle Bay, East Wall, North Area, Hose Valve Access Trim, 3′ Ht.	Beige Paint on Metal	ND <0.009
7347-03-11-67 25016382-7	1st Floor, Southeast Central Men's Restroom, Southeast Stall, West Wall, 3′ Ht.	Orange Paint on Metal Divider Wall	**1.049**
7347-03-11-68 25016382-8	1st Floor, Southeast Central Men's Restroom, West Stall, West Wall of Urinal, 3′ Ht.	Beige Paint on Concrete Block Wall	ND <0.009
7347-03-11-69 25016382-9	1st Floor, North Central Watch Room, West Wall, South Area, By Door to West Vehicle Bay, 4′ Ht.	Orange Paint on Concrete Block Wall	ND <0.009
7347-03-11-70 25016382-10	1st Floor, North Central Restroom, East Wall, North Area, 4′ Ht.	Terracotta Paint on Drywall Wall	**0.010**
7347-03-11-71 25016382-11	1st Floor, Break Room, West Wall, North Area, 4′ Ht.	Grey Paint on Drywall Wall	ND <0.009
7347-03-11-72 25016382-12	Exterior, South Side, Central Area, At Entrance to West Vehicle Bay, 5′ Ht.	Red, Green and Brown Paint on Metal Door	ND <0.008

Ohio Dept. of Health LEAD-BASED PAINT **>0.5%**
US EPA LEAD-BASED PAINT **>0.5%**
OSHA REGULATED LEAD-CONTAINING MATERIAL **Detectable**

TABLE 1 (CONTINUED): LEAD CONTENT OF PAINT AT FIRE STATION 15, 2801 WAYNE AVENUE, DAYTON, OHIO, COLLECTED MARCH 11, 2025. HELIX PROJECT NO. 7347.

Helix Sample No. Lab Sample No.	Sample Location	Description	Lead Concentration (% Lead)
7347-03-11-73 25016382-13	Exterior, North Side, West Area, Center Overhead Door, West Side, At Bottom	Red Paint on Metal	ND <0.010
7347-03-11-74 25016382-14	Exterior, North Side, Central Area, At West Outside Wall of Watch Room, 5′ Ht.	Yellow Paint on Metal Telephone Box	ND <0.010

Ohio Dept. of Health LEAD-BASED PAINT	**>0.5%**
US EPA LEAD-BASED PAINT	**>0.5%**
OSHA REGULATED LEAD-CONTAINING MATERIAL	**Detectable**

DISCUSSION AND RECOMMENDATIONS

Since the building was built prior to 1978 when lead was banned for interior coatings, it was assumed that all paint present in the renovation area contains detectable levels of lead. Demolition contractors which will disturb assumed lead-containing painted surfaces must comply with the requirements of the OSHA Construction Industry Lead regulations prior to and during any work which may disturb lead-containing coatings.

A total of fourteen (14) paint film samples of suspect lead-containing paint were collected from the Fire Station 15 renovation areas. Samples were collected from representative surfaces in the accessible renovation areas. Analytical results confirmed that five (5) of 14 paint film samples collected at Fire Station 15, 2801 Wayne Avenue contain detectable concentrations of lead, or approximately 36%.

Current OSHA regulations require that employers measure airborne exposures to lead during any work which disturbs potential lead-containing paint. In addition, employers are required to safeguard employee health until exposure monitoring results are available by:

- Respiratory Protection
- Protective Clothing
- Change Areas
- Hand washing facilities
- Biological monitoring including blood sampling and analysis, and
- Training under Hazard Communication and Respirator Standards

When exposure monitoring results are available, then OSHA may require additional controls such as airtight barriers, warning signs, regulated areas and restrictions for entry by untrained workers.

Other potential environmental issues may also be present in the renovation areas, including mercury-containing materials, suspect PCB-containing fluorescent light ballasts, and Freon®-containing refrigerants.

Mercury-containing fluorescent light bulbs in the building have sufficient concentrations of mercury to be considered universal hazardous waste. In addition, thermostats in the buildings may contain small amounts of mercury, and one mercury-containing thermostat was observed during inspection. Batteries associated with

emergency lighting may also contain mercury, and are considered to be universal hazardous waste. These universal waste materials should be carefully removed from the building and recycled in accordance with current regulations.

Fluorescent light ballasts were made with PCBs until 1979. Ballasts made after that date are required to be marked with the legend "No PCBs". Given the age of the building, PCB-containing fluorescent light ballasts and other PCB-containing electrical capacitors and transformers may be present in the building, and each ballast, capacitor or transformer should be examined to determine if it is labeled "No PCBs". If necessary, ballasts, capacitors and transformers that are not so labeled should be carefully removed from the building and packaged and labeled for recycling or incineration in accordance with current regulations.

Refrigerated cooling systems in the building, including water coolers, window air-conditioners, and refrigerators, typically contain Freon® refrigerants that must be recovered by licensed refrigerant recycler if removed, in accordance with current regulations. No unauthorized venting of Freon® refrigerants to the atmosphere is permitted under current regulations, since these materials deplete the stratospheric ozone layer (Ozone Depleting Substances).

Finally, no significant accumulations of hazardous waste were observed during the building inspection that could require special remediation, although small amounts of maintenance and custodial chemicals including interior paint were observed in or near the renovation area. It was assumed that the remaining maintenance and custodial chemicals present in the renovation area will be relocated for use during normal custodial and maintenance operations. If not, then these materials may need to be labeled, packaged and transported to a licensed hazardous waste Treatment, Storage and Disposal site in compliance with federal and state hazardous waste regulations.

The results of this inspection can only reflect the condition of the property at the date and time of the site visit within the limits of the proposed work. There are limitations to asbestos inspections without dismantling or destroying the building or its systems. No inspection was performed in inaccessible locations. Recommendations are based on the professional judgment of the inspectors, and the results of the samples collected and analyzed. Helix Environmental, Inc. and its agents are neither responsible nor liable for the non-discovery of any defects in materials, craftsmanship, or other conditions, or any problems that may be discovered or manifest after the site visit date and time. Helix Environmental, Inc.

and its agents make no warranty, expressed or implied, and accept no liability for the presence absence of asbestos or other hazardous materials in or on building products, materials, or areas. Helix Environmental, Inc. and its agents assume no responsibility for the cost of repairing, replacing, or removing any undiscovered or unreported condition or defect, or any future condition or defect.

If you have any questions or comments concerning the inspection or analytical results, please call me at (937) 226-0650.

Sincerely,

HELIX ENVIRONMENTAL, INC.

Ralph A. Froehlich, CIH, CSP, QEP
President
Attach.

ATTACHMENTS

- **ANALYTICAL RESULTS AND SAMPLE DATA SHEETS**
- **SAMPLE LOCATIONS**
- **PHOTOGRAPHS**

SanAir Technologies Laboratory

The Identification Specialists

Analysis Report prepared for Helix Environmental Inc

Report Date: 3/13/2025

Project Name: Fire Station 15,2801 Wayne Avenue

Project #: 7347

SanAir ID#: 25016382

10501 Trade Court, North Chesterfield, Virginia 23236
888.895.1177 | 804.897.1177 | fax: 804.897.0070 | LabReports@SanAir.com | SanAir.com

SanAir ID Number
25016382
FINAL REPORT
3/13/2025 4:25:13 PM

Name: Helix Environmental Inc
Address: 1 Elizabeth Place
Suite 160
Dayton, OH 45417
Phone: 937-226-0650

Project Number: 7347
P.O. Number:
Project Name: Fire Station 15,2801 Wayne Avenue
Collected Date: 3/11/2025
Received Date: 3/12/2025 10:25:00 AM

Dear Benjamin Froehlich,

We at SanAir would like to thank you for the work you recently submitted. The 14 sample(s) were received on Wednesday, March 12, 2025 via UPS. The final report(s) is enclosed for the following sample(s): 7347-03-11-61, 7347-03-11-62, 7347-03-11-63, 7347-03-11-64, 7347-03-11-65, 7347-03-11-66, 7347-03-11-67, 7347-03-11-68, 7347-03-11-69, 7347-03-11-70, 7347-03-11-71, 7347-03-11-72, 7347-03-11-73, 7347-03-11-74.

These results only pertain to this job and should not be used in the interpretation of any other job. This report is only complete in its entirety. Refer to the listing below of the pages included in a complete final report.

Sincerely,

Abisola Kasali
Metals Laboratory Director
SanAir Technologies Laboratory

Final Report Includes:
- Cover Letter
- Chemistry Analysis
- Disclaimers and Additional Information

Sample conditions:
- 14 samples in Good condition.

SanAir Technologies Laboratory

SanAir ID Number
25016382
FINAL REPORT
3/13/2025 4:25:13 PM

Name: Helix Environmental Inc
Address: 1 Elizabeth Place
Suite 160
Dayton, OH 45417
Phone: 937-226-0650

Project Number: 7347
P.O. Number:
Project Name: Fire Station 15,2801 Wayne Avenue
Collected Date: 3/11/2025
Received Date: 3/12/2025 10:25:00 AM

Analyst: Templeton, Kat
Test Method: SW846/M3050B/7000B

Lead Paint Analysis

PAINT Sample	Description	µg Pb In Sample	Sample Size (grams)	Calculated RL	Sample Results	Sample Results
25016382 - 1	7347-03-11-61	< 10	0.1013	98.7	<98.7	<0.010 %
	Beige Paint On Metal Duct				µg/g (ppm)	By Weight
25016382 - 2	7347-03-11-62	754	0.1163	86	6480	0.648 %
	Red Paint On Metal Tank				µg/g (ppm)	By Weight
25016382 - 3	7347-03-11-63	64	0.1048	95.4	615.4	0.062 %
	Brown Over Blue Paint On Metal				µg/g (ppm)	By Weight
25016382 - 4	7347-03-11-64	145	0.1049	95.3	1379	0.138 %
	Yellow Paint On Concrete Floor				µg/g (ppm)	By Weight
25016382 - 5	7347-03-11-65	< 10	0.1087	92	<92	<0.009 %
	Beige Paint on Core Black Wall				µg/g (ppm)	By Weight
25016382 - 6	7347-03-11-66	< 10	0.1138	87.9	<87.9	<0.009 %
	Beige Paint On Metal				µg/g (ppm)	By Weight
25016382 - 7	7347-03-11-67	1123	0.1071	93.4	10490	1.049 %
	Orange Paint On Metal Wall				µg/g (ppm)	By Weight
25016382 - 8	7347-03-11-68	< 10	0.11	90.9	<90.9	<0.009 %
	Beige Paint On Black Wall				µg/g (ppm)	By Weight
25016382 - 9	7347-03-11-69	< 10	0.106	94.3	<94.3	<0.009 %
	Orange Paint On Block Wall				µg/g (ppm)	By Weight
25016382 - 10	7347-03-11-70	10	0.1055	94.8	96.6	0.010 %
	Terracotta Paint On Drywall Wall				µg/g (ppm)	By Weight
25016382 - 11	7347-03-11-71	< 10	0.1095	91.3	<91.3	<0.009 %
	Grey Paint On Drywall Wall				µg/g (ppm)	By Weight
25016382 - 12	7347-03-11-72	< 10	0.1212	82.5	<82.5	<0.008 %
	Red Over Green/Brown Paint On Metal				µg/g (ppm)	By Weight
25016382 - 13	7347-03-11-73	< 10	0.1031	97	<97	<0.010 %
	Red Paint On Metal				µg/g (ppm)	By Weight

Method Reporting Limit <10 µg/0.1 g paint

Signature: Kaitlyn Templeton
Date: 3/13/2025

Reviewed:
Date: 3/13/2025

SanAir Technologies Laboratory

SanAir ID Number
25016382
FINAL REPORT
3/13/2025 4:25:13 PM

Name: Helix Environmental Inc
Address: 1 Elizabeth Place
Suite 160
Dayton, OH 45417
Phone: 937-226-0650

Project Number: 7347
P.O. Number:
Project Name: Fire Station 15,2801 Wayne Avenue
Collected Date: 3/11/2025
Received Date: 3/12/2025 10:25:00 AM

Analyst: Templeton, Kat
Test Method: SW846/M3050B/7000B

Lead Paint Analysis

PAINT Sample	Description	µg Pb In Sample	Sample Size (grams)	Calculated RL	Sample Results	Sample Results
25016382 - 14	7347-03-11-74	< 10	0.1035	96.6	<96.6	<0.010 %
	Yellow Paint On Metal Telephone Box				µg/g (ppm)	By Weight

Method Reporting Limit <10 µg/0.1 g paint

Signature: Kaitlyn Templeton
Date: 3/13/2025

Reviewed:
Date: 3/13/2025

Disclaimer

SanAir Technologies Laboratory, Inc. participates in the Environmental Lead Accreditation Program (ELAP) administered by AIHA LAP, LLC (Laboratory ID LAP-162952). Refer to our accreditation certificate and scope on our website or www.aihaaccreditedlabs.org for an up to date list of the Fields of Testing for which we are accredited. SanAir also participates in the State of New York's DOH-ELAP (Lab Id 11983), and has met the EPA's NLLAP program standards. This report does not constitute nor shall be used by the client to claim product, process, system, or person certification, approval, or endorsement by AIHA LAP, LLC, NELAC, NIST, and/or any other U.S. governmental agencies; and test results in this report may not be accredited by every local, state or federal regulatory agency.

This report is the sole property of the client named on the SanAir Technologies Laboratory chain-of-custody (COC). Results in the report are confidential information intended only for the use by the customer listed on the chain of custody. Neither results nor reports will be discussed with or released to any third party without our client's written permission. Final reports cannot be reproduced, except in full, without written authorization from SanAir Technologies Laboratory, Inc. This report and any information contained within shall not be edited, altered, or modified in any way by any persons or agencies receiving, viewing, distributing, or otherwise possessing a copy of this final report. The laboratory reserves the right to perform amendments to any finalized report, of which shall supersede and make obsolete any previous editions. Such changes, modifications, additions, or deletions shall be effective immediately upon notice thereof, which may be given by means including but not limited to posting on the SanAir client portal website, electronic or conventional mail, or by any other means. The information provided in this report applies only to the samples submitted and is relevant only for the date, time, and location of sampling. The accuracy of the results of the analysis is dependent upon the method of sample procurement and information provided by the client on the COC. SanAir is not responsible for the method of sample procurement. SanAir assumes no responsibility for information provided by the client on the COC such as project number, project name, collection dates, po number, special instructions, samples collected by, sample numbers, sample identifications, sample type, selected analysis type, flow rate, total volume or area, and start stop times that may affect the validity of the results in this report. SanAir Technologies Laboratory, Inc only assures the precision and accuracy of the data it generates and assumes no responsibility for errors or biasing that occur during collection prior to SanAir's receipt of the sample(s). Evaluation reports are based solely on the sample(s) in the condition in which they arrived at the laboratory and on the information provided by the client on the COC. Sample(s) were received in good condition unless otherwise noted on the report. SanAir assumes no responsibility or liability for the manner in which the results are used or interpreted. SanAir's Method Detection Limits (MDL) and Reporting Limits (RL) have been derived using various materials meeting each accrediting agencies' standards. All quality control results are acceptable unless otherwise noted. SanAir does not make contamination corrections to reports based upon analysis of laboratory and/or field blanks. All samples are disposed of after 90 days unless otherwise requested by the client. For Lead Exposure Limits, refer to HUD Guidelines for the Evaluation and Control of Lead-Based Paint Hazards and State and Federal Regulations, where applicable. For Lead Exposure Limits in Air, refer to EPA National Ambient Air Quality Standards, OSHA Action Levels & Permissible Exposure Limits (General Industry & Construction), and relative state or federal requirements where applicable.

AIHA LAP, LLC Lab ID: LAP-162952
Commonwealth of VA Department of General Services DCLS, VELAP Laboratory ID#460251
New York State Department of Health Laboratory ID No: 11983
California State Environmental Laboratory Accreditation Program Certificate No: 2915
State of Connecticut Department of Public Health Environmental Laboratory Registration Number: PH-0105
New Jersey Department of Environment Protection Environmental Laboratory Certification ID# VA014
Ohio Department of Health Environmental Lead Laboratory Approval Number E10049
State of Rhode Island Department of Health Environmental Lead Laboratory No LAO00371

25016382

HELIX ENVIRONMENTAL, INC.
1 ELIZABETH PLACE, SUITE 160H
DAYTON, OHIO 45417-3445
(937) 226-0650

LABORATORY: SunAir
DATE SAMPLED: 3/11/25
RUSH – YES OR (NO) DATE REQUIRED: 24 HR TAT
LOCATION: Dayton, OH
CONTRACTOR/CLIENT: Hpp Architecture
ADDRESS: Fire station 5, 2801 Wayne Avenue
INSPECTOR: ~~F.~~ Froelich
JOB NUMBER: 7347

DETERIORATED PAINT SAMPLING FORM

ANALYSES REQUESTED: Lead (Pb) % by weight

LAB SAMPLE NO.	HELIX SAMPLE NUMBER	ROOM	BUILDING COMPONENT	CONDITION	SAMPLE AREA	COMMENTS
	7347-03-11-61	1st Fl, Mech Room, S Duct 5'Ht	Beige Paint on Metal Duct	P	2"x2"	Flaking
	7347-03-11-62	1st Fl, Mech Room, NE Tank Top	Red Paint on Metal Tank	P	2"x4"	Unable to remove all paint/primer
	7347-03-11-63	1st Fl, Mech Room, Stair Riser 4'Ht	Brown over Blue Paint on Metal	P	1"x2"	
	7347-03-11-64	Truck Area, Center S Floor Stripe	Yellow Paint on Concrete Floor	P	1"x3"	
	7347-03-11-65	Truck Area, E Wall Next Door to Office 3'Ht	Beige Paint on Conc Block Wall	F	1"x1"	under Hose Valve
	7347-03-11-66	Truck Area, E Wall, Hose Valve Access Panel	Beige Paint on Metal 3'Ht	F	1"x1"	rusted metal
	7347-03-11-67	Men's RR, S Toilet Wall 3'Ht	Orange Paint on Metal Wall	F	1"x2"	rusted metal
	7347-03-11-68	Men's RR, W Wall of Urinal 3'Ht	Beige Paint on Block Wall	F	1"x2"	

THIS IS A CHAIN OF CUSTODY DOCUMENT. PLEASE COMPLETE, SIGN AND DATE. PLEASE RETURN ORIGINAL TO HELIX ENVIRONMENTAL, INC.

RECD 1	RELINQUISHED BY:	COMPANY: Helix Env. Inc.	DATE/TIME: 3/11/2025 1200	RECD 3	RELINQUISHED BY:	COMPANY:	DATE/TIME:
RECD 2	RECEIVED BY:	COMPANY:	DATE/TIME:	RECD 4	RELINQUISHED BY:	COMPANY:	DATE/TIME:

3-12 25 1025AM

25016382

HELIX ENVIRONMENTAL, INC.
1 ELIZABETH PLACE, SUITE 160H
DAYTON, OHIO 45417-3445
(937) 226-0650

LABORATORY: SunAir
DATE SAMPLED: 3/11/25
RUSH – YES OR (NO) DATE REQUIRED: 24 HR TAT
LOCATION: Dayton, OH
CONTRACTOR/CLIENT: HPP Architecture
ADDRESS: Fire Station 5, 2801 Wayne Avenue
INSPECTOR: B Froelich
JOB NUMBER: 7347

DETERIORATED PAINT SAMPLING FORM

ANALYSES REQUESTED: Lead (Pb) % by weight

LAB SAMPLE NO.	HELIX SAMPLE NUMBER	ROOM	BUILDING COMPONENT	CONDITION	SAMPLE AREA	COMMENTS
	7347-03-11-69	Watch Room, W Wall by Door to Truck Area	Orange Paint on Block Wall 4'Ht	F	0.5"x8"	
	7347-03-11-70	N Restroom, E Wall behind door	Terracotta Paint on DryWall Wall 4'Ht	G	2"x2"	
	7347-03-11-71	Break Room, NW Wall 4'Ht	Grey Paint on Drywall Wall	G	2"x2"	
	7347-03-11-72	Exterior S Door to Truck Area	Red over Green/Brown Paint on Metal 5'Ht	F	1"x4"	
	7347-03-11-73	Exterior Overhead N Door, Center at Bottom	Red Paint on Metal	F	0.5"x4"	
	7347-03-11-74	Exterior, by N door & Watch Room	Yellow Paint on Metal Telephone Box 5'Ht	P	1.5"x5"	
	7347-03-11-75					
	7347-03-11-76					

THIS IS A CHAIN OF CUSTODY DOCUMENT. PLEASE COMPLETE, SIGN AND DATE. PLEASE RETURN ORIGINAL TO HELIX ENVIRONMENTAL, INC.

RECD 1	RELINQUISHED BY:	COMPANY: Helix Env. Inc.	DATE/TIME: 3/11/2025 1200	RECD 3	RELINQUISHED BY:	COMPANY	DATE/TIME
RECD 2	RECEIVED BY:	COMPANY	DATE/TIME	RECD 4	RELINQUISHED BY	COMPANY	DATE/TIME

ESC 3-12-25 10:25AM

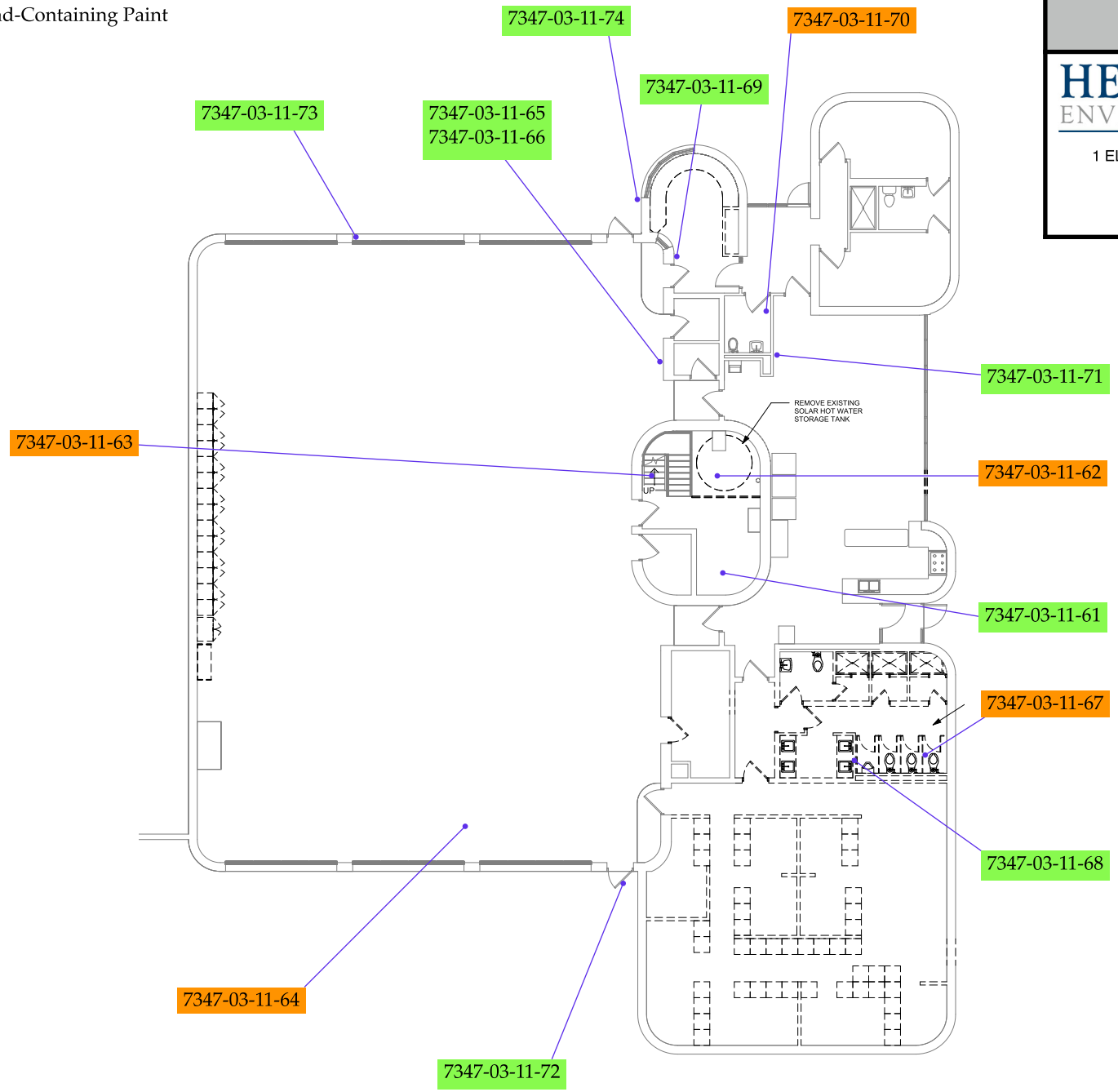
LEGEND

Lead-Containing Paint

Non Lead-Containing Paint

LEAD PAINT SAMPLE LOCATIONS,
1st FLOOR, FIRE STATION 15,
2801 WAYNE AVENUE,
DAYTON, OH

HELIX ENVIRONMENTAL, INC.
1 ELIZABETH PLACE, SUITE 160H
DAYTON, OHIO 45417
937-226-0650





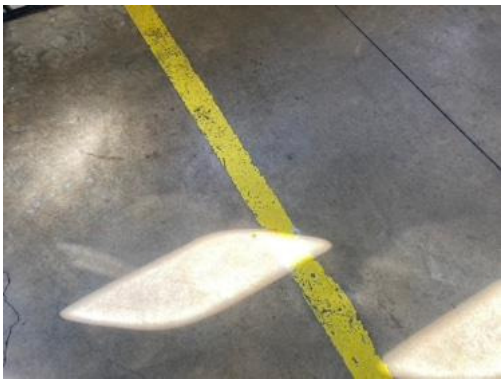
Paint Film Sample 7347-03-11-61 with no detectable lead



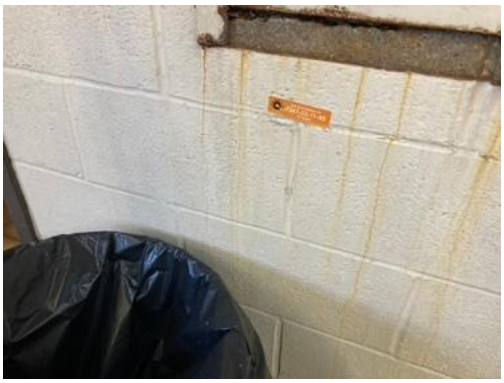
Paint Film Sample 7347-03-11-62 with 0.648% lead



Paint Film Sample 7347-03-11-63 with 0.062% lead



Paint Film Sample 7347-03-11-64 with 0.138% lead



Paint Film Sample 7347-03-11-65 with no detectable lead



Paint Film Samples 7347-03-11-65 & 66 with no detectable lead



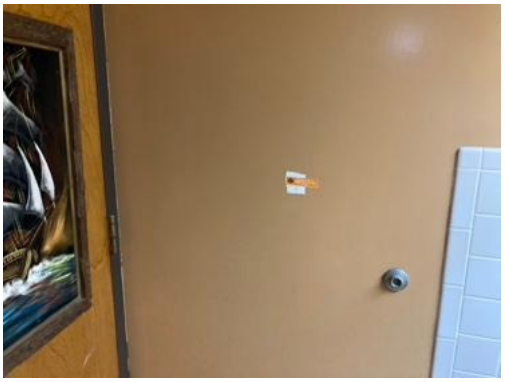
Paint Film Sample 7347-03-11-67 with 1.049% lead



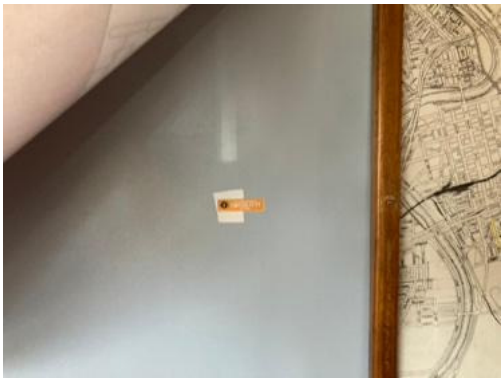
Paint Film Sample 7347-03-11-68 with no detectable lead



Paint Film Sample 7347-03-11-69 with no detectable lead



Paint Film Sample 7347-03-11-79 with 0.010% lead



Paint Film Sample 7347-03-11-71 with no detectable lead



Paint Film Sample 7347-03-11-72 with no detectable lead



Paint Film Sample 7347-03-11-73 with no detectable lead



Paint Film Sample 7347-03-11-74 with no detectable lead

HELIX ENVIRONMENTAL, INC.

April 29, 2025

Mr. Curt Sparks, Associate AIA, LEED GA
App Architecture
615 Woodside Drive
Englewood, Ohio 45322

Telephone (937) 836-8898 ext. 110

RE: Pre-Renovation Asbestos Inspection of Fire Station 16, 4111 Kings Highway, Dayton, Ohio, March 10 and 31, 2025.
Helix Project No. 7348.

Dear Mr. Sparks:

App Architecture contracted with Helix Environmental, Inc. to perform a pre-renovation asbestos inspection of the accessible portions of the Fire Station 16 located at 4111 Kings Highway, Dayton, Ohio. The inspection was necessary to determine if asbestos-containing building materials were present so that plans could be made to remove them in accordance with current regulatory requirements prior to a planned renovation project at the building. This letter report summarizes the results of the inspection performed on March 10 and 31, 2025 and the analytical results of samples collected on those dates. A separate report on a preliminary lead-containing paint inspection for Fire Station 16 was sent to you previously.

INSPECTION AND ANALYTICAL PROCEDURES

Mr. Ralph Froehlich, CIH, CSP, QEP and Mr. Benjamin Froehlich, IH with Helix Environmental, Inc. performed bulk sampling for asbestos in the accessible renovation areas at the Fire Station 16 building located on 4111 Kings Highway in Dayton, Ohio. On March 10 and 31, 2025, Mr. R. Froehlich and Mr. B. Froehlich collected samples in the areas of the accessible building where the majority of work is to occur. Mr. Ralph A. Froehlich is a Certified Industrial Hygienist with more than thirty years experience in the fields of occupational and environmental health, and is certified by the Ohio Department of Health as an Asbestos Hazard Evaluation Specialist and Asbestos Abatement Project Designer (Certification Nos. ES3074 and PD60148, respectively). Mr. Benjamin Froehlich has over fifteen years experience in the fields of occupational and environmental health and is also certified by the Ohio Department of Health as an

Asbestos Hazard Evaluation Specialist and Asbestos Abatement Project Designer (Cert. Nos. ES34739 and PD60827, respectively).

Helix Environmental, Inc. collected fifty-four (54) bulk samples of suspect asbestos-containing building materials in the renovation areas on March 10, 2025. Helix Environmental, Inc. collected an additional eighteen (18) bulk samples of suspect asbestos-containing building materials in the renovation area on March 31, 2025.

Sampling locations were determined in a manner "sufficient to determine" whether miscellaneous and non-friable materials contain more than 1% asbestos if they were not assumed to contain asbestos. No thermal system insulation or surfacing materials were identified during the inspection. Bulk samples of the suspect materials were collected using cleaned hand tools and packaged in labeled zip-lock plastic bags. The sample bags were placed into a larger zip-lock bag, with the original sample data/chain-of-custody and analytical request forms. Helix Environmental, Inc. retained copies of these forms.

Bulk samples were shipped by overnight courier to SanAir Technologies Laboratory, Inc., a National Voluntary Laboratory Accreditation Program (NVLAP) and Ohio Certified Professional accredited environmental lead laboratory, where they were analyzed via Polarized Light Microscopy (PLM) with dispersion staining in accordance with the U.S. Environmental Protection Agency's Interim Methods for the Determination of Asbestos in Bulk Insulation Samples (EPA-600/R-93/116). Under this method, the limit of detection for asbestos is about 1 percent by area. Samples containing smaller concentrations of asbestos are not reliably detected by this technique. Polarized light microscopes equipped with 10X eyepieces, 10X and 40X objective lenses and dispersion staining lenses were used to identify fibers present in the samples. This method has a reporting limit of 1%.

SanAir Technologies Laboratory, Inc. maintains accreditation from the American Industrial Hygiene Association as an environmental microbiology laboratory and has received accreditation through successful participation in the NIST National Voluntary Laboratory Accreditation Program (NVLAP) for bulk asbestos and as an environmental lead laboratory. AIHA-accredited laboratories are scrutinized on a regular basis to ensure that personnel, equipment, facilities and data are maintained. In addition, AIHA-accredited laboratories have well-developed assurance/quality control programs to ensure that analytical results accurately reflect conditions present during the sampling periods.

APPLICABLE STANDARDS

Asbestos

The U. S. Environmental Protection Agency (EPA) has established regulations that apply to friable and potentially friable materials with asbestos content in excess of one percent, as determined by PLM. These regulations establish required notification, removal techniques, and disposal of regulated asbestos-containing materials. “Friable” means that a suspect material can be reduced to a powder by hand pressure when dry and denotes a material that is capable of releasing significant amounts of asbestos fibers to the air. Potentially friable materials are those that may release asbestos fibers to the air if they are extensively damaged during demolition operations, and include Category I Nonfriable materials in poor condition and Category II Nonfriable materials. Category I Nonfriable materials include bituminous roofing materials, resilient flooring materials, and gaskets, where the asbestos is mixed in a resilient matrix. Category I Nonfriable materials may be left in buildings when they are demolished by conventional methods, if the materials are not in poor condition. The Ohio EPA has established equivalent regulations for Ohio (Ohio Administrative Code 3745-20).

U. S. EPA has also recently banned certain uses of asbestos, and requires exposure monitoring to determine whether potentially-exposed persons exceed an airborne "Existing Chemical Exposure Limit" (ECEL) of 0.005 fibers/cc. The requirement for exposure monitoring and provision of respirators for persons whose exposures exceed 0.005 fibers/cc is currently in effect (40 CFR 751 Subpart F).

The Occupational Safety and Health Administration (OSHA) has promulgated an eight-hour Time-Weighted Average (TWA) Permissible Exposure Limit of 0.1 fibers/cc for airborne asbestos exposures while working in and around asbestos-containing materials (29 CFR 1910.1001, 29 CFR 1926.1101). A 30-minute Excursion Limit of 1.0 fibers/cc is also included with the standards. Asbestos-containing materials are defined as those that contain more than 1% asbestos. These regulations include complex requirements for asbestos abatement, dividing the work with and around asbestos into four classes, with varying requirements for each class. OSHA also requires building and facility owners to maintain records of information concerning the presence, location and quantity of asbestos-containing material (ACM) and presumed asbestos-containing material (PACM) installed in their building or facility (29 CFR 1910.1001(j)(2)(ii)).

The U.S. Environmental Protection Agency (EPA) has established clearance criteria of 0.01 fibers/cc by PCM analyses for small-scale asbestos abatement projects in schools (40 CFR 763.91). In addition, EPA has established clearance criteria of 70 asbestos structures/mm^2 by Transmission Electron Microscopy (TEM) analyses. However, this clearance criteria is only required for large asbestos abatement projects in schools.

The American Conference of Governmental Industrial Hygienists (ACGIH) recommends an airborne eight-hour TWA Threshold Limit Value of 0.1 fibers/cc (ACGIH *2024 TLVs and BEIs*). ACGIH TLVs denote concentrations and conditions to which it is believed that nearly all workers may be repeatedly exposed day after day without adverse effect.

The National Institute for Occupational Safety and Health (NIOSH) identifies asbestos as an occupational carcinogen, and recommends that occupational exposures be "limited to the lowest feasible concentration" (NIOSH *Pocket Guide to Chemical Hazards*, 2007).

The Ohio Environmental Protection Agency (OEPA) has established additional regulations for asbestos abatement, including a certification program for asbestos supervisors, workers, hazard evaluation specialists, project designers, and air monitoring technicians. OEPA regulations also require contractors to be licensed, and require 10 working day advance notifications for asbestos abatement in amounts over 50 linear feet (LF) or 50 square feet (SF) of friable asbestos-containing material (Ohio Administrative Code 3745-20, 22).

ANALYTICAL RESULTS

TABLE 1: CONFIRMED AND ASSUMED ASBESTOS-CONTAINING MATERIALS AT FIRE STATION 16, 4111 KINGS HIGHWAY, DAYTON, OHIO, COLLECTED MARCH 10 AND 31, 2025. HELIX PROJECT NO. 7348.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	PLM Result (% Asbestos)
7348-03-10-04 25016076-004 25016863-001	200 LF 18 SF	1	Grey Interior Caulk/ Basement, Southwest Central Hose Drainage Closet, Southeast Doorway, South Side, 3' Ht.	Non-Friable	**3% Chrysotile Asbestos Detected; 2% Chrysotile Asbestos by Point Count**
7348-03-10-05 25016076-005 25016863-002	-	1	Grey Interior Caulk/ Basement, Northwest Exercise Room, Southeast Entrance, West Side, 1.5' Ht.	Non-Friable	**3% Chrysotile Asbestos Detected; 2.5% Chrysotile Asbestos by Point Count**
7348-03-10-25 25016076-025 25017959-001	960 LF 80 SF	1	Grey Interior Caulk/ 1st Floor, North Central Dormitory, West Wall, South Area, At Window Frame, 7' Ht.	Non-Friable	**3% Chrysotile Asbestos Detected; 0.3% Chrysotile Asbestos by Point Count with Gravimetric Reduction**
7348-03-10-36 25016076-036 25017959-002	-	1	Grey Interior Caulk/ 1st Floor, Dining Room, Southwest Corner, 4 ' Ht.	Non-Friable	**2% Chrysotile Asbestos Detected; 0.9% Chrysotile Asbestos by Point Count with Gravimetric Reduction**

Ohio EPA REGULATED ASBESTOS-CONTAINING BUILDING MATERIAL >1% Asbestos
US EPA REGULATED ASBESTOS-CONTAINING BUILDING MATERIAL >1% Asbestos
OSHA REGULATED ASBESTOS-CONTAINING MATERIAL >1% Asbestos

TABLE 1 (CONTINUED): CONFIRMED AND ASSUMED ASBESTOS-CONTAINING MATERIALS AT FIRE STATION 16, 4111 KINGS HIGHWAY, DAYTON, OHIO, COLLECTED MARCH 10 AND 31, 2025. HELIX PROJECT NO. 7348.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	PLM Result (% Asbestos)
7348-03-10-26 25016076-026	1600 SF	1	9″ x 9″ Tan Streaked Floor Tile, Floor Tile/ 1st Floor, North Central Dormitory, Southeast Area, At Southeast Entrance, 0′ Ht.	Non-Friable	**4% Chrysotile Asbestos Detected**
		2	9″ x 9″ Tan Streaked Floor Tile, Black Mastic/ 1st Floor, North Central Dormitory, Southeast Area, At Southeast Entrance, 0′ Ht.	Non-Friable	**No Asbestos Detected**
7348-03-10-27 25016076-027	-	1	9″ x 9″ Tan Streaked Floor Tile, Floor Tile/ 1st Floor, North Central Dormitory, Northwest Corner, 0′ Ht.	Non-Friable	**4% Chrysotile Asbestos Detected**
		1	9″ x 9″ Tan Streaked Floor Tile, Black Mastic/ 1st Floor, North Central Dormitory, Northwest Corner, 0′ Ht.	Non-Friable	**No Asbestos Detected**
7348-03-10-28 25016076-028	5 SF	1	9″ x 9″ Pink Streaked Floor Tile, Floor Tile/ 1st Floor, North Central Dormitory, Southwest Area, At Southwest Entrance Threshold, 0′ Ht.	Non-Friable	**4% Chrysotile Asbestos Detected**
		2	9″ x 9″ Pink Streaked Floor Tile, Black Mastic/ 1st Floor, North Central Dormitory, Southwest Area, At SW Entrance Threshold, 0′ Ht.	Non-Friable	**No Asbestos Detected**
7348-03-10-29 25016076-029	-	1	9″ x 9″ Pink Streaked Floor Tile, Floor Tile/ 1st Floor, North Central Dormitory, Southwest Area, At Southwest Entrance Threshold, 0′ Ht.	Non-Friable	**4% Chrysotile Asbestos Detected**
		1	9″ x 9″ Pink Streaked Floor Tile, Black Mastic/ 1st Floor, North Central Dormitory, Southwest Area, At Southwest Entrance Threshold, 0′ Ht.	Non-Friable	**No Asbestos Detected**

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TABLE 1 (CONTINUED): CONFIRMED AND ASSUMED ASBESTOS-CONTAINING MATERIALS AT FIRE STATION 16, 4111 KINGS HIGHWAY, DAYTON, OHIO, COLLECTED MARCH 10 AND 31, 2025. HELIX PROJECT NO. 7348.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	PLM Result (% Asbestos)
7348-03-10-30 25016076-030	700 SF	1	9″ x 9″ Terracotta Streaked Floor Tile, Floor Tile/ 1st Floor, South Central Hallway, Southwest Area, 0′ Ht.	Non-Friable	**4% Chrysotile Asbestos Detected**
		1	9″ x 9″ Terracotta Streaked Floor Tile, Black Mastic/ 1st Floor, South Central Hallway, Southwest Area, 0′ Ht.	Non-Friable	**No Asbestos Detected**
7348-03-10-31 25016076-031	-	1	9″ x 9″ Terracotta Streaked Floor Tile, Floor Tile/ 1st Floor, South Central Hallway, South Central Area, At South Wall, 0′ Ht.	Non-Friable	**4% Chrysotile Asbestos Detected**
		1	9″ x 9″ Terracotta Streaked Floor Tile, Black Mastic/ 1st Floor, South Central Hallway, South Central Area, At South Wall, 0′ Ht.	Non-Friable	**No Asbestos Detected**
7348-03-10-32 25016076-032 25017959-003	20 SF	1	9″ x 9″ Grey and Green Streaked Floor Tile, Floor Tile/ 1st Floor, Southwest Office, North Central Area, At North Wall, 0′ Ht.	Non-Friable	**2% Chrysotile Asbestos Detected; 2.2% Chrysotile Asbestos by Point Count with Gravimetric Reduction**
		1	9″ x 9″ Grey and Green Streaked Floor Tile, Black Mastic/ 1st Floor, Southwest Office, North Central Area, At North Wall, 0′ Ht.	Non-Friable	**No Asbestos Detected**

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TABLE 1 (CONTINUED): CONFIRMED AND ASSUMED ASBESTOS-CONTAINING MATERIALS AT FIRE STATION 16, 4111 KINGS HIGHWAY, DAYTON, OHIO, COLLECTED MARCH 10 AND 31, 2025. HELIX PROJECT NO. 7348.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	PLM Result (% Asbestos)
7348-03-10-33 25016076-033 25017959-004	20 SF	1	9" x 9" Grey and Green Streaked Floor Tile, Floor Tile/ 1st Floor, South Central Captain's Office, Restroom, Northeast Corner, On Floor, 0' Ht.	Non-Friable	**2% Chrysotile Asbestos Detected; 3.5% Chrysotile Asbestos by Point Count with Gravimetric Reduction**
		1	9" x 9" Grey and Green Streaked Floor Tile, Black Mastic/ 1st Floor, South Central Captain's Office, Restroom, Northeast Corner, On Floor, 0' Ht.	Non-Friable	**No Asbestos Detected**
7348-03-10-34 25016076-034	150 SF	1	9" x 9" Green Streaked Floor Tile, Floor Tile/ 1st Floor, Southwest Office, North Central Area, 0' Ht.	Non-Friable	**4% Chrysotile Asbestos Detected**
		1	9" x 9" Green Streaked Floor Tile, Black Mastic/ 1st Floor, Southwest Office, North Central Area, 0' Ht.	Non-Friable	**No Asbestos Detected**
7348-03-10-35 25016076-035	-	1	9" x 9" Green Streaked Floor Tile, Floor Tile/ 1st Floor, Southwest Office, Northeast Corner, 0' Ht.	Non-Friable	**4% Chrysotile Asbestos Detected**
		1	9" x 9" Green Streaked Floor Tile, Black Mastic/ 1st Floor, Southwest Office, Northeast Corner, 0' Ht.	Non-Friable	**No Asbestos Detected**

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TABLE 1 (CONTINUED): CONFIRMED AND ASSUMED ASBESTOS-CONTAINING MATERIALS AT FIRE STATION 16, 4111 KINGS HIGHWAY, DAYTON, OHIO, COLLECTED MARCH 10 AND 31, 2025. HELIX PROJECT NO. 7348.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	PLM Result (% Asbestos)
7348-03-10-42 25016076-042 25017959-005	20 SF	1	9″ x 9″ Brown and Maroon Streaked Floor Tile, Floor Tile/ 1st Floor, South Central Hallway, South Exit Hallway, Southeast Area, 0′ Ht.	Non-Friable	**2% Chrysotile Asbestos Detected; 0.5% Chrysotile Asbestos by Point Count with Gravimetric Reduction**
		1	9″ x 9″ Brown and Maroon Streaked Floor Tile, Black Mastic/ 1st Floor, South Central Hallway, South Exit Hallway, Southeast Area, 0′ Ht.	Non-Friable	**No Asbestos Detected**
7348-03-10-43 25016076-043 25017959-006	-	1	9″ x 9″ Brown and Maroon Streaked Floor Tile, Floor Tile/ 1st Floor, Dining Room, Northwest Area, At Exit, 0′ Ht.	Non-Friable	**2% Chrysotile Asbestos Detected; 1.3% Chrysotile Asbestos by Point Count with Gravimetric Reduction**
		1	9″ x 9″ Brown and Maroon Streaked Floor Tile, Black Mastic/ 1st Floor, Dining Room, Northwest Area, At Exit, 0′ Ht.	Non-Friable	**No Asbestos Detected**

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TABLE 1 (CONTINUED): CONFIRMED AND ASSUMED ASBESTOS-CONTAINING MATERIALS AT FIRE STATION 16, 4111 KINGS HIGHWAY, DAYTON, OHIO, COLLECTED MARCH 10 AND 31, 2025. HELIX PROJECT NO. 7348.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	PLM Result (% Asbestos)
7348-03-31-11 25021185-011 25021480-001	170 SF	1	Tan Square 1" x 1" Ceramic Floor Tile/ 1st Floor, Locker Room, West Central Bathroom, Northeast Area, On Floor, 0' Ht.	Non-Friable	**No Asbestos Detected**
		2	Tan Grout/ 1st Floor, Locker Room, W. Central Bathroom, NE Area, On Floor, 0' Ht.	Non-Friable	**No Asbestos Detected**
		3	Grey Mortar/ 1st Floor, Locker Room, West Central Bathroom, Northeast Area, On Floor, 0' Ht.	Non-Friable	**<1% Chrysotile Asbestos Detected; <0.25% Chrysotile Asbestos Detected by Point Count**
7348-03-31-12 25021185-012 25021480-002	-	1	Tan Square 1" x 1" Ceramic Floor Tile/ 1st Floor, Locker Room, E. Bathroom, NW Area, 0' Ht.	Non-Friable	**No Asbestos Detected**
		2	Tan Grout/ 1st Floor, Locker Room, East Bathroom, NW Area, On Floor, 0' Ht.	Non-Friable	**No Asbestos Detected**
		3	Grey Mortar/ 1st Floor, Locker Room, East Bathroom, Northwest Area, On Floor, 0' Ht.	Non-Friable	**<1% Chrysotile Asbestos Detected; <0.25% Chrysotile Asbestos Detected by Point Count**
ASSUMED **Not Sampled**	30 SF (1)	1	Fire Doors/ Basement, Boiler Room, South Entrance Door	Friable	**Assumed to Contain Asbestos**

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TABLE 1 (CONTINUED): CONFIRMED AND ASSUMED ASBESTOS-CONTAINING MATERIALS AT FIRE STATION 16, 4111 KINGS HIGHWAY, DAYTON, OHIO, COLLECTED MARCH 10 AND 31, 2025. HELIX PROJECT NO. 7348.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	PLM Result (% Asbestos)
ASSUMED Not Sampled	50 SF (2)	1	Fire Doors/ Basement, East Central Maintenance Room, North Wall, Northwest Area	Friable	**Assumed to Contain Asbestos**
ASSUMED Not Sampled	6 SF (1)	1	White Vibration Isolator Cloth/ Basement, Southwest Room, Southeast Central Area, On Air Handler, 6′ Ht.	Friable	**Assumed to Contain Asbestos**
ASSUMED Not Sampled	140 SF	1	Boiler Exhaust Flue Insulation/ Basement, Extending from the Boiler to the Central Tower	Friable	**Assumed to Contain Asbestos**
ASSUMED Not Sampled	6 SF	1	Electrical Insulators in Switch Gear/ Basement, Southwest Room, West Wall, 3′ Ht.	Non-Friable	**Assumed to Contain Asbestos**
ASSUMED Not Sampled	3 SF (1)	1	Electrical Insulators in Circuit Breaker/ Basement, Southwest Room, West Wall, South Area, 2′ Ht.	Non-Friable	**Assumed to Contain Asbestos**
ASSUMED Not Sampled	2 SF (1)	1	Electrical Insulators in Circuit Breaker/ Basement, Southwest Room, West Wall, Central Area, 3′ Ht.	Non-Friable	**Assumed to Contain Asbestos**
ASSUMED Not Sampled	2.5 SF (1)	1	Electrical Insulators in Circuit Breaker/ Basement, East Central Maintenance Room, South Wall, East Central Area, 3′ Ht.	Non-Friable	**Assumed to Contain Asbestos**
ASSUMED Not Sampled	1 SF (1)	1	Electrical Insulators in Circuit Breaker/ Basement, Boiler Room, East Wall, South Area, 4′ Ht.	Non-Friable	**Assumed to Contain Asbestos**

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TABLE 1 (CONTINUED): CONFIRMED AND ASSUMED ASBESTOS-CONTAINING MATERIALS AT FIRE STATION 16, 4111 KINGS HIGHWAY, DAYTON, OHIO, COLLECTED MARCH 10 AND 31, 2025. HELIX PROJECT NO. 7348.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	PLM Result (% Asbestos)
ASSUMED Not Sampled	2 SF (2)	1	Electrical Insulators in Circuit Breakers/ 1st Floor, Throughout	Non-Friable	**Assumed to Contain Asbestos**
ASSUMED Not Sampled	2 SF (2)	1	Electrical Insulators in Safety Switches/ Basement, Southwest Room, W. Wall, Central Area, 6' Ht.	Non-Friable	**Assumed to Contain Asbestos**
ASSUMED Not Sampled	2 SF (1)	1	Electrical Insulators in Safety Switch/ Basement, Southwest Room, North Wall, NW Area, 3' Ht.	Non-Friable	**Assumed to Contain Asbestos**
ASSUMED Not Sampled	0.25 SF (1)	1	Electrical Insulators in Safety Switch/ Basement, Southwest Room, Southeast Central Area, On Air Handler, South Side, 3' Ht.	Non-Friable	**Assumed to Contain Asbestos**
ASSUMED Not Sampled	0.5 SF (2)	1	Electrical Insulators in Safety Switches/ Basement, West Central Hallway, East Wall, Central Area, Behind Laundry Machines, 3' Ht.	Non-Friable	**Assumed to Contain Asbestos**
ASSUMED Not Sampled	1 SF (1)	1	Electrical Insulators in Safety Switch/ Exterior, West Side, Central Area, 8' Ht.	Non-Friable	**Assumed to Contain Asbestos**
ASSUMED Not Sampled	1 SF (1)	1	Electrical Insulators in Safety Switch/ Exterior, East Side, South Central Area, 2' Ht.	Non-Friable	**Assumed to Contain Asbestos**
ASSUMED Not Sampled	3 SF (3)	1	Electrical Insulators in Safety Switches/ Exterior, Roof, South Central Area, On East Side of Tower, South Area, 2' Ht.	Non-Friable	**Assumed to Contain Asbestos**
ASSUMED Not Sampled	8900 SF	1	Bituminous Roofing/ Main Roof on Building	Non-Friable	**Category I Nonfriable Asbestos Material**

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TABLE 2: CONFIRMED NON ASBESTOS-CONTAINING MATERIALS AT FIRE STATION 16, 4111 KINGS HIGHWAY, DAYTON, OHIO, COLLECTED MARCH 10 AND 31, 2025. HELIX PROJECT NO. 7348.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	PLM Result (% Asbestos)
7348-03-10-22 25016076-022	84 SF	1	2′ x 2′ Ceiling Tile, Directional Fissures and Holes/ 1st Floor, Locker Room, Southeast Bathroom, Southwest Area, On Ceiling, 8.5′ Ht.	Friable	**No Asbestos Detected**
7348-03-10-23 25016076-023	-	1	2′ x 2′ Ceiling Tile, Directional Fissures and Holes/ 1st Floor, Locker Room, Southwest Central Bathroom, South Central Area, On Ceiling, 8.5′ Ht.	Friable	**No Asbestos Detected**
7348-03-10-20 25016076-020	1044 SF	1	2′ x 4′ Ceiling Tile, Horizontal Fissures and Holes/ 1st Floor, South Central Captain's Office, West Side, Center, On Ceiling, 8.5′ Ht.	Friable	**No Asbestos Detected**
7348-03-10-21 25016076-021	-	1	2′ x 4′ Ceiling Tile, Horizontal Fissures and Holes/ 1st Floor, Dining Room, East Side, Center, On Ceiling, 8.5′ Ht.	Friable	**No Asbestos Detected**
7348-03-10-01 25016076-001	360 SF	1	Cream Pipe Sealant/ Basement, Northwest Exercise Room, Northeast Area, On Fiberglass Insulated Pipe, 7′ Ht.	Non-Friable	**No Asbestos Detected**
7348-03-10-02 25016076-002	-	1	Cream Pipe Sealant/ Basement, Southwest Room, West Central Area, On Fiberglass Insulated Pipe, 6.5′ Ht.	Non-Friable	**No Asbestos Detected**
7348-03-10-03 25016076-003	-	1	Cream Pipe Sealant/ Basement, Southeast Room, Northeast Area, On Fiberglass Insulated Pipe, 6.5′ Ht.	Non-Friable	**No Asbestos Detected**

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TABLE 2 (CONTINUED): CONFIRMED NON ASBESTOS-CONTAINING MATERIALS AT FIRE STATION 16, 4111 KINGS HIGHWAY, DAYTON, OHIO, COLLECTED MARCH 10 AND 31, 2025. HELIX PROJECT NO. 7348.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	PLM Result (% Asbestos)
7348-03-10-06 25016076-006	360 SF	1	Cream Pipe Sealant/ Basement, Southeast Room, Northwest Central Boiler Room, Southeast Central Area, On Fiberglass Insulated Pipe, 7' Ht.	Non-Friable	**No Asbestos Detected**
7348-03-10-39 25016076-039	-	1	Cream Pipe Sealant/ 1st Floor, West Vehicle Bay, Northeast Area, On Ceiling Radiotor, On Fiberglass Insulated Pipe, 13' Ht.	Non-Friable	**No Asbestos Detected**
7348-03-10-44 25016076-044	-	1	Cream Pipe Sealant/ 1st Floor, Locker Room, Southwest Central Area, On Fiberglass Insulated Pipe, 7' Ht.	Non-Friable	**No Asbestos Detected**
7348-03-10-07 25016076-007	400 SF	1	Drywall, Drywall/ Basement, Southeast Central Office, West Wall, Central Area, 4' Ht.	Non-Friable	**No Asbestos Detected**
		2	Drywall, Joint Compound/ Basement, Southeast Central Office, West Wall, Central Area, 4' Ht.	Non-Friable	**No Asbestos Detected**
7348-03-10-08 25016076-008	-	1	Drywall, Drywall/ Basement, Southeast Central Office, East Wall, Central Area, 4' Ht.	Non-Friable	**No Asbestos Detected**
		2	Drywall, Joint Compound/ Basement, Southeast Central Office, East Wall, Central Area, 4' Ht.	Non-Friable	**No Asbestos Detected**
7348-03-10-24 25016076-024	3,000 SF	1	Drywall, Drywall/ 1st Floor, Locker Room, Southeast Bathroom, East Wall, South Area, 9' Ht.	Non-Friable	**No Asbestos Detected**
		2	Drywall, Joint Compound/ 1st Floor, Locker Room, Southeast Bathroom, East Wall, South Area, 9' Ht.	Non-Friable	**No Asbestos Detected**

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TABLE 2 (CONTINUED): CONFIRMED NON ASBESTOS-CONTAINING MATERIALS AT FIRE STATION 16, 4111 KINGS HIGHWAY, DAYTON, OHIO, COLLECTED MARCH 10 AND 31, 2025. HELIX PROJECT NO. 7348.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	PLM Result (% Asbestos)
7348-03-31-05 25021185-005	3,000 SF	1	Drywall, Drywall/ 1st Floor, North Central Dormitory, Northwest Central Area, In Sleeping Cubicle, North Wall, Center, 4' Ht.	Non-Friable	**No Asbestos Detected**
		2	Drywall, Joint Compound/ 1st Floor, North Central Dormitory, Northwest Central Area, In Sleeping Cubicle, North Wall, Center, 4' Ht.	Non-Friable	**No Asbestos Detected**
7348-03-31-06 25021185-006	-	1	Drywall, Drywall/ 1st Floor, North Central Dormitory, Southeast Central Area, On Outer Southwest Corner of Southeast Sleeping Cubicle, 4' Ht.	Non-Friable	**No Asbestos Detected**
		2	Drywall, Joint Compound/ 1st Floor, North Central Dormitory, Southeast Central Area, On Outer Southwest Corner of Southeast Sleeping Cubicle, 4' Ht.	Non-Friable	**No Asbestos Detected**
7348-03-10-13 25016076-013	320 SF	1	Hard Plaster/ Basement, Northwest Exercise Room, Central Area, On Ceiling, 8.5' Ht.	Non-Friable	**No Asbestos Detected**
7348-03-10-14 25016076-014	-	1	Hard Plaster/ Basement, Northwest Central Boiler Room, Southeast Area, On Ceiling, 8.5' Ht.	Non-Friable	**No Asbestos Detected**
7348-03-10-15 25016076-015		1	Hard Plaster/ Basement, Northwest Central Boiler Room, Northwest Area, On Ceiling, 8.5' Ht.	Non-Friable	**No Asbestos Detected**
7348-03-10-40 25016076-040	8,900 SF	1	Hard Plaster/ 1st Floor, West Vehicle Bay, Northwest Area, On Ceiling, 14' Ht.	Non-Friable	**No Asbestos Detected**

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Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	PLM Result (% Asbestos)
7348-03-10-41 25016076-041	8,900 SF	1	Hard Plaster, Hard Plaster / 1st Floor, West Vehicle Bay, Central Area, On Ceiling, At Hole, 14′ Ht.	Non-Friable	**No Asbestos Detected**
		2	Hard Plaster, Skim Coat/ 1st Floor, West Vehicle Bay, Central Area, On Ceiling, At Hole, 14′ Ht.	Non-Friable	**No Asbestos Detected**
7348-03-10-45 25016076-045	-	1	Hard Plaster/ 1st Floor, North Central Dormitory, Southwest Corner, On Ceiling, 8.5′ Ht.	Non-Friable	**No Asbestos Detected**
7348-03-10-47 25016076-047	-	1	Hard Plaster, Hard Plaster / 1st Floor, SE Central Hallway, South Central Area, On Ceiling, 9′ Ht.	Non-Friable	**No Asbestos Detected**
		2	Hard Plaster, Skim Coat/ 1st Floor, Southeast Central Hallway, South Central Area, On Ceiling, 9′ Ht.	Non-Friable	**No Asbestos Detected**
7348-03-10-48 25016076-048	-	1	Hard Plaster, Hard Plaster / 1st Floor, Locker Room, Southwest Corner Area, On Ceiling, 9′ Ht.	Non-Friable	**No Asbestos Detected**
		2	Hard Plaster, Skim Coat/ 1st Floor, Locker Room, Southwest Corner Area, On Ceiling, 9′ Ht.	Non-Friable	**No Asbestos Detected**
7348-03-10-46 25016076-046	130 SF	1	4″ Black Cove Base, Cove Base/ 1st Floor, Locker Room, East Central Area, On Lockers, South Side, 0′ Ht.	Non-Friable	**No Asbestos Detected**
		2	4″ Black Cove Base, Brown Mastic/ 1st Floor, Locker Room, East Central Area, On Lockers, South Side, 0′ Ht.	Non-Friable	**No Asbestos Detected**
7348-03-31-07 25021185-007	-	1	4″ Black Cove Base, Brown Mastic/ 1st Floor, Locker Room, Southeast Corner, Behind Door, 0′ Ht.	Non-Friable	**No Asbestos Detected**
		2	4″ Black Cove Base, Brown Mastic/ 1st Floor, Locker Room, Southeast Corner, Behind Door, 0′ Ht.	Non-Friable	**No Asbestos Detected**

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TABLE 2 (CONTINUED): CONFIRMED NON ASBESTOS-CONTAINING MATERIALS AT FIRE STATION 16, 4111 KINGS HIGHWAY, DAYTON, OHIO, COLLECTED MARCH 10 AND 31, 2025. HELIX PROJECT NO. 7348.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	PLM Result (% Asbestos)
7348-03-31-04 25021185-004	12 SF	1	4" Dark Brown Cove Base, Cove Base/ 1st Floor, South Central Custodial Closet, North Wall, East Area, 0' Ht.	Non-Friable	**No Asbestos Detected**
		2	4" Dark Brown Cove Base, Brown Mastic/ 1st Floor, South Central Custodial Closet, North Wall, East Area, 0' Ht.	Non-Friable	**No Asbestos Detected**
7348-03-31-08 25021185-008		1	4" Dark Brown Cove Base, Cove Base/ 1st Floor, South Central Custodial Closet, North Wall, West Area, 0' Ht.	Non-Friable	**No Asbestos Detected**
		2	4" Dark Brown Cove Base, Brown Mastic/ 1st Floor, South Central Custodial Closet, North Wall, West Area, 0' Ht.	Non-Friable	**No Asbestos Detected**
7348-03-31-09 25021185-009	400 SF	1	Tan Ceramic Tile Adhesive/ 1st Floor, Locker Room, South Wall, At Central Restroom, 7' Ht.	Non-Friable	**No Asbestos Detected**
7348-03-31-10 25021185-010	-	1	Tan Ceramic Tile Adhesive/ 1st Floor, Locker Room, South Wall, At West Restroom, 7' Ht.	Non-Friable	**No Asbestos Detected**
7348-03-31-01 25021185-001	960 SF	1	Yellow Concrete Block Sealant/ 1st Floor, Central Turn-Out Gear Room, South Wall, Center, 6" Ht.	Non-Friable	**No Asbestos Detected**
7348-03-31-02 25021185-002	-	1	Yellow Concrete Block Sealant/ 1st Floor, South Central Custodial Closet, West Wall, Center, 6" Ht.	Non-Friable	**No Asbestos Detected**

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TABLE 2 (CONTINUED): CONFIRMED NON ASBESTOS-CONTAINING MATERIALS AT FIRE STATION 16, 4111 KINGS HIGHWAY, DAYTON, OHIO, COLLECTED MARCH 10 AND 31, 2025. HELIX PROJECT NO. 7348.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	PLM Result (% Asbestos)
7348-03-31-03 25021185-003	960 SF	1	Yellow Concrete Block Sealant/ 1st Floor, Central Hallway, Northwest Area, West Wall, ,North Central Area, 6′ Ht.	Non-Friable	**No Asbestos Detected**
7348-03-10-11 25016076-011	170 SF	1	12″ x 12″ Tan Mottled Floor Tile, Floor Tile/ Basement, Southeast Central Office, Southwest Area, At Entrance, On Floor, 0′ Ht.	Non-Friable	**No Asbestos Detected**
		2	12″ x 12″ Tan Mottled Floor Tile, Tan Mastic/ Basement, Southeast Central Office, Southwest Area, At Entrance, On Floor, 0′ Ht.	Non-Friable	**No Asbestos Detected**
7348-03-10-12 25016076-012	-	1	12″ x 12″ Tan Mottled Floor Tile, Floor Tile/ Basement, Southeast Central Office, West Central Area, At Entrance, On Floor, 0′ Ht.	Non-Friable	**No Asbestos Detected**
		2	12″ x 12″ Tan Mottled Floor Tile, Tan Mastic/ Basement, Southeast Central Office, West Central Area, At Entrance, On Floor, 0′ Ht.	Non-Friable	**No Asbestos Detected**
7348-03-10-49 25016076-049	650 SF	1	12″ x 12″ Tan Mottled Floor Tile, Floor Tile/ 1st Floor, Locker Room, Southwest Corner, On Floor, 0′ Ht.	Non-Friable	**No Asbestos Detected**
		2	12″ x 12″ Tan Mottled Floor Tile, Yellow Mastic/ 1st Floor, Locker Room, SW Corner, On Floor, 0′ Ht.	Non-Friable	**No Asbestos Detected**
7348-03-10-50 25016076-050	-	1	12″ x 12″ Tan Mottled Floor Tile, Floor Tile/ 1st Floor, Locker Room, Southeast Corner, On Floor, 0′ Ht.	Non-Friable	**No Asbestos Detected**
		2	12″ x 12″ Tan Mottled Floor Tile, Yellow Mastic/ 1st Floor, Locker Room, SE Corner, On Floor, 0′ Ht.	Non-Friable	**No Asbestos Detected**

Ohio EPA REGULATED ASBESTOS-CONTAINING BUILDING MATERIAL **>1% Asbestos**
US EPA REGULATED ASBESTOS-CONTAINING BUILDING MATERIAL **>1% Asbestos**
OSHA REGULATED ASBESTOS-CONTAINING MATERIAL **>1% Asbestos**

TABLE 2 (CONTINUED): CONFIRMED NON ASBESTOS-CONTAINING MATERIALS AT FIRE STATION 16, 4111 KINGS HIGHWAY, DAYTON, OHIO, COLLECTED MARCH 10 AND 31, 2025. HELIX PROJECT NO. 7348.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	PLM Result (% Asbestos)
7348-03-10-51 25016076-051	15 SF	1	12″ x 12″ Taupe Mottled Floor Tile, Floor Tile/ 1st Floor, Locker Room, Southeast Area, Under Sinks, On Floor, 0′ Ht.	Non-Friable	**No Asbestos Detected**
		2	12″ x 12″ Taupe Mottled Floor Tile, Yellow Mastic/ 1st Floor, Locker Room, Southeast Area, Under Sinks, On Floor, 0′ Ht.	Non-Friable	**No Asbestos Detected**
7348-03-10-52 25016076-052	-	1	12″ x 12″ Taupe Mottled Floor Tile, Floor Tile/ 1st Floor, Locker Room, Southeast Area, Southwest Corner, Under Sinks, On Floor, 0′ Ht.	Non-Friable	**No Asbestos Detected**
		2	12″ x 12″ Taupe Mottled Floor Tile, Yellow Mastic/ 1st Floor, Locker Room, Southeast Area, Southwest Corner, Under Sinks, On Floor, 0′ Ht.	Non-Friable	**No Asbestos Detected**
7348-03-10-53 25016076-053	230 SF	1	12″ x 12″ Bronze Mottled Floor Tile, Floor Tile/ 1st Floor, Kitchen, Northwest Area, At Entrance, On Floor, 0′ Ht.	Non-Friable	**No Asbestos Detected**
		2	12″ x 12″ Bronze Mottled Floor Tile, Black Mastic/ 1st Floor, Kitchen, Northwest Area, At Entrance, On Floor, 0′ Ht.	Non-Friable	**No Asbestos Detected**
7348-03-10-54 25016076-054	-	1	12″ x 12″ Bronze Mottled Floor Tile, Floor Tile/ 1st Floor, Kitchen, East Central Area, At Entrance, On Floor, 0′ Ht.	Non-Friable	**No Asbestos Detected**
		2	12″ x 12″ Bronze Mottled Floor Tile, Black Mastic/ 1st Floor, Kitchen, East Central Area, At Entrance, On Floor, 0′ Ht.	Non-Friable	**No Asbestos Detected**

Ohio EPA REGULATED ASBESTOS-CONTAINING BUILDING MATERIAL **>1% Asbestos**
US EPA REGULATED ASBESTOS-CONTAINING BUILDING MATERIAL **>1% Asbestos**
OSHA REGULATED ASBESTOS-CONTAINING MATERIAL **>1% Asbestos**

TABLE 2 (CONTINUED): CONFIRMED NON ASBESTOS-CONTAINING MATERIALS AT FIRE STATION 16, 4111 KINGS HIGHWAY, DAYTON, OHIO, COLLECTED MARCH 10 AND 31, 2025. HELIX PROJECT NO. 7348.

Helix Sample No. Lab Sample No.	Amount	Layer	Description/Sample Location	Friable or Non-Friable	PLM Result (% Asbestos)
7348-03-31-17 25021185-017	30 SF	1	Black Sink Soundproofing/ 1st Floor, Kitchen, Southeast Central Area, Under Sink, East Side, 2' Ht.	Non-Friable	**No Asbestos Detected**
7348-03-31-18 25021185-018	-	1	Black Sink Soundproofing/ 1st Floor, Kitchen, Southeast Central Area, Under Sink, East Side, 2' Ht.	Non-Friable	**No Asbestos Detected**
7348-03-31-13 25021185-013	60 SF	1	Grey Exterior Caulk/ Exterior, North Side, At Central Vehicle Bay Entrance, East Side, 4.5' Ht.	Non-Friable	**No Asbestos Detected**
7348-03-31-14 25021185-014	-	1	Grey Exterior Caulk/ Exterior, South Side, Central Area, At Main Entrance, East Side, 4.5' Ht.	Non-Friable	**No Asbestos Detected**
7348-03-31-15 25021185-015	80 SF	1	Light Grey Exterior Caulk/ Exterior, West Side, North Central Area, On Window Sill, 4' Ht.	Non-Friable	**No Asbestos Detected**
7348-03-31-16 25021185-016	-	1	Light Grey Exterior Caulk/ Exterior, East Side, Southeast Corner, On South Window Sill, 2' Ht.	Non-Friable	**No Asbestos Detected**

Ohio EPA REGULATED ASBESTOS-CONTAINING BUILDING MATERIAL >1% Asbestos
US EPA REGULATED ASBESTOS-CONTAINING BUILDING MATERIAL >1% Asbestos
OSHA REGULATED ASBESTOS-CONTAINING MATERIAL >1% Asbestos

DISCUSSION AND RECOMMENDATIONS

A total of seventy-two (72) total bulk samples of suspect asbestos-containing materials, some containing multiple layers, were collected from the Fire Station 16 Building located at 4111 Kings Highway renovation areas. Samples were collected from all accessible suspect asbestos-containing building materials in the accessible renovation areas with the exception of roofing materials, fire doors, and boilers which were in use and energized electrical insulation materials.

Analytical results confirmed that the following suspect asbestos-containing building materials at Fire Station 16, 4111 Kings Highway in Dayton, Ohio contain or were assumed to contain more than 1% asbestos:

- Grey Interior Caulk, Basement, Throughout, Around Door Frames, Window Frames, and Joints (200 LF, 18 SF)
- 9″ x 9″ Tan Streaked Floor Tile, 1st Floor, North Central Dormitory and Dining Room, Throughout (1600 SF)
- 9″ x 9″ Pink Streaked Floor Tile, 1st Floor, North Central Dormitory, Southwest Entrance (5 SF)
- 9″ x 9″ Terracotta Streaked Floor Tile, 1st Floor, Central Hallway and Rooms, Throughout (700 SF)
- 9″ x 9″ Grey and Green Streaked Floor Tile, 1st Floor, Captain's Office, Throughout (20 SF)
- 9″ x 9″ Green Streaked Floor Tile, 1st Floor, Southwest Office and Captain's Office, Throughout (150 SF)
- 9″ x 9″ Maroon and Red Streaked Floor Tile, 1st Floor, Northeast Dining Room, Northwest Entrance and South Central Hallway, South Entrance (20 SF)
- White Vibration Isolator Cloth, Basement, Southwest Room, Southeast Central Area, On Air Handler (6 SF Total, Not Sampled, Assumed to Contain Asbestos)
- Fire Doors, Basement, Boiler Room Door and North Maintenance Room Exit Doors (80 SF, 3 Not Sampled, Assumed to Contain Asbestos)
- Boiler Exhaust Flue, From the Basement Boiler to the Central Tower, Extending into the Top of the Central Tower Roof, (140 SF Total, Not Sampled, Assumed to Contain Asbestos)
- Electrical Insulators, Throughout, All Electrical Insulators within Switch Gears, Circuit Breakers and Safety Switches (26.25 SF Total, Not Sampled, Assumed to Contain Asbestos)

- Bituminous Roofing, All Roofing on Building (8900 SF Total, Not Sampled, Assumed to Contain Asbestos)

Several materials were reported to contain 2% asbestos by PLM visual area estimation, but were reported to contain less than 1% by PLM 400 Point Count with Gravimetric Reduction analytical methods:

- Grey Interior Caulk, 1st Floor, Throughout (80 SF)
- Ceramic Floor Tile Grout, 1st Floor, Locker Room, In Bathrooms and Showers, All Three Restrooms, Throughout (170 SF Total, Confirmed to Contain Less than 1% Asbestos)

OSHA has interpreted its regulations to require wet methods for the removal of materials containing less than 1% asbestos, with prompt cleanup of debris in leak tight containers. Helix Environmental, Inc. recommends the use of a licensed asbestos abatement company to perform this work since they have the equipment, experience, and knowledge to safely remove materials containing trace amounts of asbestos without creating a potential hazard.

No special asbestos requirements are necessary for their removal and disposal of sampled suspect materials which were found to contain no detectable asbestos.

Current Federal and State regulations require special asbestos abatement procedures prior to building demolition that will disturb confirmed or assumed friable or potentially-friable asbestos-containing materials. Helix Environmental, Inc. recommends that the identified asbestos-containing materials be removed using a licensed asbestos abatement contractor. Helix Environmental, Inc. also strongly recommends that the abatement work be competitively bid using specifications developed by a licensed Asbestos Project Designer to ensure that the regulatory requirements are met by the contractor and that the work is properly documented in the event of future legal action.

Trained workers and supervisors certified by OEPA must be used to remove the identified asbestos-containing building materials using special procedures and protective equipment to ensure that the workers are not overexposed to airborne asbestos. Advance notification may need to be provided to both the Regional Air Pollution Control Agency (RAPCA) and OEPA at least ten working days in advance of the start of abatement on site, depending on the quantity of materials removed. The fact

that asbestos-containing materials were observed in or on the building should be noted on the demolition notification form along with the name and certification number of the inspectors (Mr. Benjamin Froehlich, Ohio Certification Cert. No. ES34739). In addition, approximately 4,000 SF of bituminous roofing materials on the Main Building and 800 SF of bituminous roofing materials on the East Addition were also observed by the inspectors, and were Category I Non-Friable materials. Under current EPA regulations, Category I Non-Friable materials, including bituminous roofing materials, resilient flooring material, and non-friable gaskets, do not need to be removed from buildings prior to their demolition. The quantities of these Category I Non-Friable materials must be noted on the demolition/renovation notification form which must be sent to the Ohio EPA at least 10-working days prior to the start of demolition or asbestos abatement.

Additional suspect asbestos-containing materials may be hidden in uninspected or inaccessible locations, such as pipe chases, duct chases or wall cavities. If any additional suspect materials are encountered in these locations, they should be kept intact and undisturbed until they can be inspected and sampled by a licensed Asbestos Hazard Evaluation Specialist. Helix Environmental, Inc. will also be happy to return to the site if additional suspect materials are encountered during the renovation.

Since the building was built prior to 1978 when lead was banned for interior coatings, it was assumed that all paint present in the renovation area contains detectable levels of lead. Demolition contractors which will disturb assumed lead-containing painted surfaces must comply with the requirements of the OSHA Construction Industry Lead regulations prior to and during any work which may disturb lead-containing coatings. A separate report was submitted to document the results of a Preliminary Lead-Containing Paint inspection in both buildings.

Other potential environmental issues may also be present in the renovation area, including mercury-containing materials, suspect PCB-containing fluorescent light ballasts, and Freon®-containing refrigerants.

Mercury-containing fluorescent light bulbs in the building have sufficient concentrations of mercury to be considered universal hazardous waste. In addition, thermostats in the buildings may contain small amounts of mercury, and one mercury-containing thermostat was observed during inspection. Batteries associated with emergency lighting may also contain mercury, and are considered to be universal

hazardous waste. These universal waste materials should be carefully removed from the building and recycled in accordance with current regulations.

Fluorescent light ballasts were made with PCBs until 1979. Ballasts made after that date are required to be marked with the legend "No PCBs". Given the age of the building, PCB-containing fluorescent light ballasts and other PCB-containing electrical capacitors and transformers may be present in the building, and each ballast, capacitor or transformer should be examined to determine if it is labeled "No PCBs". If necessary, ballasts, capacitors and transformers that are not so labeled should be carefully removed from the building and packaged and labeled for recycling or incineration in accordance with current regulations.

Refrigerated cooling systems in the buildings, including water coolers, window air-conditioners, and refrigerators, typically contain Freon® refrigerants that must be recovered by licensed refrigerant recycler if removed, in accordance with current regulations. No unauthorized venting of Freon® refrigerants to the atmosphere is permitted under current regulations, since these materials deplete the stratospheric ozone layer (Ozone Depleting Substances).

Finally, no significant accumulations of hazardous waste were observed during the building inspection that could require special remediation, although small amounts of maintenance and custodial chemicals including interior paint were observed in or near the renovation area. It was assumed that the remaining maintenance and custodial chemicals present in the renovation area will be relocated for use during normal custodial and maintenance operations. If not, then these materials may need to be labeled, packaged and transported to a licensed hazardous waste Treatment, Storage and Disposal site in compliance with federal and state hazardous waste regulations.

The results of this inspection can only reflect the condition of the property at the date and time of the site visit within the limits of the proposed work. There are limitations to asbestos inspections without dismantling or destroying the building or its systems. No inspection was performed in inaccessible locations. Recommendations are based on the professional judgment of the inspectors, and the results of the samples collected and analyzed. Helix Environmental, Inc. and its agents are neither responsible nor liable for the non-discovery of any defects in materials, craftsmanship, or other conditions, or any problems that may be discovered or manifest after the site visit date and time. Helix Environmental, Inc. and its agents make no warranty, expressed or implied, and accept no liability for the

presence absence of asbestos or other hazardous materials in or on building products, materials, or areas. Helix Environmental, Inc. and its agents assume no responsibility for the cost of repairing, replacing, or removing any undiscovered or unreported condition or defect, or any future condition or defect.

If you have any questions or comments concerning the inspection or analytical results, please call me at (937) 226-0650.

Sincerely,

HELIX ENVIRONMENTAL, INC.

Ralph A. Froehlich, CIH, CSP, QEP
President
Attach.

ATTACHMENTS

- **ANALYTICAL RESULTS AND SAMPLE DATA SHEETS**
- **SAMPLE LOCATIONS**
- **PHOTOGRAPHS**

SanAir Technologies Laboratory

The Identification Specialists

Analysis Report prepared for Helix Environmental Inc

Report Date: 3/12/2025

Project Name: Fire Station 16, 4111 Kings Highway

Project #: 7348

SanAir ID#: 25016076

NVLAP TESTING

NVLAP LAB CODE 200870-0

10501 Trade Court, North Chesterfield, Virginia 23236
888.895.1177 | 804.897.1177 | fax: 804.897.0070 | LabReports@SanAir.com | SanAir.com

SanAir ID Number
25016076
FINAL REPORT
3/12/2025 12:32:15 PM

Name: Helix Environmental Inc
Address: 1 Elizabeth Place
Suite 160
Dayton, OH 45417
Phone: 937-226-0650

Project Number: 7348
P.O. Number:
Project Name: Fire Station 16, 4111 Kings Highway
Collected Date: 3/10/2025
Received Date: 3/11/2025 10:40:00 AM

Dear Benjamin Froehlich,

We at SanAir would like to thank you for the work you recently submitted. The 54 sample(s) were received on Tuesday, March 11, 2025 via UPS. The final report(s) is enclosed for the following sample(s): 7348-03-10-01, 7348-03-10-02, 7348-03-10-03, 7348-03-10-04, 7348-03-10-05, 7348-03-10-06, 7348-03-10-07, 7348-03-10-08, 7348-03-10-09, 7348-03-10-10, 7348-03-10-11, 7348-03-10-12, 7348-03-10-13, 7348-03-10-14, 7348-03-10-15, 7348-03-10-16, 7348-03-10-17, 7348-03-10-18, 7348-03-10-19, 7348-03-10-20, 7348-03-10-21, 7348-03-10-22, 7348-03-10-23, 7348-03-10-24, 7348-03-10-25, 7348-03-10-26, 7348-03-10-27, 7348-03-10-28, 7348-03-10-29, 7348-03-10-30, 7348-03-10-31, 7348-03-10-32, 7348-03-10-33, 7348-03-10-34, 7348-03-10-35, 7348-03-10-36, 7348-03-10-37, 7348-03-10-38, 7348-03-10-39, 7348-03-10-40, 7348-03-10-41, 7348-03-10-42, 7348-03-10-43, 7348-03-10-44, 7348-03-10-45, 7348-03-10-46, 7348-03-10-47, 7348-03-10-48, 7348-03-10-49, 7348-03-10-50, 7348-03-10-51, 7348-03-10-52, 7348-03-10-53, 7348-03-10-54.

These results only pertain to this job and should not be used in the interpretation of any other job. This report is only complete in its entirety. Refer to the listing below of the pages included in a complete final report.

Sincerely,

Sandra Sobrino
Asbestos & Materials Laboratory Manager
SanAir Technologies Laboratory

Final Report Includes:
- Cover Letter
- Analysis Pages
- Disclaimers and Additional Information

Sample conditions:
- 54 samples in Good condition.

SanAir ID Number
25016076
FINAL REPORT
3/12/2025 12:32:15 PM

Name: Helix Environmental Inc
Address: 1 Elizabeth Place
Suite 160
Dayton, OH 45417
Phone: 937-226-0650

Project Number: 7348
P.O. Number:
Project Name: Fire Station 16, 4111 Kings Highway
Collected Date: 3/10/2025
Received Date: 3/11/2025 10:40:00 AM

Analyst: Mayes, Jean

Asbestos Bulk PLM EPA 600/R-93/116

	Stereoscopic	Components		
SanAir ID / Description	Appearance	% Fibrous	% Non-fibrous	Asbestos Fibers
7348-03-10-01 / 25016076-001 Basement, NW Exercise Room, NE Corner, On Fiberglass	Various Fibrous Heterogeneous	50% Cellulose 5% Glass	45% Other	None Detected
7348-03-10-02 / 25016076-002 Basement, SW Room, West Central Area, On Fiberglass	Cream Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-10-03 / 25016076-003 Basement, SE Room, NE Area, On Fiberglass Insulated Pipe	Cream Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-10-04 / 25016076-004 Basement, SW Central Hose Drainage Closet, SE Doorway, S.	Grey Non-Fibrous Homogeneous		97% Other	3% Chrysotile
7348-03-10-05 / 25016076-005 Basement, NW Exercise Room, SE Entrance, West Side, 1.5' Ht.	Grey Non-Fibrous Homogeneous		97% Other	3% Chrysotile
7348-03-10-06 / 25016076-006 Basement, N West Central Boiler Room, SE Central Area, On	Cream Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-10-07 / 25016076-007 Basement, SE Central Office, West Wall, Central Area, 4' Ht., Drywall	Various Non-Fibrous Heterogeneous	10% Cellulose	90% Other	None Detected
7348-03-10-07 / 25016076-007 Basement, SE Central Office, West Wall, Central Area, 4' Ht., Joint Compound	White Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-10-08 / 25016076-008 Basement, SE Central Office, East Wall, Central Area, 5' Ht., Drywall	Various Non-Fibrous Heterogeneous	10% Cellulose	90% Other	None Detected
7348-03-10-08 / 25016076-008 Basement, SE Central Office, East Wall, Central Area, 5' Ht., Joint Compound	White Non-Fibrous Homogeneous		100% Other	None Detected

Analyst: J. Mayes
Analysis Date: 3/12/2025

Approved Signatory: Sandra Robins
Date: 3/12/2025

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Analyst: Mayes, Jean

Asbestos Bulk PLM EPA 600/R-93/116

	Stereoscopic	Components		
SanAir ID / Description	Appearance	% Fibrous	% Non-fibrous	Asbestos Fibers
7348-03-10-09 / 25016076-009 Basement, SE Central Office, N. Wall, Central Area, 0' Ht., Cove Base	Brown Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-10-09 / 25016076-009 Basement, SE Central Office, N. Wall, Central Area, 0' Ht., Mastic	Tan Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-10-10 / 25016076-010 Basement, SE Central Office, E. Wall, Central Area, 0' Ht., Cove Base	Brown Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-10-10 / 25016076-010 Basement, SE Central Office, E. Wall, Central Area, 0' Ht., Mastic	Tan Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-10-11 / 25016076-011 Basement, SE Central Office, SW Area, In Doorway, 0' Ht., Floor Tile	Tan Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-10-11 / 25016076-011 Basement, SE Central Office, SW Area, In Doorway, 0' Ht., Mastic	Tan Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-10-12 / 25016076-012 Basement, SE Central Office, West Wall, S. Central Area, Floor Tile	Tan Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-10-12 / 25016076-012 Basement, SE Central Office, West Wall, S. Central Area, Mastic	Tan Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-10-13 / 25016076-013 Basement, NW Exercise Room, Central Area, On Ceiling, 8.5'	Grey Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-10-14 / 25016076-014 Basement, West Central Boiler Room, SE Area, On Ceiling 8.5'	Grey Non-Fibrous Homogeneous		100% Other	None Detected

Analyst: J. Mayes
Analysis Date: 3/12/2025

Approved Signatory: Sandra Robins
Date: 3/12/2025

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Analyst: Mayes, Jean

Asbestos Bulk PLM EPA 600/R-93/116

	Stereoscopic	Components		
SanAir ID / Description	Appearance	% Fibrous	% Non-fibrous	Asbestos Fibers
7348-03-10-15 / 25016076-015 Basement, NW Central Boiler Room, NW Area, On Ceiling 8.5'	Grey Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-10-16 / 25016076-016 Basement, NW Exercise Room, E. Wall, Central Area, On	Grey Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-10-17 / 25016076-017 Basement, S. West Central Laundry Room, N. Wall, West Area	Grey Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-10-18 / 25016076-018 Basement, NW Central Boiler Rm., SW Area, On Boiler, N. Side	Grey Non-Fibrous Heterogeneous		100% Other	None Detected
7348-03-10-19 / 25016076-019 Basement, NW Central Boiler Rm., SW Area, On Boiler, N. Side	Grey Non-Fibrous Heterogeneous		100% Other	None Detected
7348-03-10-20 / 25016076-020 1st Fl., Captain's Office (S. Central Office), West Side	Tan Fibrous Heterogeneous	40% Cellulose 30% Glass	30% Other	None Detected
7348-03-10-21 / 25016076-021 1st Fl., Dining Room, (Mess Hall), E. Side, Center, 8.5' Ht.	Tan Fibrous Heterogeneous	40% Cellulose 30% Glass	30% Other	None Detected
7348-03-10-22 / 25016076-022 1st Fl., Locker Room, SE. Bathroom, SW Area, On Ceiling	Tan Fibrous Heterogeneous	40% Cellulose 30% Glass	30% Other	None Detected
7348-03-10-23 / 25016076-023 1st Fl., Locker Room, SW Central Bathroom, S. Central Area	Tan Fibrous Heterogeneous	40% Cellulose 30% Glass	30% Other	None Detected
7348-03-10-24 / 25016076-024 1st Fl., Locker Room, SE Bathroom, E. Wall, S. Area, 9' Ht., Drywall	Various Non-Fibrous Heterogeneous	10% Cellulose	90% Other	None Detected

Analyst: J. Mayes
Analysis Date: 3/12/2025

Approved Signatory: Sandra Robins
Date: 3/12/2025

SanAir ID Number
25016076
FINAL REPORT
3/12/2025 12:32:15 PM

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Project Name: Fire Station 16, 4111 Kings Highway
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Received Date: 3/11/2025 10:40:00 AM

Analyst: Mayes, Jean

Asbestos Bulk PLM EPA 600/R-93/116

	Stereoscopic	Components		
SanAir ID / Description	Appearance	% Fibrous	% Non-fibrous	Asbestos Fibers
7348-03-10-24 / 25016076-024 1st Fl., Locker Room, SE Bathroom, E. Wall, S. Area, 9' Ht., Joint Compound	White Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-10-25 / 25016076-025 1st Fl., N. Central Dormitory, W. Wall, S. Area, On Window	Grey Non-Fibrous Homogeneous		97% Other	3% Chrysotile
7348-03-10-26 / 25016076-026 1st Fl., N. Central Dormitory, SE Area, At SE Entrance, 0', Floor Tile	Tan Non-Fibrous Homogeneous		96% Other	4% Chrysotile
7348-03-10-26 / 25016076-026 1st Fl., N. Central Dormitory, SE Area, At SE Entrance, 0', Mastic	Black Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-10-27 / 25016076-027 1st Fl, N. Central Dormitory, NW Corner, 0' Ht. 9"x9", Floor Tile	Tan Non-Fibrous Homogeneous		96% Other	4% Chrysotile
7348-03-10-27 / 25016076-027 1st Fl, N. Central Dormitory, NW Corner, 0' Ht. 9"x9", Mastic	Black Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-10-28 / 25016076-028 1st Fl., N. Central Dormitory, SW Area, At SW Entrance, Floor Tile	Pink Non-Fibrous Homogeneous		96% Other	4% Chrysotile
7348-03-10-28 / 25016076-028 1st Fl., N. Central Dormitory, SW Area, At SW Entrance, Mastic	Black Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-10-29 / 25016076-029 1st Fl, N. Central Dormitory, SW Area, At SW Entrance 0' Ht., Floor Tile	Pink Non-Fibrous Homogeneous		96% Other	4% Chrysotile
7348-03-10-29 / 25016076-029 1st Fl, N. Central Dormitory, SW Area, At SW Entrance 0' Ht., Mastic	Yellow Non-Fibrous Homogeneous		100% Other	None Detected

Analyst: J. Mayes
Analysis Date: 3/12/2025

Approved Signatory: Sandra Jobin
Date: 3/12/2025

SanAir ID Number
25016076
FINAL REPORT
3/12/2025 12:32:15 PM

Name: Helix Environmental Inc
Address: 1 Elizabeth Place
Suite 160
Dayton, OH 45417
Phone: 937-226-0650

Project Number: 7348
P.O. Number:
Project Name: Fire Station 16, 4111 Kings Highway
Collected Date: 3/10/2025
Received Date: 3/11/2025 10:40:00 AM

Analyst: Mayes, Jean

Asbestos Bulk PLM EPA 600/R-93/116

	Stereoscopic	Components		
SanAir ID / Description	Appearance	% Fibrous	% Non-fibrous	Asbestos Fibers
7348-03-10-30 / 25016076-030 1st Fl, EW Hall At Truck Area Flooring 9"x9" Floor Tile, Floor Tile	Brown Non-Fibrous Homogeneous		96% Other	4% Chrysotile
7348-03-10-30 / 25016076-030 1st Fl, EW Hall At Truck Area Flooring 9"x9" Floor Tile, Mastic	Black Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-10-31 / 25016076-031 1st Fl, FW Hold, W Wall By Door 9"x9" Floor Tile, Terracotta, Floor Tile	Brown Non-Fibrous Homogeneous		96% Other	4% Chrysotile
7348-03-10-31 / 25016076-031 1st Fl, FW Hold, W Wall By Door 9"x9" Floor Tile, Terracotta, Mastic	Black Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-10-32 / 25016076-032 1st Fl, SW Office, N Center Floor 9"x9" Floor Tile, Streaked, Floor Tile	Grey Non-Fibrous Homogeneous		98% Other	2% Chrysotile
7348-03-10-32 / 25016076-032 1st Fl, SW Office, N Center Floor 9"x9" Floor Tile, Streaked, Mastic	Black Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-10-33 / 25016076-033 1st Fl, Captain's Office Toilet, NE Corner Floor 9"x9" Floor, Floor Tile	Grey Non-Fibrous Homogeneous		98% Other	2% Chrysotile
7348-03-10-33 / 25016076-033 1st Fl, Captain's Office Toilet, NE Corner Floor 9"x9" Floor, Mastic	Black Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-10-34 / 25016076-034 1st Fl, SW Office, N Center Floor 9"x9" Floor Tile, Streaked, Floor Tile	Green Non-Fibrous Homogeneous		96% Other	4% Chrysotile
7348-03-10-34 / 25016076-034 1st Fl, SW Office, N Center Floor 9"x9" Floor Tile, Streaked, Mastic	Yellow Non-Fibrous Homogeneous		100% Other	None Detected

Analyst: J. Mayes
Analysis Date: 3/12/2025

Approved Signatory: Sandra Robins
Date: 3/12/2025

SanAir ID Number
25016076
FINAL REPORT
3/12/2025 12:32:15 PM

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Project Number: 7348
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Project Name: Fire Station 16, 4111 Kings Highway
Collected Date: 3/10/2025
Received Date: 3/11/2025 10:40:00 AM

Analyst: Mayes, Jean

Asbestos Bulk PLM EPA 600/R-93/116

	Stereoscopic	Components		
SanAir ID / Description	Appearance	% Fibrous	% Non-fibrous	Asbestos Fibers
7348-03-10-35 / 25016076-035 1st Fl, SW Office, NE Corner Floor 9"x9" Floor Tile, Floor Tile	Green Non-Fibrous Homogeneous		96% Other	4% Chrysotile
7348-03-10-35 / 25016076-035 1st Fl, SW Office, NE Corner Floor 9"x9" Floor Tile, Mastic	Yellow Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-10-36 / 25016076-036 1st Fl Dining Room, SW Corner 4' Ht Caulk Interior	Grey Non-Fibrous Heterogeneous		98% Other	2% Chrysotile
7348-03-10-37 / 25016076-037 1st Fl., West Engine Bay, Central Area, On Magna Track	Grey Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-10-38 / 25016076-038 1st Fl., West Engine Bay, West Side, Center, On Magna Track	Grey Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-10-39 / 25016076-039 1st Fl., West Engine Bay, NE Area, On Ceiling Radiator Fan	Cream Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-10-40 / 25016076-040 1st Fl, Truck Area, NW Corner Ceiling 14' Ht Hard Plaster	Off-White Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-10-41 / 25016076-041 1st Fl, Truck Area, Center Ceiling By Hole 14' Ht Hard, Plaster	Off-White Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-10-41 / 25016076-041 1st Fl, Truck Area, Center Ceiling By Hole 14' Ht Hard, Skim Coat	White Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-10-42 / 25016076-042 1st Fl., S Entrance Area Floor At Door 9"x9" Streaked Floor, Floor Tile	Brown Non-Fibrous Homogeneous		98% Other	2% Chrysotile

Analyst: J. Mayes
Analysis Date: 3/12/2025

Approved Signatory: Sandra Jobrins
Date: 3/12/2025

SanAir ID Number
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Name: Helix Environmental Inc
Address: 1 Elizabeth Place
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Project Number: 7348
P.O. Number:
Project Name: Fire Station 16, 4111 Kings Highway
Collected Date: 3/10/2025
Received Date: 3/11/2025 10:40:00 AM

Analyst: Mayes, Jean

Asbestos Bulk PLM EPA 600/R-93/116

	Stereoscopic	Components		
SanAir ID / Description	Appearance	% Fibrous	% Non-fibrous	Asbestos Fibers
7348-03-10-42 / 25016076-042 1st Fl., S Entrance Area Floor At Door 9"x9" Streaked Floor, Mastic	Yellow Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-10-43 / 25016076-043 1st Fl., N Entrance (Dining Area) Floor At Door 9"x9", Floor Tile	Brown Non-Fibrous Homogeneous		98% Other	2% Chrysotile
7348-03-10-43 / 25016076-043 1st Fl., N Entrance (Dining Area) Floor At Door 9"x9", Mastic	Yellow Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-10-44 / 25016076-044 1st Fl., Locker Room, SW Central Area, On Fiberglass	Cream Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-10-45 / 25016076-045 1st Fl., N. Central Dormitory, SW Corner, On Ceiling, 8.5'	Tan Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-10-46 / 25016076-046 1st Fl, Locker Room, S Side Of Lockers 4" Cove Base & Mastic, Cove Base	Black Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-10-46 / 25016076-046 1st Fl, Locker Room, S Side Of Lockers 4" Cove Base & Mastic, Mastic	Brown Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-10-47 / 25016076-047 1st Fl, Locker Room, SW Corner Ceiling 9' Ht Hard Plaster, Plaster	Grey Non-Fibrous Heterogeneous		100% Other	None Detected
7348-03-10-47 / 25016076-047 1st Fl, Locker Room, SW Corner Ceiling 9' Ht Hard Plaster, Skim Coat	Cream Non-Fibrous Heterogeneous		100% Other	None Detected
7348-03-10-48 / 25016076-048 1st Fl, EW Hall, E Of Kitchen Door 9' Ht Hard Plaster, Plaster	Grey Non-Fibrous Heterogeneous		100% Other	None Detected

Analyst: J. Mayes
Analysis Date: 3/12/2025

Approved Signatory: Sandra Robins
Date: 3/12/2025

SanAir ID Number
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3/12/2025 12:32:15 PM

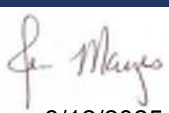
Name: Helix Environmental Inc
Address: 1 Elizabeth Place
Suite 160
Dayton, OH 45417
Phone: 937-226-0650

Project Number: 7348
P.O. Number:
Project Name: Fire Station 16, 4111 Kings Highway
Collected Date: 3/10/2025
Received Date: 3/11/2025 10:40:00 AM

Analyst: Mayes, Jean

Asbestos Bulk PLM EPA 600/R-93/116

	Stereoscopic	Components		
SanAir ID / Description	Appearance	% Fibrous	% Non-fibrous	Asbestos Fibers
7348-03-10-48 / 25016076-048 1st Fl, EW Hall, E Of Kitchen Door 9' Ht Hard Plaster, Skim Coat	Cream Non-Fibrous Heterogeneous		100% Other	None Detected
7348-03-10-49 / 25016076-049 1st Fl Locker Room, SW Corner Floor 12"x12" Floor Tile, Floor Tile	Tan Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-10-49 / 25016076-049 1st Fl Locker Room, SW Corner Floor 12"x12" Floor Tile, Mastic	Yellow Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-10-50 / 25016076-050 1st Fl Locker Room, SE Corner Floor 12"x12" Floor Tile, Floor Tile	Tan Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-10-50 / 25016076-050 1st Fl Locker Room, SE Corner Floor 12"x12" Floor Tile, Mastic	Yellow Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-10-51 / 25016076-051 1st Fl Locker Room SE Area Under Sinks 12"x12" Floor Tile, Floor Tile	Tan Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-10-51 / 25016076-051 1st Fl Locker Room SE Area Under Sinks 12"x12" Floor Tile, Mastic	Yellow Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-10-52 / 25016076-052 1st Fl, Locker Room, SW Area Under Sinks 12"x12" Floor Tile, Floor Tile	Tan Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-10-52 / 25016076-052 1st Fl, Locker Room, SW Area Under Sinks 12"x12" Floor Tile, Mastic	Yellow Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-10-53 / 25016076-053 1st Fl, Kitchen, NW Entrance Floor 12"x12" Floor Tile, Floor Tile	Brown Non-Fibrous Homogeneous		100% Other	None Detected

Analyst: 
Analysis Date: 3/12/2025

Approved Signatory: 
Date: 3/12/2025

SanAir ID Number
25016076
FINAL REPORT
3/12/2025 12:32:15 PM

Name: Helix Environmental Inc
Address: 1 Elizabeth Place
Suite 160
Dayton, OH 45417
Phone: 937-226-0650

Project Number: 7348
P.O. Number:
Project Name: Fire Station 16, 4111 Kings Highway
Collected Date: 3/10/2025
Received Date: 3/11/2025 10:40:00 AM

Analyst: Mayes, Jean

Asbestos Bulk PLM EPA 600/R-93/116

	Stereoscopic	Components		
SanAir ID / Description	Appearance	% Fibrous	% Non-fibrous	Asbestos Fibers
7348-03-10-53 / 25016076-053 1st Fl, Kitchen, NW Entrance Floor 12"x12" Floor Tile, Mastic	Black Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-10-54 / 25016076-054 1st Fl, Kitchen, SE Doorway Floor 12"x12" Floor Tile Mottled, Floor Tile	Brown Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-10-54 / 25016076-054 1st Fl, Kitchen, SE Doorway Floor 12"x12" Floor Tile Mottled, Mastic	Black Non-Fibrous Homogeneous		100% Other	None Detected

Analyst: J. Mayes
Analysis Date: 3/12/2025

Approved Signatory: Sandra Jobin
Date: 3/12/2025

Disclaimer and Additional Information:
Asbestos Bulk PLM EPA 600/R-93/116

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The information provided in this report applies only to the samples submitted and is relevant only for the date, time, and location of sampling. The accuracy of the results is dependent upon the client's sampling procedure and information provided to the laboratory by the client on the COC. SanAir assumes no responsibility for the sampling procedure and will provide evaluation reports based solely on the sample(s) in the condition received at the laboratory and information provided by the client on the COC, such as: project number, project name, collection dates, P.O. number, special instructions, samples collected by, sample numbers, sample identifications, sample type, selected analysis type, flow rate, total volume or area, and start-stop times that may affect the validity of the results in this report. Samples were received in good condition unless otherwise noted on the report. When the client requires samples to be tested that deviates from a specific method or condition, all reported results may be affected by the deviation. SanAir assumes no responsibility or liability for the manner in which the results are used or interpreted.

This report does not constitute nor shall not be used by the client to claim product, process, system, or person certification, approval, or endorsement by NVLAP, NIST, NELAC, AIHA LAP, LLC or any other U.S. governmental agencies; all or somet tests contained in this report may not be accredited by every local, state, and federal regulatory agencies. Refer to the SanAir website at www.sanair.com for copies of current certificates and scopes of various accreditations, certifications, and licenses or contact the laboratory for inquiries regarding the status or scope of an accreditation or certification.

Samples are held for a period of 60 days. Fibers smaller than 5 microns cannot be seen with this method due to scope limitations. For NY state samples, method EPA 600/M4-82-020 is performed.

NYELAP Disclaimer:
Polarized-light microscopy is not consistently reliable in detecting asbestos in floor covering and similar non-friable organically bound materials. Quantitative transmission electron microscopy is currently the only method that can be used to determine if this material can be considered or treated as non-asbestos containing.

Asbestos Accreditations, Certifications, and Licenses
National Voluntary Laboratory Accreditation Program (NVLAP) Lab Code 200870-0
City of Philadelphia Department of Public Health Air Management Services, Certification#ALL-460
Commonwealth of Pennsylvania Department of Environmental Protection Number 68-05397
California State Environmental Laboratory Accreditation Program Certificate Number 2915
Colorado Department of Public Health and Environment Registration Number AL-23143
Connecticut Department of Public Health Environmental Laboratory Registration Number PH-0105
Massachusetts Department of Labor Standards Asbestos Analytical Services License Number: AA000222
State of Maine Department of Environmental Protection License Number: LB-0075
New York State Department of Health Laboratory ID: 11983
State of Rhode Island Department of Health Certification No.: PLM00126
Texas Department of State Health Services License Number: 300440
Commonwealth of Virginia Department of Professional and Occupational Regulation Number: 3333000323
State of Washington Department of Ecology Laboratory ID: C989
State of West Virginia Bureau for Public Health Analytical Laboratory Number: LT000616
Vermont Department of Health License Number: Asb-Co-An-000006
Louisiana Department of Environmental Quality AI Number 212253, LELAP Lab ID #05088

25016076

HELIX ENVIRONMENTAL, INC.
1 Elizabeth Place, Suite 160 • Dayton, Ohio 45417-3445
Phone: (937) 226-0650 Fax: (937) 226-0653 Email: helix@helixenv.com

RUSH - YES OR (NO)

LABORATORY: San Air
DATE SAMPLED: 3/10/2025
DATE REQUIRED: 24 HR TAT
JOB NO./LOCATION: 7348 Dayton, OH
CLIENT: APP Architecture
BUILDING: Fire Station 16, 4111 Kings Highway
INSPECTOR: Ben Frech
JOB NUMBER: 7348

BULK SAMPLE DATA SHEET | **ANALYSES REQUESTED:** Asbestos PLM

HELIX SAMPLE ID NUMBER	AMOUNT	REPRESENTATIVE SAMPLE LOCATION	MATERIAL DESCRIPTION	FRIABLE/ NON	CONDITION	COMMENTS
7348-03-10-01	360 SF	Basement, NW Exercise Room, NE Corner, on Fiberglass Insulated Pipe, 7' Ht.	Cream/Tan Pipe Insulation Sealant	N	F	Steam Pipe
7348-03-10-02	—	Basement, SW Room, West Central Area, on Fiberglass Insulated Pipe, 6.5' Ht.	Cream/Tan Pipe Insulation Sealant	N	F	Cold water
7348-03-10-03	—	Basement, SE Room, NE Area, on Fiberglass Insulated Pipe, 6.5' Ht.	Cream/Tan Pipe Insulation Sealant	N	F	
7348-03-10-04	200 LF	Basement, SW Central Hose Drainage closet, SE Doorway, S. Side, 7' Ht.	Grey Doorway Caulk	N	F	(5 x 20 LF) x 2 / 100 x 2 = 200
7348-03-10-05	—	Basement, NW Exercise Room, SE Entrance, West Side, 1.5' Ht.	Grey Doorway Caulk	N	F	
7348-03-10-06		Basement, West Central Boiler Room, SE Central Area, on Fiberglass Insulated Pipe, 7' Ht.	Cream/Tan Pipe Insulation Sealant	N	P	Steam Pipe
7348-03-10-07	400 SF	Basement, SE Central Office, West Wall, Central Area, 4' Ht.	Drywall and Joint compound	N	F	Some Drywall also — no J.C. ~20 SF
7348-03-10-08	—	Basement, SE Central Office, East Wall, Central Area, 5' Ht.	Drywall and Joint compound	N	F	
7348-03-10-09	24 LF 8 SF	Basement, SE Central Office, N. Wall, Central Area, 0' Ht.	4" Dark Brown Cove Base and Tan Mastic	N	F	
7348-03-10-10		Basement, SE Central Office, E. Wall, Central Area, 0' Ht.	4" Dark Brown Cove Base and Tan Mastic	N	F	
7348-03-10-11	170 SF	Basement, SE Central Office, SW Area, in Doorway, 0' Ht.	12" x 12" Tan Mottled Floor Tile and Tan Mastic	N	G	
7348-03-10-12	—	Basement, SE Central Office, West Wall, S. Central Area, At West Entrance, 0' Ht.	12" x 12" Tan Mottled Floor Tile and Tan Mastic	N	G	

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REC'D 1	Relinquished by: Ben Frech	Company: Helix Env, Inc.	Date/Time: 3/10/25 18:00	REC'D 3	Relinquished by:	Company:	Date/Time:
REC'D 2	Received by: MC	Company:	Date/Time: 3/11/25 10:45	REC'D 4	Relinquished by:	Company:	Date/Time:

2301646

HELIX ENVIRONMENTAL, INC.

1 Elizabeth Place, Suite 160 • Dayton, Ohio 45417-3445
Phone: (937) 226-0650 Fax: (937) 226-0653 Email: helix@helixenv.com

RUSH - YES OR (NO)

LABORATORY: San Air
DATE SAMPLED: 3/10/2025
DATE REQUIRED: 24 HR TAT
JOB NO./LOCATION: 7348 Dayton, OH
CLIENT: App Architecture
BUILDING: Fire Station 16, 4111 Kings Highway
INSPECTOR: Ben Fraelich
JOB NUMBER: 7348

BULK SAMPLE DATA SHEET

ANALYSES REQUEST: Asbestos PLM 5

HELIX SAMPLE ID NUMBER	AMOUNT	REPRESENTATIVE SAMPLE LOCATION	MATERIAL DESCRIPTION	FRIABLE/ NON	CONDITION	COMMENTS
7348-03-10-13	320 SF	Basement, NW Exercise Room, Central Area, On Ceiling, 8' Ht.	Hard Plaster	N	F	
7348-03-10-14	—	Basement/Pest Control Boiler Room, SE Area, On Ceiling 8.5' Ht.	Hard Plaster	N	F	
7348-03-10-15	—	Basement/ NW central Boiler Room, NW Area, On Ceiling 8.5' Ht.	Hard Plaster	N	F	
7348-03-10-16	25 SF	Basement/ NW Exercise Room, E. Wall, Central Area, On Ceiling 8.5' Ht.	Pipe Penetration Caulk	N	F	
7348-03-10-17	—	Basement, West central Laundry Room N. Wall, west Area, 7' Ht.	Pipe Penetration Caulk	N	F	Outside of boiler for pipe Penetration Loose - Fallen off
7348-03-10-18	60 SF	Basement, NW central Boiler Room, SW Area, on Boiler, 4' Ht. N' side, Loose,	Grey Boiler sealant	N	G	
7348-03-10-19	—	Basement, NW Central Boiler Room, SW Area, on Boiler, 1.5' Ht. N' side,	Grey Boiler sealant	N	G	
7348-03-10-20	1044 SF	1st Fl, Captains Office (S. Central Office), West side, Center, 8.5' Ht.	2'x4' Ceiling Tile, Horizontal Fissures and Holes	F	F	HO + 288 + 616 =
7348-03-10-21	—	1st Fl, Dining Room (Chess Hall), E. Side, Center	2'x4' ceiling tile, Horizontal Fissures and Holes	F	F	
7348-03-10-22	84 SF	1st Fl, Locker Room/SE. Bathroom, SW Area, On Ceiling, 8.5' Ht.	2'x2' Ceiling tile, Directional Fissures and Holes	F	F	
7348-03-10-23	—	1st Fl, Locker Room, SW central Bathroom, S. central Area, On Ceiling, 8.5' Ht.	2'x2' Ceiling tile, Directional Fissures and Holes	F	F	
7348-03-10-24		1st Fl Locker Room, SE Bathroom/E. wall, S. Area, 9' Ht.	Drywall and Joint compound	N	F	

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RECD 2	Received by: AC	Company:	Date/Time: 3/11/25 10:10AM	RECD 4	Relinquished by:	Company:	Date/Time:

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T Elizabeth Place, Suite 160 • Dayton, Ohio 45417-3445
(937) 226-0650 Fax: (937) 226-0653 Email: helix@helixenv.com
Phone:

RUSH - YES OR (NO)

LABORATORY: San Air
DATE SAMPLED: 3/10/2025
DATE REQUIRED: 24 HR TAT
JOB NO./LOCATION: 7348 Dayton, OH
CLIENT: App Architecture
BUILDING: Fire Station 16, 4 e
INSPECTOR: B Fraehlich 111 Kings Highway
JOB NUMBER: 7348

BULK SAMPLE DATA SHEET | ANALYSES REQUESTED: Asbestos PLM

HELIX SAMPLE ID NUMBER	AMOUNT	REPRESENTATIVE SAMPLE LOCATION	MATERIAL DESCRIPTION	FRIABLE/ NON	CONDITION	COMMENTS
7348-03-10-25		1st Fl, N. Central Dormitory, W wall, 5 Area, on Window Frame	Window Caulk (Grey)	N	F	
7348-03-10-26	840 SF	1st Fl, N. Central Dormitory, SE Area, At SE Entrance, IN	9"x9" Black Streaked Floor tile, Black Mastic	N	F	A 42x20
7348-03-10-27	—	1st Fl, Central Dormitory, NW Corner	9"x9" Tan Streaked Floor tile, Black Mastic	N	F	A
7348-03-10-28	5 SF	1st Fl, N. Central Dormitory, SW Area, At SW entrance, Thru hold,	9"x9" Pink & Black Streaked Floor tile, Black Mastic	N	P	B + Floor leveler
7348-03-10-29	—	1st Fl, N. Central Dormitory, SW Area, At SW entrance,	9"x9" Pink Streaked Floor tile, Black Mastic	N	P	B
7348-03-10-30	400 SF	1st Fl, E/W Hall at Cracked Area	9"x9" Floor Tile, Terracotta & Black Mastic	N	F	C
7348-03-10-31	—	1st Fl, Captain's Office to left Well by door	9"x9" Floor Tile Terracotta & Black Mastic	N	F	C
7348-03-10-32	10 SF	1st Fl, SW Office, N Center Floor	9"x9" Floor Tile, Grey Green Streaked	N	F	E & Black Mastic
7348-03-10-33	—	1st Fl, Office, NE Corner Floor	9"x9" Floor Tile, Grey Green Streaked	N	F	E & Black Mastic
7348-03-10-34	SF	1st Fl, SW Office, N Center Floor	9"x9" Floor Tile, Green Streaked	N	F	E & Black Mastic
7348-03-10-35	—	1st Fl, SW Office, NE Corner Floor	9"x9" Floor Tile, Grey Streaked & Black	N	F	E & Black Mastic
7348-03-10-36	—	1st Fl Printing Room, SW Corner	Caulk Interior Grey	N	G	

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HELIX ENVIRONMENTAL INC.
Suite 160 • Dayton, Ohio 45417-3445
1 Elizabeth Place 50 Fax: (937) 226-0653 Email: helix@helixenv.com
Phone: (937) 226-0

RUSH - YES OR (NO)

LABORATORY: Sm. AH
DATE SAMPLED: 3 m r
DATE REQUIRED: 24/10/2025
JOB NO./LOCATION: HR TAT
CLIENT: 7348 Dayton, OH
BUILDING: App Architecture
INSPECTOR: Fire Station 6, 4111 Kings Highway
JOB NUMBER: ~~7348~~ Eulich

SHEET

BULK SAMPLE DATA

ANALYSES REQUESTED: Asbestos PLM

HELIX SAMPLE ID NUMBER	AMOUNT	REPRESENTATIVE SAMPLE LOCATION	MATERIAL DESCRIPTION	FRIABLE/ NON	CONDITION	COMMENTS
7348-03-10-37	50 SF	1st Fl, West Engine Bay, Central Area on Truck Duct work, Magma 10.5 Ht	Grey Duct sealant	N	G	
7348-03-10-38	—	1st Fl, West Engine Bay, West side, Center, on Ductwork, 11 Ht	Grey Duct sealant	N	G	
7348-03-10-39	SF	1st Floor Tan Area in Bay, NE Area, on Ductwork, 13 Ht	Tan/Cream Pipe Insulation sealant	N	F	
7348-03-10-40	51 00 SF	1st Fl, Truck Area, NW Corner, Ceiling 14 Ht	Hard Plaster	N	G	White + 1st Fl Offices
7348-03-10-41	—	1st Fl, Truck Area, Center Ceiling 14 Ht	Hard Plaster	N	F	
7348-03-10-42	20 SF	1st Fl SW Entrance Area Floor at door	9"x9" Brown, Maroon Streaked Marble, Mastic	N	F	
7348-03-10-43	—	1st Fl, N Entrance (Dining Area) Floor at door	9"x9" Brown, Maroon Streaked Marble, Mastic	N	F	
7348-03-10-44	—	1st Fl, Locker Room, SW Central Area, on Fiberglass Insulated Pipe, 8 Ht.	Tan/Cream Pipe Insulation sealant	N	G	
7348-03-10-45	—	1st Fl, N. Central Dormitory, SW corner, on ceiling 8.5 Ht	Hard Plaster	N	F	
7348-03-10-46		1st Fl Locker Room, S Side of Lockers	4" Black Cove Base & Mastic	N	F	
7348-03-10-47	—	1st Fl, Locker Room, SW Corner Ceiling 9 Ht	Hard Plaster	N	F	
7348-03-10-48	—	1st Fl, E/W Hall, E of Kitchen Door 9 Ht	Hard Plaster	N	F	

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RECD 1	Relinquished by: Ben Frohlich	Company: Helix Env, Inc	Date/Time: 3/10/25 12:00	RECD 3	Relinquished by:	Company:	Date/Time:
RECD 2	Received by: MC	Company:	Date/Time: 10:40	RECD 4	Relinquished by:	Company:	Date/Time:

HELIX ENVIRONMENTAL, INC.
1 Elizabeth Place, Suite 160 • Dayton, Ohio 45417-3445
Phone: (937) 226-0650 Fax: (937) 226-0653 Email: helix@helixenv.com

RUSH - YES OR (NO)

LABORATORY: San Air
DATE SAMPLED: 3/10/2025
DATE REQUIRED: 24 HR TAT
JOB NO./LOCATION: 7348 Dayton, OH
CLIENT: App Architecture
BUILDING: Fire Station 16, 4111 Kings Highway
INSPECTOR: RA Frechlich
JOB NUMBER: 7348

BULK SAMPLE DATA SHEET

ANALYSES REQUESTED: Asbestos PLM

HELIX SAMPLE ID NUMBER	AMOUNT	REPRESENTATIVE SAMPLE LOCATION	MATERIAL DESCRIPTION	FRIABLE/ NON	CONDITION	COMMENTS
7348-03-10-49	5SF	1st Fl, Locker Room, SW Corner	2"x2" 12" Floor Tile, Tan Mottled & Black Mastic	N	F	H
7348-03-10-50		1st Fl, Locker Room, SE Corner	12"x12" 2" Floor Tile, Taupe Mottled & Black Mastic	N	F	H Mastic
7348-03-10-51	15SF	1st Fl, Locker Room SE Area under Sinks	12"x12" Floor Tile, Taupe Mottled &	N	G	J Black Mastic
7348-03-10-52		1st Fl, Locker Room SW Area under Sinks	12"x12" Floor Tile, Taupe Mottled &	N	G	J Black Mastic
7348-03-10-53		1st Fl, Kitchen, NW Entrance Floor	12"x12" Floor Tile, Bronze Mottled &	N	G	I Black Mastic
7348-03-10-54	5SF	1st Fl, Kitchen SE Doorway Floor	12"x12" Floor Tile Bronze Mottled &	N	G	I Black Mastic
7348-03-10-						
7348-03-10-						
7348-03-10-						
7348-03-10-						
7348-03-10-						
7348-03-10-						

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REC'D 2	Received by:	Company:	Date/Time: 3/11/25 10:45AM	REC'D 4	Relinquished by:	Company:	Date/Time:

SanAir Technologies Laboratory

The Identification Specialists

Analysis Report prepared for Helix Environmental Inc

Report Date: 3/14/2025

Project Name: Fire Station 16, 8111 Kings Highway

Project #: 7348

SanAir ID#: 25016863

NVLAP TESTING

NVLAP LAB CODE 200870-0

10501 Trade Court, North Chesterfield, Virginia 23236
888.895.1177 | 804.897.1177 | fax: 804.897.0070 | LabReports@SanAir.com | SanAir.com

SanAir ID Number
25016863
FINAL REPORT
3/14/2025 4:54:16 PM

Name: Helix Environmental Inc
Address: 1 Elizabeth Place
Suite 160
Dayton, OH 45417
Phone: 937-226-0650

Project Number: 7348
P.O. Number:
Project Name: Fire Station 16, 8111 Kings Highway
Collected Date: 3/10/2025
Received Date: 3/14/2025 8:00:00 AM

Dear Benjamin Froehlich,

We at SanAir would like to thank you for the work you recently submitted. The 2 sample(s) were received on Friday, March 14, 2025 via Fax or Email request. The final report(s) is enclosed for the following sample(s): 7348-03-10-04, 7348-03-10-05.

These results only pertain to this job and should not be used in the interpretation of any other job. This report is only complete in its entirety. Refer to the listing below of the pages included in a complete final report.

Sincerely,

Sandra Sobrino
Asbestos & Materials Laboratory Manager
SanAir Technologies Laboratory

Final Report Includes:
- Cover Letter
- Analysis Pages
- Disclaimers and Additional Information

Sample conditions:
- 2 samples in Good condition.

SanAir ID Number
25016863
FINAL REPORT
3/14/2025 4:54:16 PM

Name: Helix Environmental Inc
Address: 1 Elizabeth Place
Suite 160
Dayton, OH 45417
Phone: 937-226-0650

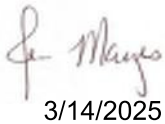
Project Number: 7348
P.O. Number:
Project Name: Fire Station 16, 8111 Kings Highway
Collected Date: 3/10/2025
Received Date: 3/14/2025 8:00:00 AM

Analyst: Mayes, Jean

Asbestos Bulk EPA PLM 400 Point Count

	Stereoscopic	Components		
SanAir ID / Description	Appearance	% Fibrous	% Non-fibrous	Asbestos Fibers
7348-03-10-04 / 25016863-001 Basement, SW Central Hose Drainage Closet, SE Doorway, S.	Grey Non-Fibrous Heterogeneous		98% Other	2% Chrysotile
7348-03-10-05 / 25016863-002 Basement, NW Exercise Room, SE Entrance, West Side, 1.5' Ht.	Grey Non-Fibrous Heterogeneous		97.5% Other	2.5% Chrysotile

EPA 400 Point Count with Gravimetric Reduction.

Analyst: 
Analysis Date: 3/14/2025

Approved Signatory: 
Date: 3/14/2025

Disclaimer and Additional Information:
400 Point Count Method EPA 600/R-93/116

EPA – 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples

EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials

This report is the sole property of the client named on the chain-of-custody (COC) submitted to SanAir Technologies Laboratory, Inc. (SanAir). Results in the report are confidential information intended only for the use by the customer listed on the COC. Neither results nor reports will be discussed with or released to any third party without our client's written permission. The final report shall not be reproduced, except in full, without written approval of the laboratory to assure that parts of the report are not taken out of context. This report and any information contained within shall not be edited, altered, or modified in any way by any persons or agencies receiving, viewing, distributing, or otherwise possessing a copy of this final report. The laboratory reserves the right to perform amendments to any finalized report, of which shall supersede and make obsolete any previous editions. Such changes, modifications, additions, or deletions shall be effective immediately upon notice thereof, which may be given by means including but not limited to posting on the SanAir client portal website, electronic or conventional mail, or by any other means.

The information provided in this report applies only to the samples submitted and is relevant only for the date, time, and location of sampling. The accuracy of the results is dependent upon the client's sampling procedure and information provided to the laboratory by the client. SanAir assumes no responsibility for the sampling procedure and will provide evaluation reports based solely on the sample(s) in the condition in which they arrived at the laboratory and information provided by the client on the COC, such as: project number, project name, collection dates, P.O. number, special instructions, samples collected by, sample numbers, sample identifications, sample type, selected analysis type, flow rate, total volume or area, and start - stop times that may affect the validity of the results in this report. Samples were received in good condition unless otherwise noted. When the client requires samples to be tested that deviates from a specific method or condition, all reported results may be affected by the deviation. SanAir assumes no responsibility or liability for the manner in which the results are used or interpreted. The limit of detection is 0.25%. Samples are held for a period of 60 days.

This report does not constitute and shall not be used to claim product, process, system, or person certification, approval, or endorsement by NVLAP, NIST, NELAC, AIHA LAP, LLC or any other U.S. governmental agencies; all or some tests contained in this report may not be accredited by every local, state, and federal regulatory agency. Refer to the SanAir website at www.sanair.com for copies of current certificates and scopes of various accreditations, certifications, and licenses or contact the laboratory for inquiries regarding the status or scope of an accreditation or certification.

Asbestos Accreditations, Certifications, and Licenses
National Voluntary Laboratory Accreditation Program (NVLAP) Lab Code 200870-0
City of Philadelphia Department of Public Health Air Management Services, Certification#ALL-460
Commonwealth of Pennsylvania Department of Environmental Protection Number 68-05397
California State Environmental Laboratory Accreditation Program Certificate Number 2915
Colorado Department of Public Health and Environment Registration Number AL-23143
Connecticut Department of Public Health Environmental Laboratory Registration Number PH-0105
Massachusetts Department of Labor Standards Asbestos Analytical Services License Number: AA000222
State of Maine Department of Environmental Protection License Number: LB-0075
New York State Department of Health Laboratory ID: 11983
State of Rhode Island Department of Health Certification No.: PLM00126
Texas Department of State Health Services License Number: 300440
Commonwealth of Virginia Department of Professional and Occupational Regulation Number: 3333000323
State of Washington Department of Ecology Laboratory ID: C989
State of West Virginia Bureau for Public Health Analytical Laboratory Number: LT000616
Vermont Department of Health License Number: Asb-Co-An-000006
Louisiana Department of Environmental Quality AI Number 212253, LELAP Lab ID #05088

25016863

Outlook

Fw: Analysis Report for Job 25016076 is complete.

From Maria E. Coker <mcoker@sanair.com>
Date Fri 3/14/2025 9:09 AM
To Maria E. Coker <mcoker@sanair.com>

From: Benjamin Froehlich <bfroehlich@helixenv.com>
Sent: Thursday, March 13, 2025 5:00 PM
To: Lab Reports <labreports@sanair.com>
Subject: Re: Analysis Report for Job 25016076 is complete.

EXTERNAL EMAIL: DO NOT CLICK on links or attachments unless you recognize the sender and know the content is safe.

Hello,

May I please have 48-hour turn-around point counts on the following samples?

7348-03-10-04 (25016076-004)
7348-03-10-05 (25016076-005)
7348-03-10-25 (25016076-025)
7348-03-10-32 (25016076-032), floor tile only
7348-03-10-33 (25016076-033), floor tile only
7348-03-10-36 (25016076-036)
7348-03-10-42 (25016076-042), floor tile only
7348-03-10-43 (25016076-043), floor tile only

Thanks,
Ben Froehlich
Helix Environmental, Inc,
(937) 226-0650

> On Mar 12, 2025, at 12:32 PM, SanAir Technologies Laboratory <labreports@sanair.com> wrote:
>
> <25016076_Fire Station 16, 4111 Kings Highway_2025312123215.pdf>

MC 3/14/25

2501607[illegible]

2501607[illegible] PLM

HELIX ENVIRONMENTAL, INC.

1 Elizabeth Place, Suite 160 • Dayton, Ohio 45417-3445
Phone: (937) 226-0650 Fax: (937) 226-0653 Email: helix@helixenv.com

RUSH - YES OR (NO)

LABORATORY: San Air
DATE SAMPLED: 3/10/2025
DATE REQUIRED: 24 HR TAT
JOB NO./LOCATION: 7348 Dayton, OH
CLIENT: App Architecture
BUILDING: Fire Station 16, 3111 Kings Highway
INSPECTOR: Ben Froehlich
JOB NUMBER: 7348

BULK SAMPLE DATA SHEET — ANALYSES REQUESTED: Asbestos PLM

HELIX SAMPLE ID NUMBER	AMOUNT	REPRESENTATIVE SAMPLE LOCATION	MATERIAL DESCRIPTION	FRIABLE/ NON	CONDITION	COMMENTS
7348-03-10-01	360 SF	Basement, NW Exercise Room, NE Corner, On Fiberglass Insulated Pipe, 7' Ht.	Cream/Tan Pipe Insulation Sealant	N	F	steam pipe
7348-03-10-02	—	Basement, 2nd Floor, West Central Area, on Fiberglass Insulated Pipe, 6.5' Ht.	Cream/Tan Pipe Insulation Sealant	N	F	cold water
7348-03-10-03	—	Basement, SE Room, NE Area, on Fiberglass Insulated Pipe, 6.5' Ht.	Cream/Tan Pipe Insulation Sealant	N	F	
7348-03-10-04	200 LF	Basement, SW Central Hose Drainage closet, SE Doorway, S. Side, 3' Ht.	Grey Doorway Caulk	N	F	(5 x 20 LF) x 2 sides = 200
7348-03-10-05	—	Basement, NW Exercise Room, SE Entrance, West Side, 1.5' Ht.	Grey Doorway Caulk	N	F	
7348-03-10-06		Basement, NWest central locker room, SE central Area, on fiberglass insulated pipe, 7' Ht.	Cream/Tan Pipe Insulation Sealant	N	F	steam pipe
7348-03-10-07	400 SF	Basement, SE central office, West Wall, SE Central Area, 4' Ht.	original and Joint compound	N	F	some drywall also — no d.c. ~20 sf
7348-03-10-08	—	Basement, SE Central office, East wall, central Area, 5' Ht.	Drywall and Joint compound	N	F	
7348-03-10-09	24 LF & SF	Basement, SE central office, N. wall, central Area, 0' Ht.	4" Dark Brown Cove Base and Tan Mastic	N	F	
7348-03-10-10		Basement, SE Central Office, E. Wall, Central Area, 0' Ht.	4" Dark Brown Cove Base and Tan Mastic	N	F	
7348-03-10-11	170 SF	Basement, SE central office, SW Area, in doorway, 0' Ht.	12" x 12" Tan Mottled Floor tile and Tan Mastic	N	G	
7348-03-10-12	—	Basement, SE Central Office, West Hallway, Central Area At west Entrance, 0' Ht.	12" x 12" Tan Mottled Floor tile and Tan Mastic	N	G	

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REC'D 2	Received by:	Company:	Date/Time: 3/11/25 10:47 AM	REC'D 4	Relinquished by:	Company:	Date/Time:

25016076 PLM

HELIX ENVIRONMENTAL, INC.
1 Elizabeth Place, Suite 160 • Dayton, Ohio 45417-3445
Phone: (937) 226-0650 Fax: (937) 226-0653 Email: helix@helixenv.com

RUSH - YES OR (NO)

LABORATORY: San Air
DATE SAMPLED: 3/10/2025
DATE REQUIRED: 24 HR TAT
JOB NO./LOCATION: 7340 Dayton, OH
CLIENT: App Architecture
BUILDING: Fire Station 16, 4111 Kings Highway
INSPECTOR: Ben Frechlich
JOB NUMBER: 7348

BULK SAMPLE DATA SHEET | ANALYSES REQUESTED: Asbestos PLM

HELIX SAMPLE ID NUMBER	AMOUNT	REPRESENTATIVE SAMPLE LOCATION	MATERIAL DESCRIPTION	FRIABLE/ NON	CONDITION	COMMENTS
7348-03-10-13	320 SF	Basement NW Exercise Room Central Area, On Ceiling, 8.5' Ht	Hard Plaster,	N	F	
7348-03-10-14	—	Basement, NW Central Boiler Room, SE Area, On Ceiling 8.5' Ht	Hard Plaster	N	F	
7348-03-10-15	—	Basement, NW Central Boiler Room, NW Area, On Ceiling 8.5' Ht	Hard Plaster	N	F	
7348-03-10-16	25 SF	Basement, NW Exercise Room, E. Wall, Central Area, On Fire Ceiling, 8.5' Ht	Fire Penetration Caulk	N	F	
7348-03-10-17	—	Basement, W. Central Laundry Room, N. Wall, West Area, S. Penetration	Fire Penetration Caulk	N	F	Outside of boiler Room
7348-03-10-18	60 SF	Basement, NW Central Boiler Room, SW Area, On N. side, Loose, 7' Ht	Grey Boiler Insulation	N	F	Loose - Fallen off
7348-03-10-19	—	Basement, NW Central Boiler Room, SW Area, on N. side, 8' Ht	Grey Boiler Insulation	N	F	
7348-03-10-20	10 445F	1st Fl, Captains Office (S. Central Office), West side, Center, 8.5' Ht	2'x2' Ceiling Tile, Horizontal Fissures and Holes	F	F	450 + 285 + 616 =
7348-03-10-21	—	1st Fl, Dining Room (Chess Hall), E. side, Center 8.5' Ht	2'x4' Ceiling Tile, Horizontal Fissures and Holes	F	F	
7348-03-10-22	84 SF	1st Fl, Locker Room, SE. Bathroom, SW Area, On Ceiling 8.5' Ht	2'x2' Ceiling Tile, Directional Fissures and Holes	F	F	
7348-03-10-23	—	1st Fl, Locker Room, SW Central Bathroom, S. Central Arch, On Ceiling, 8.5' Ht	2'x2' Ceiling Tile, Directional Fissures and Holes	F	F	
7348-03-10-24		1st Fl, Locker Room, SE Bathroom E. Wall, S. Area, 9' Ht	Drywall and Joint compound	N	F	

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25-16863 PLM

25-16078 PLM

HELIX ENVIRONMENTAL, INC.

1 Elizabeth Place, Suite 160 • Dayton, Ohio 45417-3445
Phone: (937) 226-0650 Fax: (937) 226-0653 Email: helix@helixenv.com

RUSH - YES OR (NO)

LABORATORY: San Air
DATE SAMPLED: 3/10/2025
DATE REQUIRED: 24 HR TAT
JOB NO./LOCATION: 7348 Dayton, OH
CLIENT: App Architecture
BUILDING: Fire Station 16, 4111 Kings Highway
INSPECTOR: B Frachtel
JOB NUMBER: 7348

BULK SAMPLE DATA SHEET

ANALYSES REQUESTED: Asbesto S L P M

HELIX SAMPLE ID NUMBER	AMOUNT	REPRESENTATIVE SAMPLE LOCATION	MATERIAL DESCRIPTION	FRIABLE/ NON	CONDITION	COMMENTS
~~7348-03-10-25~~		1st Floor, N. Central Dormitory, W wall, S Area on N interior entrance,	Window Caulk (Grey)	N	F	
7348-03-10-26	840 SF	1st Fl, N. Central Dormitory, 2E Area, At 7th entrance,	Tan/Blue/Black Mastic under 9"x9" Floor Tile	N	F	A 42 x 20
7348-03-10-27	—	1st Fl, N. Central Dormitory, NW Corner,	9"x9" Tan Floor Tile; Black Mastic	N	F	A
7348-03-10-28	5 SF	1st Fl, N. Central Dormitory, SW Area, At SW entrance Threshold,	9"x9" Tan Floor Tile, Black Mastic, Trowled	N	F	B + Floor Leveler
7348-03-10-29	—	1st Fl, N. Central Dormitory, SW Area, At SW	9"x9" Black Floor Tile, Black Mastic	N	F	B
7348-03-10-30	450 SF	1st Fl, EW Hall at Cracked Area floor,	9"x9" Floor Tile, Terracotta & Black Mastic	N	F	C
7348-03-10-31	—	1st Fl, Custodian's Office to Left Wall by door,	9"x9" Floor Tile Terracotta Black Mastic	N	F	C
7348-03-10-32	105 SF	1st Fl, SW Office, N Center Floor	9"x9" Floor Tile Grey & Green, Streaked	N	F	E Black Mastic
7348-03-10-33	—	1st Fl, SW Office, NE Corner	9"x9" Floor Tile Grey Green Streaked	N	F	E Black Mastic
7348-03-10-34	4 SF	1st Fl, SW Office, N Center Floor	9"x9" Floor Tile Green Streaked	N	F	E Black Mastic
7348-03-10-35	—	1st Fl, SW Office, NE Corner	9"x9" Floor Tile, Grey Streaked, Black	N	F	E Black Mastic
7348-03-10-36	—	1st Fl, Entry Room, SW Corner	Caulk Under Grey	N	G	

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REC'D 2	Received by: MC	Company:	Date/Time: 3/11/25 9:30AM	REC'D 4	Relinquished by:	Company:	Date/Time:

HELIX ENVIRONMENTAL, INC.

1 Elizabeth Place, Suite 160 • Dayton, Ohio 45417-3445
Phone: (937) 226-0650 Fax: (937) 226-0653 Email: helix@helixenv.com

RUSH - YES OR (NO)

LABORATORY: San Air
DATE SAMPLED: 3/10/2025
DATE REQUIRED: 24 HR TAT
JOB NO./LOCATION: 7348 Dayton, OH
CLIENT: App Architecture
BUILDING: Fire Station 16, 4111 Kings Highway
INSPECTOR: B Froehlich
JOB NUMBER: 7348

BULK SAMPLE DATA SHEET

ANALYSES REQUESTED: Asbestos PLM

HELIX SAMPLE ID NUMBER	AMOUNT	REPRESENTATIVE SAMPLE LOCATION	MATERIAL DESCRIPTION	FRIABLE/ NON	CONDITION	COMMENTS
7348-03-10-37	50 SF	West Engine Bay, Central Area on Engine Truck 1st Fl 10.5' Ht	Grey Duct Sealant	N	G	
7348-03-10-38	—	1st Fl, West Engine Bay, West side, Center, Engine truck shutter, 11' Ht	Grey Duct Sealant	N	G	
7348-03-10-39	5F	1st Fl, West Engine Bay, NE Area, on ceiling Radiator Fan Pipe, on Fiberglass Insulation 13' Ht	Tan/Cream Pipe Insulation & Sealant		F	
7348-03-10-40	5 100 SF	1st Fl, Truck Area, NW corner	Hard Plaster	N	G	White + 1st Fl Offices
7348-03-10-41	—	1st Fl, Truck Area, Center 14' Ht	Hard Plaster	N	F	
7348-03-10-42	70 SF	1st Fl, SE Entrance Area Floor 1st Fl, N Entrance (Dining area) floor at door	9"x9" Grey/White Marble Streaked Floor, Mastic	N	F	
7348-03-10-43	—	1st Fl, Kitchen, Room, SW Central Area, On Fiberglass Insulated Pipe, 7' Ht.	Streaked Brown/Tan/Cream Marble, Mastic & Sealant	N	F	
7348-03-10-44	—	1st Fl, N. Central Dormitory, SW Corner, On Ceiling 8.5' Ht.	Hard Plaster	N	G	
7348-03-10-45	—	1st Fl, Locker Room, S Side of Lockers	4" Black Cove Base & Mastic Hard Plaster	N	F	
7348-03-10-46	—	1st Fl, Locker Room, SW Corner Ceiling	Hard Plaster	N	F	
7348-03-10-47	—	1st Fl, E/W Hall, E of Kitchen Door 9' Ht	Hard Plaster	N	F	
7348-03-10-48	—	1st Fl, E/W Hall, E of Kitchen Door 9' Ht	Hard Plaster	N	F	

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RECD 1	Relinquished by: B Froehlich	Company: Helix Env.	Date/Time: 3/10/25 @ 2:00	RECD 3	Relinquished by:	Company:	Date/Time:
RECD 2	Received by: [illegible]	Company:	Date/Time: 3/11/25 @ 10:45am	RECD 4	Relinquished by:	Company:	Date/Time:

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1 Elizabeth Place, Suite 160 • Dayton, Ohio 45417-3445
Phone: (937) 226-0650 Fax: (937) 226-0653 Email: helix@helixenv.com

RUSH - YES OR (NO)

LABORATORY: San Air
DATE SAMPLED: 3/10/2025
DATE REQUIRED: 24 HR TAT
JOB NO./LOCATION: 7348 / Dayton, OH
CLIENT: APP Architecture
BUILDING: Fire Station 16, 4111 Kings Highway
INSPECTOR: RA Frechtling
JOB NUMBER: 7348

BULK SAMPLE DATA SHEET | ANALYSES REQUESTED: Asbestos PLM

HELIX SAMPLE ID NUMBER	AMOUNT	REPRESENTATIVE SAMPLE LOCATION	MATERIAL DESCRIPTION	FRIABLE/ NON	CONDITION	COMMENTS
7348-03-10-49	5SF	1st Fl Locker Room, SW Corner Floor	12"x12" Floor Tile, Tan Mottled & Black Mastic	N	F	7
7348-03-10-50	—	1st Fl Locker Room, SE Corner Floor	12"x12" Floor Tile, Taupe Mottled & Black	N	F	H Mastic
7348-03-10-51	65SF	1st Floor Locker Room SE Area under Sinks	12"x12" Floor Tile, Taupe Mottled	N	G	J Black Mastic
7348-03-10-52	—	1st Fl, Locker Room, SW Area under Sinks	12"x12" Floor Tile, Taupe Mottled	N	G	J Black Mastic
7348-03-10-53	5F	1st Fl, Kitchen, NW Entrance Floor	12"x12" Floor Tile Bronze Mottled	N	G	I Black Mastic
7348-03-10-54	—	1st Fl, Kitchen SE Doorway Floor	12"x12" Floor Tile Bronze Mottled	N	G	I Black Mastic
7348-03-10-						
7348-03-10-						
7348-03-10-						
7348-03-10-						
7348-03-10-						
7348-03-10-						

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REC'D 1	Relinquished by:	Company: Helix Env.	Date/Time: 3/10/2025 1730	REC'D 3	Relinquished by:	Company:	Date/Time:
REC'D 2	Received by:	Company:	Date/Time: 3/11/25 10:54	REC'D 4	Relinquished by:	Company:	Date/Time:

SanAir Technologies Laboratory

The Identification Specialists

Analysis Report prepared for Helix Environmental Inc

Report Date: 3/20/2025

Project Name: Fire Station 16, 8111 Kings Highway

Project #: 7348

SanAir ID#: 25017959

NVLAP TESTING

NVLAP LAB CODE 200870-0

10501 Trade Court, North Chesterfield, Virginia 23236
888.895.1177 | 804.897.1177 | fax: 804.897.0070 | LabReports@SanAir.com | SanAir.com

SanAir ID Number
25017959
FINAL REPORT
3/20/2025 4:49:22 PM

Name: Helix Environmental Inc
Address: 1 Elizabeth Place
Suite 160
Dayton, OH 45417
Phone: 937-226-0650

Project Number: 7348
P.O. Number:
Project Name: Fire Station 16, 8111 Kings Highway
Collected Date: 3/10/2025
Received Date: 3/19/2025 9:55:00 AM

Dear Benjamin Froehlich,

We at SanAir would like to thank you for the work you recently submitted. The 6 sample(s) were received on Wednesday, March 19, 2025 via Fax or Email request. The final report(s) is enclosed for the following sample(s): 7348-03-10-25, 7348-03-10-36, 7348-03-10-32, 7348-03-10-33, 7348-03-10-42, 7348-03-10-43.

These results only pertain to this job and should not be used in the interpretation of any other job. This report is only complete in its entirety. Refer to the listing below of the pages included in a complete final report.

Sincerely,

Sandra Sobrino
Asbestos & Materials Laboratory Manager
SanAir Technologies Laboratory

Final Report Includes:
- Cover Letter
- Analysis Pages
- Disclaimers and Additional Information

Sample conditions:
- 6 samples in Good condition.

SanAir ID Number
25017959
FINAL REPORT
3/20/2025 4:49:22 PM

Name: Helix Environmental Inc
Address: 1 Elizabeth Place
Suite 160
Dayton, OH 45417
Phone: 937-226-0650

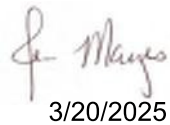
Project Number: 7348
P.O. Number:
Project Name: Fire Station 16, 8111 Kings Highway
Collected Date: 3/10/2025
Received Date: 3/19/2025 9:55:00 AM

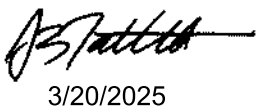
Analyst: Mayes, Jean

Asbestos Bulk EPA PLM NOB EPA 600/R-93/116

SanAir ID / Description	Appearance	% Fibrous	% Non Fibrous	Asbestos Types	% Total Asbestos
25017959-001 / 7348-03-10-25 1st Fl., N. Central Dormitory, W. Wall, S. Area, On Window	Grey Non-Fibrous Homogeneous		99.7 %	Chrysotile	0.3 %
25017959-002 / 7348-03-10-36 1st Fl Dining Room, SW Corner 4' Ht Caulk Interior	Grey Non-Fibrous Heterogeneous		99.1 %	Chrysotile	0.9 %
25017959-003 / 7348-03-10-32 1st Fl, SW Office, N Center Floor 9"x9", Floor Tile	Grey Non-Fibrous Homogeneous		97.8 %	Chrysotile	2.2 %
25017959-004 / 7348-03-10-33 1st Fl, Center Office Toilet, NE Corner Floor, Floor Tile	Grey Non-Fibrous Homogeneous		96.5 %	Chrysotile	3.5 %
25017959-005 / 7348-03-10-42 1st Fl, S Entrance Area Floor At Door 9"x9", Floor Tile	Brown Non-Fibrous Homogeneous		99.5 %	Chrysotile	0.5 %
25017959-006 / 7348-03-10-43 1st Fl., N Entrance (Dining Area) Floor At Door, Floor Tile	Brown Non-Fibrous Homogeneous		98.7 %	Chrysotile	1.3 %

EPA 400 Point Count with Gravimetric Reduction.

Analyst: 
Analysis Date: 3/20/2025

Approved Signatory: 
Date: 3/20/2025

Disclaimer and Additional Information:
Method for the Determination of Asbestos in Bulk Building Materials
EPA 600/R-93/116, July 1993 PLM EPA NOB

This report is the sole property of the client on the chain-of-custody (COC) submitted to SanAir Technologies Laboratory, Inc. (SanAir). Results in the report are confidential information intended only for the use by the customer listed on the COC. Neither results nor reports will be discussed with or released to any third party without our client's written permission to maintain client confidentiality. The final report shall not be reproduced, except in full, without written authorization of the laboratory to assure that parts of the report are not taken out of context. This report and any information contained within shall not be edited, altered, or modified in any way by any persons or agencies receiving, viewing, distributing, or otherwise possessing a copy of this final report. The laboratory reserves the right to perform amendments to any finalized report, of which shall supersede and make obsolete any previous editions. Such changes, modifications, additions, or deletions shall be effective immediately upon notice thereof, which may be given by means including but not limited to posting on the SanAir client portal website, electronic or conventional mail, or by any other means.

The information provided in this report applies only to the samples submitted and is relevant only for the date, time, and location of sampling. The accuracy of the results is dependent upon the client's sampling procedure and information provided to the laboratory by the client on the COC. SanAir assumes no responsibility for the sampling procedure and will provide evaluation reports based solely on the sample(s) in the condition in which they arrived at the laboratory and information provided by the client on the COC, such as: project number, project name, collection dates, P.O. number, special instructions, samples collected by, sample numbers, sample identifications, sample type, selected analysis type, flow rate, total volume or area, and start - stop times that may affect the validity of the results in this report. Samples were received in good condition unless otherwise noted. When client requires samples to be tested that deviates from a specific method or condition, all reported results may be affected by the deviation. Where noted on the chain of custody, 400 point count with gravimetric reduction was employed with this analysis. Limit of detection is 0.25%. SanAir assumes no responsibility or liability for the manner in which the results are used or interpreted.

This report does not constitute and shall not be used to claim product, process, system, or person certification, approval, or endorsement by NVLAP, NIST, NELAC, AIHA LAP, LLC or any other U.S. governmental agencies; all or some tests contained in this report may not be certified or accredited by every local, state, and federal regulatory agency. Refer to the SanAir website at www.sanair.com for copies of current certificates and scopes of various accreditations, certifications, and licenses or contact the laboratory for inquiries regarding the status or scope of an accreditation or certification.

Samples are held for a period of 60 days. Fibers smaller than 5 microns cannot be seen with this method due to scope limitations.

Revision #03, 10/3/2024

25017959

Outlook

Fw: Analysis Report for Job 25016076 is complete.

From Maria E. Coker <mcoker@sanair.com>
Date Wed 3/19/2025 10:13 AM
To Maria E. Coker <mcoker@sanair.com>

From: Benjamin Froehlich <bfroehlich@helixenv.com>
Sent: Wednesday, March 19, 2025 9:55 AM
To: Lab Reports <labreports@sanair.com>
Subject: Re: Analysis Report for Job 25016076 is complete.

EXTERNAL EMAIL: DO NOT CLICK on links or attachments unless you recognize the sender and know the content is safe.

Yes,

Please analyze the samples for PLM EPA NOB for 48 hour turn around.

Thanks,
Ben Froehlich
Helix Environmental, Inc.
(937) 226-0650

> On Mar 12, 2025, at 12:32 PM, SanAir Technologies Laboratory <labreports@sanair.com> wrote:
>
> <25016076_FireStation 16, 4111 Kings Highway_2025312123215.pdf>

MC 3/19/25 9:55AM

25017959

Outlook

Fw: Analysis Report for Job 25016076 is complete.

From Maria E. Coker <mcoker@sanair.com>
Date Fri 3/14/2025 9:09 AM
To Maria E. Coker <mcoker@sanair.com>

From: Benjamin Froehlich <bfroehlich@helixenv.com>
Sent: Thursday, March 13, 2025 5:00 PM
To: Lab Reports <labreports@sanair.com>
Subject: Re: Analysis Report for Job 25016076 is complete.

EXTERNAL EMAIL: DO NOT CLICK on links or attachments unless you recognize the sender and know the content is safe.

Hello,

May I please have 48-hour turn-around point counts on the following samples?

7348-03-10-04 (25016076-004)
7348-03-10-05 (25016076-005)
7348-03-10-25 (25016076-025)
7348-03-10-32 (25016076-032), floor tile only
7348-03-10-33 (25016076-033), floor tile only
7348-03-10-36 (25016076-036)
7348-03-10-42 (25016076-042), floor tile only
7348-03-10-43 (25016076-043), floor tile only

Thanks,
Ben Froehlich
Helix Environmental, Inc,
(937) 226-0650

> On Mar 12, 2025, at 12:32 PM, SanAir Technologies Laboratory <labreports@sanair.com> wrote:
>
> <25016076_Fire Station 16, 4111 Kings Highway_2025312123215.pdf>

MC 3/19/25 9:35AM

25017959 NOB

25016076 PLM

HELIX ENVIRONMENTAL, INC.

1 Elizabeth Place, Suite 160 • Dayton, Ohio 45417-3445
Phone: (937) 226-0650 Fax: (937) 226-0653 Email: helix@helixenv.com

RUSH - YES OR (NO)

LABORATORY: San Air
DATE SAMPLED: 3/10/2025
DATE REQUIRED: 24 HR TAT
JOB NO./LOCATION: 7348 Dayton, OH
CLIENT: App Architecture
BUILDING: Fire Station 16, 4111 Kings Highway
INSPECTOR: Ben Froehlich
JOB NUMBER: 7348

BULK SAMPLE DATA SHEET — ANALYSES REQUESTED: Asbestos PLM

HELIX SAMPLE ID NUMBER	AMOUNT	REPRESENTATIVE SAMPLE LOCATION	MATERIAL DESCRIPTION	FRIABLE/ NON	CONDITION	COMMENTS
7348-03-10-01	360 SF	Basement, NW Exercise Room, NE Corner, on Insulated Pipe, 7' Ht	Cream/Tan Pipe Insulation + Sealant	N	F	Hot water pipe
7348-03-10_02	—	Basement, SW Room, West Central Area, on Fiberglass Insulated Pipe, 6.5' Ht	Cream/Tan Pipe Insulation Sealant	N	F	Cold water
7348-03-10_03	—	Basement, SE Room, NE Area, on Fiberglass Insulated Pipe, 6.5' Ht	Cream/Tan Pipe Insulation Sealant	N	F	
7348-03-10-04	200 LF	Basement, SW Central Hose Drainage closet, SE Doorway, S. Side, 1' Ht	Gray Doorway Caulk	N	F	(5 x 20 LF) x 2 = 200
7348-03-10-05	—	Basement, NW Exercise Room, SE Doorway, West Side, 1.5' Ht	Gray Doorway Caulk	N	F	
7348-03-10-06	—	Basement, West central Room on fiberglass insulated pipe, SE central Area, 7' Ht	Cream/Tan Pipe Insulation Sealant	N	P	Steam Pipe
7348-03-10-07	400 SF	Basement, SE central office, West wall, central Area, 8' Ht	Drywall and Joint compound	N	F	some drywall also — no J.C. 2 x 20 =
7348-03-10-08	—	Basement, SE central office, East wall, central Area, 11' Ht	Drywall and Joint compound	N	F	
7348-03-10-09	24 LF & 8 SF	Basement, SE central office, N. wall, central Area, 5' Ht.	Dark Brown Mastic Base cove Tan Brown Stove Duct-Tan Mastic Base	N	F	
7348-03-10-10		Basement, SE Central Office, E. wall, central Area, 0' Ht.		N	F	
7348-03-10-11	170 SF	Basement, SE central office, SW Area, in Doorway, 7' Ht	12"x12" Mottled Floor Tan Mastic	N	G	
7348-03-10-12		Basement, SE central Office, West Entrance, West wall, central Area, 0' Ht.	12" Base and Tan Mastic for the Attic Floor Area	N	G	

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RECD 2	Received by:	Company:	3/11/25 10:45	RECD 4	Relinquished by:	Company:	Date/Time:

25017959 NOB

25016076 PLM

HELIX ENVIRONMENTAL, INC.

1 Elizabeth Place, Suite 160 • Dayton, Ohio 45417-3445
Phone: (937) 226-0650 Fax: (937) 226-0653 Email: helix@helixenv.com

RUSH - YES OR (NO)

LABORATORY: San Air
DATE SAMPLED: 3/10/2025
DATE REQUIRED: 24 HR TAT
JOB NO./LOCATION: 7348 Dayton, OH
CLIENT: App Architecture
BUILDING: Fire Station 16, 411 Kings Highway
INSPECTOR: Ben Fraelich
JOB NUMBER: 7348

BULK SAMPLE DATA SHEET — ANALYSES REQUESTED: Asbestos PLM

HELIX SAMPLE ID NUMBER	AMOUNT	REPRESENTATIVE SAMPLE LOCATION	MATERIAL DESCRIPTION	FRIABLE/ NON	CONDITION	COMMENTS
7348-03-10_13	320 SF	Basement, NW Exercise Room, central Area, On ceiling 8.5' HL	Hard Plaster,	N	F	
7348-03-10-14	—	Basement, West Central Boiler Room, SE Area, On ceiling 8.5' HL	Hard Plaster	N	F	
7348-03-10-15	—	Basement, NW central Boiler Room, NW Area, On ceiling 8.5' HL	Hard Plaster	N	F	
7348-03-10-16	25 SF	Basement, NW Exercise Room, E. wall, Central Area, On ceiling, 8.5' 7' HL Pipe	Fire Penetration Caulk	N	F	
7348-03-10-17	—	Basement, S. West Central Laundry Room, N. Wall, West Wall, 7' HL Pipe Penetration	Pipe Penetration Caulk	N	F	Outside of Boiler Room
7348-03-10-18	60 SF	Basement, central Boiler Room SW Area, On Boiler, N. side, 4' HL	Fire Boiler Joint Sealant	N	G	Loose-Fallen off
7348-03-10-19	—	Basement NW central Boiler Room SW Area, On Boiler, " side, " " " 4' HL	Grey Boiler Sealant	N	G	
7348-03-10-20	10 445F	NW Area, Locker, Captains Office (Central Office), West side, 1st Fl, 8.5' HL	2'x4' Ceiling Tile, Horizontal Fissures and Holes	F	F	HO + 285 + 616 =
7348-03-10-21	—	1st Fl, Day Room (Mess Hall), E. side, center, 8.5' HL	2'x4' ceiling tile, Horizontal Fissures and Holes	F	F	
7348-03-10-22	64 SF	1st Fl, Day Room, Locker Room, SE. Bathroom, SW Area, On ceiling, 8.5' HL	2'x2' ceiling tile, Directional Fissures and Holes	F	F	
7348-03-10-23	—	1st Fl, Day Room, SW Central Bathroom, S. wall, 9' HL	2'x2' ceiling tile, Directional Fissures and Holes	F	F	
7348-03-10-24	—	1st Fl, On Ceiling, Bathroom, E wall, S Area, Locker Room, SE 9' HL	Drywall and Joint compound	N	F	

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REC'D 2	Received by: AC	Company:	Date/Time: 3/11/25 1040	REC'D 4	Relinquished by:	Company:	Date/Time:

25017959 NOB

25016078 PLM

HELIX ENVIRONMENTAL, INC.

1 Elizabeth Place, Suite 160 • Dayton, Ohio 45417-3445
Phone: (937) 226-0650 Fax: (937) 226-0653 Email: helix@helixenv.com

RUSH - YES OR (NO)

LABORATORY: San Air
DATE SAMPLED: 3/10/2025
DATE REQUIRED: 24 HR TAT
JOB NO./LOCATION: 7348 Dayton, OH
CLIENT: App Architecture
BUILDING: Fire Station 16, 4111 Kings Highway
INSPECTOR: B Fraehlich
JOB NUMBER: 7348

BULK SAMPLE DATA SHEET — ANALYSES REQUESTED: Asbestos PLM

HELIX SAMPLE ID NUMBER	AMOUNT	REPRESENTATIVE SAMPLE LOCATION	MATERIAL DESCRIPTION	FRIABLE/ NON	CONDITION	COMMENTS
7348-03-10-25		1st Fl., N. Central Dormitory, W wall, S. Area on window Frame, 7 HA.	Window Caulk (Grey)	N	F	
7348-03-10-26	240 SF	1st Fl, N. Central Dormitory, E Area, At SE entrance, 0 HA	9"x9" tan streaked Floor tile; Black Mastic	N	F	A 42 x 20
7348-03-10-27	—	1st Fl, N Central Dormitory, NW Corner,	9"x9" tan streaked Floor tile; Black mastic	N	F	A —
7348-03-10-28	5 SF	1st Fl, N central Dormitory, SW Area, At SW Entrance Threshold, 0 HA	9"x9" Floor tile, Black streaked Floor tile, Black mastic	N	P	B + floor leveler
7348-03-10-29	—	1st Fl, N. central Dormitory, SW Area, At 0 HA entrance,	9"x9" Floor tile, Black streaked Floor tile, Black mastic	N	P	B
7348-03-10-30	400 SF	1st Fl, E/W Hall at Cracks Area	Tan/Grey 9"x9" Floor Tile, Terracotta & Black Mastic	N	F	C
7348-03-10-31	—	1st Fl Captain's Office ~~for tile~~ ~~Hall~~ E/W Wall by door N Corner	9"x9" Floor Tile, Terracotta & Black Mastic	N	F	C
7348-03-10-32	10 SF	1st Fl, SW office. Floor	9"x9" Floor Tile, Grey & Green Streaked	N	F	A & Black Mastic
7348-03-10-33	—	1st Fl, SW office NE Corner	9"x9" Floor Tile, Grey Green Streaked	N	F	A & Black Mastic
7348-03-10-34	—	1st Fl, SW Office, N Center	9"x9" Floor Tile, Green Black streaked	N	F	& Black Mastic
7348-03-10-35	—	1st Fl, SW Office NE Corner	9"x9" Floor Tile, Grey Streaked Black	N	F	& Black Mastic
7348-03-10-36	—	1st Fl Printing Room, SW Corner 4 HA	Caulk Interior Grey	N	G	

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REC'D 1	Relinquished by: Brad Fraehlich	Company: Helix Env. Inc	Date/Time: 3/10/25 16:00	REC'D 3	Relinquished by:	Company	Date/Time
REC'D 2	Received by:	Company:	Date/Time: 3/11/25 9:30AM	REC'D 4	Relinquished by:	Company:	Date/Time

2501959 NOB

2>016076 PLM

HELIX ENVIRONMENTAL, INC.

1 Elizabeth Place, Suite 160 • Dayton, Ohio 45417-3445
Phone: (937) 226-0650 Fax: (937) 226-0653 Email: helix@helixenv.com

RUSH - YES OR (NO)

LABORATORY: San Air
DATE SAMPLED: 3/10/2025
DATE REQUIRED: 24 HR TAT
JOB NO./LOCATION: 7348 Dayton, OH
CLIENT: App Architecture
BUILDING: Fire Station 16, 4111 Kings Highway
INSPECTOR: B Froelich
JOB NUMBER: 7348

BULK SAMPLE DATA SHEET

ANALYSES REQUESTED: Asbestos PLM

HELIX SAMPLE ID NUMBER	AMOUNT	REPRESENTATIVE SAMPLE LOCATION	MATERIAL DESCRIPTION	FRIABLE/ NON	CONDITION	COMMENTS
7348-03-10-37	50 SF	1st Fl, West Engine Bay, Central Area on Magna Truck Outlook, 10' Ht.	Grey Duct Sealant	N	G	
7348-03-10-38	—	1st Fl, West Engine Bay, West side, Center, on Magnatrek Outlook, 11' Ht.	Grey Duct Sealant	N	G	
7348-03-10-39	5 SF	1st Fl, West Engine Bay, NE Area, On radiating radiator fan pipe, on Fiberglass Insulation, 13' Ht	Tan/Cream Pipe Insulation Sealant	N	F	
7348-03-10-40	5100 SF	1st Fl, Truck Area, NW Corner Ceiling, 14' Ht	Hard Plaster	N	G	Unsafe + 1st Fl Office
7348-03-10-41	—	1st Fl, Truck Area, Center Ceiling Drywall Hole, 14' Ht	Hard Plaster	N	F	
7348-03-10-42	70 SF	1st Fl, SE Entrance Area Floor at door	9"x9" Brown, Maroon Streaked Marble, Mastic	N	F	
7348-03-10-43	—	1st Fl, N Entrance (Dining Area) Floor at door	9"x9" Brown, Maroon, Streaked Marble, Mastic	N	F	
7348-03-10-44	—	1st Fl, Locker Room, SW Central Area, On Angled Fiberglass Insulated Pipe, 7' Ht	Tan/Cream Pipe Insulation Sealant	N	G	
7348-03-10-45	—	1st Flr N. Central Dormitory, SW Corner, On Ceiling 8.5' Ht	Hard Plaster	N	F	
7348-03-10-46		1st Fl, Locker Room, S Side of Lockers	4" Black Cove Base	N	F	
7348-03-10-47		1st Fl, Locker Room, SW Corner Ceiling 9' Ht	Hard Plaster	N	F	
7348-03-10-48		1st Fl, E/W Hall, E of Kitchen Door 9' Ht	Hard Plaster	N	F	

COMPLETE, SIGN, AND DATE. PLEASE RETURN

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REC'D 1	Relinquished by: B Froelich	Company: Helix	Date/Time: 3/11/25 @ 23:00	REC'D 3	Relinquished by:	Company:	Date/Time:
REC'D 2	Received by: [illegible]	Company:	Date/Time: 10:47am	REC'D 4	Relinquished by:	Company:	Date/Time:

25017959 NOB

HELIX ENVIRONMENTAL, INC.
1 Elizabeth Place, Suite 160 • Dayton, Ohio 45417-3445
Phone: (937) 226-0650 Fax: (937) 226-0653 Email: helix@helixenv.com

RUSH - YES OR (NO)

LABORATORY: San Air
DATE SAMPLED: 3/10/2025
DATE REQUIRED: 24 HR TAT
JOB NO./LOCATION: 7348 Dayton, OH
CLIENT: App Architecture
BUILDING: Fire Station 16, 4111 Kings Highway
INSPECTOR: RA Frackleton
JOB NUMBER: 7348

BULK SAMPLE DATA SHEET | ANALYSES REQUESTED: Asbestos PLM

HELIX SAMPLE ID NUMBER	AMOUNT	REPRESENTATIVE SAMPLE LOCATION	MATERIAL DESCRIPTION	FRIABLE/ NON	CONDITION	COMMENTS
7348-03-10-49	5SF	1st Fl Locker Room, SW Corner Floor	12"x12" Floor Tile, Tan Mottled & Black Mastic	N	F	H
7348-03-10-50	—	1st Fl Locker Room, SE Corner Floor	12"x12" Floor Tile, Taupe Mottled & Black	N	F	H Mastic
7348-03-10-51	65SF	1st Floor Locker Room SE Area under Sinks	12"x12" Floor Tile, Taupe Mottled	N	G	J Black Mastic
7348-03-10-52	—	1st Fl, Locker Room, SW Area under Sinks	12"x12" Floor Tile, Taupe Mottled	N	G	J Black Mastic
7348-03-10-53	5SF	1st Fl, Kitchen, NW Entrance Floor	12"x12" Floor Tile Bronze Mottled	N	G	I Black Mastic
7348-03-10-54	—	1st Fl, Kitchen SE Doorway Floor	12"x12" Floor Tile Bronze Mottled	N	G	I Black Mastic
7348-03- 10-						
7348-03-10-						
7348-03-10-						
7348-03-10-						
7348-03-10-						
7348-03-10-						

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REC'D 1	Relinquished by: RA Frackleton	Company: Helix Env. Inc.	Date/Time: 3/10/2025 1730	REC'D 3	Relinquished by:	Company:	Date/Time:
REC'D 2	Received by:	Company:	Date/Time: 3/11/25 10:54 AM	REC'D 4	Relinquished by:	Company:	Date/Time:

SanAir Technologies Laboratory

The Identification Specialists

Analysis Report
prepared for
Helix Environmental Inc

Report Date: 4/1/2025

Project Name: App Architecture, Fire Station 16, 4111 Kings Hwy

Project #: 7348

SanAir ID#: 25021185

NVLAP TESTING

NVLAP LAB CODE 600227-0

11709 Chesterdale Road, Cincinnati, Ohio 45246
888.895.1177 | 513.438.6066 | LabReports@SanAir.com | SanAir.com

SanAir ID Number
25021185
FINAL REPORT
4/1/2025 5:51:20 PM

Name: Helix Environmental Inc
Address: 1 Elizabeth Place
Suite 160
Dayton, OH 45417
Phone: 937-226-0650

Project Number: 7348
P.O. Number:
Project Name: App Architecture, Fire Station 16, 4111 Kings Hwy
Collected Date: 3/31/2025
Received Date: 4/1/2025 10:30:00 AM

Dear Benjamin Froehlich,

We at SanAir would like to thank you for the work you recently submitted. The 18 sample(s) were received on Tuesday, April 01, 2025 via UPS. The final report(s) is enclosed for the following sample(s): 7348-03-31-01, 7348-03-31-02, 7348-03-31-03, 7348-03-31-04, 7348-03-31-05, 7348-03-31-06, 7348-03-31-07, 7348-03-31-08, 7348-03-31-09, 7348-03-31-10, 7348-03-31-11, 7348-03-31-12, 7348-03-31-13, 7348-03-31-14, 7348-03-31-15, 7348-03-31-16, 7348-03-31-17, 7348-03-31-18.

These results only pertain to this job and should not be used in the interpretation of any other job. This report is only complete in its entirety. Refer to the listing below of the pages included in a complete final report.

Sincerely,



Maureen Y. Haley
Asbestos Laboratory Manager
SanAir Technologies Laboratory

Final Report Includes:
- Cover Letter
- Analysis Pages
- Disclaimers and Additional Information

Sample conditions:
- 18 samples in Good condition.

SanAir ID Number
25021185
FINAL REPORT
4/1/2025 5:51:20 PM

Name: Helix Environmental Inc
Address: 1 Elizabeth Place
Suite 160
Dayton, OH 45417
Phone: 937-226-0650

Project Number: 7348
P.O. Number:
Project Name: App Architecture, Fire Station 16, 4111 Kings Hwy
Collected Date: 3/31/2025
Received Date: 4/1/2025 10:30:00 AM

Analyst: Hedge, Emily

Asbestos Bulk PLM EPA 600/R-93/116

	Stereoscopic	Components		
SanAir ID / Description	Appearance	% Fibrous	% Non-fibrous	Asbestos Fibers
7348-03-31-01 / 25021185-001 Coating on Concrete Block, 1st Fl, Turnout Gear Locker Room	Yellow Non-Fibrous Homogeneous	2% Cellulose	98% Other	None Detected
7348-03-31-02 / 25021185-002 Coating on Concrete Block, 1st Fl, Custodial Closet, W Wall	Yellow Non-Fibrous Homogeneous	2% Cellulose	98% Other	None Detected
7348-03-31-03 / 25021185-003 Coating on Concrete Block, 1st Fl, Hall to Dormitory Rooms	Yellow Non-Fibrous Homogeneous	2% Cellulose	98% Other	None Detected
7348-03-31-04 / 25021185-004 4" Cove Base + Mastic, 1st Fl, Custodial Closet, N Wall, Cove Base	Brown Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-31-04 / 25021185-004 4" Cove Base + Mastic, 1st Fl, Custodial Closet, N Wall, Mastic	Various Non-Fibrous Heterogeneous	2% Cellulose	98% Other	None Detected
7348-03-31-05 / 25021185-005 Drywall & Joint Compound, 1st Fl, Locker Room, SE Corner, Drywall	Grey Non-Fibrous Homogeneous	5% Cellulose	95% Other	None Detected
7348-03-31-05 / 25021185-005 Drywall & Joint Compound, 1st Fl, Locker Room, SE Corner, Joint Compound	White Non-Fibrous Homogeneous	2% Cellulose	98% Other	None Detected
7348-03-31-06 / 25021185-006 Drywall & Joint Compound, 1st Fl, Dormitory Room, NE Cubicle, Drywall	Grey Non-Fibrous Homogeneous	5% Cellulose	95% Other	None Detected
7348-03-31-06 / 25021185-006 Drywall & Joint Compound, 1st Fl, Dormitory Room, NE Cubicle, Joint Compound	White Non-Fibrous Homogeneous	2% Cellulose	98% Other	None Detected

Analyst:

Approved Signatory:

Analysis Date: 4/1/2025

Date: 4/1/2025

SanAir ID Number
25021185
FINAL REPORT
4/1/2025 5:51:20 PM

Name: Helix Environmental Inc
Address: 1 Elizabeth Place
Suite 160
Dayton, OH 45417
Phone: 937-226-0650

Project Number: 7348
P.O. Number:
Project Name: App Architecture, Fire Station 16, 4111 Kings Hwy
Collected Date: 3/31/2025
Received Date: 4/1/2025 10:30:00 AM

Analyst: Hedge, Emily

Asbestos Bulk PLM EPA 600/R-93/116

	Stereoscopic	Components		
SanAir ID / Description	Appearance	% Fibrous	% Non-fibrous	Asbestos Fibers
7348-03-31-07 / 25021185-007 4" Cove Base & Mastic, 1st Fl, Dormitory Room, SE Corner, Cove Base	Black Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-31-07 / 25021185-007 4" Cove Base & Mastic, 1st Fl, Dormitory Room, SE Corner, Mastic	Brown Non-Fibrous Homogeneous	2% Cellulose	98% Other	None Detected
7348-03-31-08 / 25021185-008 4" Cove Base & Mastic, 1st Fl, Custodial Closet, N Wall, Cove Base	Black Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-31-08 / 25021185-008 4" Cove Base & Mastic, 1st Fl, Custodial Closet, N Wall, Mastic	Brown Non-Fibrous Homogeneous	2% Cellulose	98% Other	None Detected
7348-03-31-09 / 25021185-009 Adhesive Behind Ceramic, 1st Fl, Locker Room, S Wall Outside	Tan Non-Fibrous Homogeneous	2% Cellulose	98% Other	None Detected
7348-03-31-10 / 25021185-010 Adhesive Behind Ceramic, 1st Fl, Locker Room, S Wall	Tan Non-Fibrous Homogeneous	2% Cellulose	98% Other	None Detected
7348-03-31-11 / 25021185-011 Tile Grout & Mortar, 1st Fl, Locker Room, Floor at Door, Tile	Tan Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-31-11 / 25021185-011 Tile Grout & Mortar, 1st Fl, Locker Room, Floor at Door, Grout	Tan Non-Fibrous Homogeneous	2% Cellulose	98% Other	None Detected
7348-03-31-11 / 25021185-011 Tile Grout & Mortar, 1st Fl, Locker Room, Floor at Door, Mortar	Grey Non-Fibrous Homogeneous	2% Cellulose	98% Other	< 1% Chrysotile
7348-03-31-12 / 25021185-012 Tile Grout & Mortar, 1st Fl, Locker Room, Floor at Door, Tile	Tan Non-Fibrous Homogeneous		100% Other	None Detected

Analyst: Approved Signatory:

Analysis Date: 4/1/2025 Date: 4/1/2025

SanAir ID Number
25021185
FINAL REPORT
4/1/2025 5:51:20 PM

Name: Helix Environmental Inc
Address: 1 Elizabeth Place
Suite 160
Dayton, OH 45417
Phone: 937-226-0650

Project Number: 7348
P.O. Number:
Project Name: App Architecture, Fire Station 16, 4111 Kings Hwy
Collected Date: 3/31/2025
Received Date: 4/1/2025 10:30:00 AM

Analyst: Hedge, Emily

Asbestos Bulk PLM EPA 600/R-93/116

	Stereoscopic	Components		
SanAir ID / Description	Appearance	% Fibrous	% Non-fibrous	Asbestos Fibers
7348-03-31-12 / 25021185-012 Tile Grout & Mortar, 1st Fl, Locker Room, Floor at Door, Grout	Tan Non-Fibrous Homogeneous	2% Cellulose	98% Other	None Detected
7348-03-31-12 / 25021185-012 Tile Grout & Mortar, 1st Fl, Locker Room, Floor at Door, Mortar	Grey Non-Fibrous Homogeneous	2% Cellulose	98% Other	< 1% Chrysotile
7348-03-31-13 / 25021185-013 Exterior Caulk, N Exterior, E Side Door	Grey Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-31-14 / 25021185-014 Exterior Caulk, S Exterior, E Side Entrance Door	Grey Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-31-15 / 25021185-015 Exterior Caulk, W Exterior, N Window at Sill	Grey Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-31-16 / 25021185-016 Exterior Caulk, E Exterior, SE Corner, S Window	Grey Non-Fibrous Homogeneous		100% Other	None Detected
7348-03-31-17 / 25021185-017 Sink Soundproofing, 1st Fl Kitchen, Under S Sink, E Side	Black Non-Fibrous Homogeneous	2% Cellulose	98% Other	None Detected
7348-03-31-18 / 25021185-018 Sink Soundproofing, 1st Fl Kitchen, Under S Sink, E Side	Black Non-Fibrous Homogeneous	2% Cellulose	98% Other	None Detected

Analyst: Approved Signatory:

Analysis Date: 4/1/2025 Date: 4/1/2025

Disclaimer and Additional Information

This report is the sole property of the client named on the SanAir Technologies Laboratory, Inc. (SanAir) chain-of-custody (COC). Results in the report are confidential information intended only for the use by the client named on the COC. Neither results nor reports will be discussed with or released to any third party without our client's written permission to maintain client confidentiality. The final report cannot be reproduced, except in full, without written authorization from SanAir to assure that parts of the report are not taken out of context. This report and any information contained within shall not be edited, altered, or modified in any way by any persons or agencies receiving, viewing, distributing, or otherwise possessing a copy of this final report. The laboratory reserves the right to perform amendments to any finalized report, of which shall supersede and make obsolete any previous editions. Such changes, modifications, additions, or deletions shall be effective immediately upon notice thereof, which may be given by means including, but not limited to, posting on the SanAir client portal website, electronic or conventional mail, or by any other means. The information provided in this report applies only to the samples submitted in the condition they were received at the laboratory and is relevant only for the date, time, and location of sampling. Samples were received in good condition unless otherwise noted on the report. The accuracy of the results is dependent upon the client's sampling procedure and information provided to the laboratory by the client on the COC, which includes the project name, project number, P.O. number, sample collection dates, special instructions, samples collected by, sample numbers, sample identifications/location, sample type, selected analysis type, and total area or volume that may affect the validity of the results. SanAir assumes no responsibility for the sampling procedure and will provide evaluation reports based solely on the sample and information provided by the client. SanAir assumes no responsibility or liability for the manner in which results are used or interpreted. This report does not constitute and shall not be used to claim product, process, system, or person certification, approval, or endorsement by NVLAP, NIST, NELAC, AIHA LAP, LLC or any other agency of the U.S. government; all or some tests contained in this report may not be accredited by every local, state, and federal regulatory agency. Refer to the SanAir website at www.sanair.com for copies of current certificates and scopes of various accreditations, certifications, and licenses or contact the laboratory at iaq@sanair.com for inquiries regarding the status or scope of an accreditation or certification.

Fibers smaller than 5-microns cannot be seen with this method due to scope limitations. Polarized- light microscopy is not consistently reliable in detecting asbestos in floor covering and similar non-friable organically bound materials. Quantitative transmission electron microscopy is currently the only method that can be used to determine if this material can be considered or treated as non-asbestos containing. Samples are held for a period of 60 days.

Asbestos Accreditations, Certifications, and Licenses
National Voluntary Laboratory Accreditation Program (NVLAP) Lab Code 600227-0
State of Connecticut Department of Public Health Registration Number: PH-0817
State of Rhode Island Department of Health, Certification Number: PLM00144, TEM00144
State of West Virginia Bureau for Public Health, Analytical Laboratory Number: LT000637
Texas Department of State Health Services License Number: 300510

HELIX ENVIRONMENTAL, INC.

1 Elizabeth Place, Suite 160 • Dayton, Ohio 45417-3445
Phone: (937) 226-0650 Fax: (937) 226-0653 Email: helix@helixenv.com

25021185

RUSH - YES OR (NO)

LABORATORY: San Air
DATE SAMPLED: 3/31/2025
DATE REQUIRED: 24 HR TAT
JOB NO./LOCATION: 7348 Dayton, OH
CLIENT: App Architecture
BUILDING: Fire Station 16, 4111 Kings Highway
INSPECTOR: B Froehlich, RA Froehlich
JOB NUMBER: 7348

BULK SAMPLE DATA SHEET | ANALYSES REQUESTED: Asbestos PLM

HELIX SAMPLE ID NUMBER	AMOUNT	REPRESENTATIVE SAMPLE LOCATION	MATERIAL DESCRIPTION	FRIABLE/ NON	CONDITION	COMMENTS
7348-03-31-01	SF	1st Fl, Turnout Gear Locker Room, S. Wall Center, 6" H.F.	Yellow Coating on Concrete Block	N	F	
7348-03-31-02	—	1st Fl, Custodial Closet, West Wall Center, 6" H.F.	Yellow Coating on Concrete Block	N	F	
7348-03-31-03		1st Fl, Hall to Dormitory Room W Wall 6" H.F.	Yellow Coating on Concrete Block	N	F	
7348-03-31-04	4 SF	1st Fl, Custodial Closet, N Wall bottom E of Door	4" Cove Base Brown & Mastic	N	G	12 LF / 3 = 4 SF
7348-03-31-05	—	1st Fl, Locker room, SE Corner behind Door	Drywall & Joint Compound	N	G	
7348-03-31-06		1st Fl, Dormitory Room, NE Cubicle, N Wall 4" H.F.	Drywall & Joint Compound	N	G	
7348-03-31-07		1st Fl, Dormitory Room, SE Corner Divider 4" H.F.	4" Cove Base, Black & Mastic	N	G	
7348-03-31-08	—	1st Fl, Custodial Closet, N Wall Bottom, W of Door	4" Cove Base, Dk Brown & Mastic	N	G	
7348-03-31-09	400 SF	1st Fl, Locker room, S Wall outside Center Toilet 7" H.	Tan Adhesive behind Tan Ceramic	N	G	Do not analyze Ceramic Tile
7348-03-31-10	—	1st Fl, Locker room, S Wall outside W Toilet 7" H.	Tan Adhesive behind Tan Ceramic	N	G	"
7348-03-31-11	60 SF	1st Fl, Locker room, Floor at Door to West Toilet	Tile Grout & Mortar	N	G	Toilet Room Floor
7348-03-31-12	✓	1st Fl, Locker room, Floor at Door to East Toilet	Tile Grout & Mortar	N	G	"

THIS IS A CHAIN OF CUSTODY DOCUMENT. PLEASE COMPLETE, SIGN, AND DATE. PLEASE RETURN ORIGINAL TO HELIX ENVIRONMENTAL, INC.

REC'D	Relinquished by: B Froehlich	Company: Helix Env. Inc.	Date/Time: 3/31/2025 15:00	REC'D 3	Relinquished by: RMB APR 01	Company: 2025	Date/Time: 10:30 am	
REC'D 2	Received by:	Company:	Date/Time:	REC'D 4	Relinquished by:	Company:	Date/Time:	

25021185

HELIX ENVIRONMENTAL, INC.

1 Elizabeth Place, Suite 160 • Dayton, Ohio 45417-3445
Phone: (937) 226-0650 Fax: (937) 226-0653 Email: helix@helixenv.com

RUSH - YES OR (NO)

LABORATORY: San Air
DATE SAMPLED: 3/31/2025
DATE REQUIRED: 24 HR TAT
JOB NO./LOCATION: 7348 Dayton, OH
CLIENT: APP Architecture
BUILDING: Fire Station 16, 4111 Kings Highway
INSPECTOR: B Froehlich
JOB NUMBER: 7348

BULK SAMPLE DATA SHEET | ANALYSES REQUESTED: Asbestos PLM

HELIX SAMPLE ID NUMBER	AMOUNT	REPRESENTATIVE SAMPLE LOCATION	MATERIAL DESCRIPTION	FRIABLE/ NON	CONDITION	COMMENTS
7348-03-31-13	SF	N Exterior, E side door 4.5'Ht	Gray Exterior Caulk	N	G	
7348-03-31-14	—	S Exterior, E side Entrance Door 4.5'Ht	Grey Exterior Caulk	N	G	
7348-03-31-15	SF	W Exterior, N Window at Sill 4'Ht	Lt. Grey Exterior Caulk	N	G	
7348-03-31-16	—	E Exterior, SE Corner, S Window Sill 2'Ht	Lt. Grey Exterior Caulk	N	G	DK Grey Around Windows
7348-03-31-17	SF	1st Fl Kitchen, under S Sink, E Side 2'Ht	Black Sink Soundproofing	N	G	
7348-03-31-18	—	1st Fl Kitchen, under S Sink, E Side 2'Ht	Black Sink Soundproofing	N	G	
7348-03-31-						
7348-03-31-						
7348-03-31-						
7348-03-31-						
7348-03-31-						
7348-03-31-						

THIS IS A CHAIN OF CUSTODY DOCUMENT. PLEASE COMPLETE, SIGN, AND DATE. PLEASE RETURN ORIGINAL TO HELIX ENVIRONMENTAL, INC.

REC'D 1	Relinquished by:	Company: Helix Env. Inc.	Date/Time: 3/31/2025 1500	REC'D 3	Relinquished by: RWB	APR 01 2025	Company: 10:30am	Date/Time:
REC'D 2	Received by:	Company:	Date/Time:	REC'D 4	Relinquished by:		Company:	Date/Time:

SanAir Technologies Laboratory

The Identification Specialists

Analysis Report
prepared for
Helix Environmental Inc

Report Date: 4/2/2025

Project Name: App Architecture, Fire Station 16, 4111 Kings Hwy

Project #: 7348

SanAir ID#: 25021480

NVLAP TESTING

NVLAP LAB CODE 600227-0

11709 Chesterdale Road, Cincinnati, Ohio 45246
888.895.1177 | 513.438.6066 | LabReports@SanAir.com | SanAir.com

SanAir ID Number
25021480
FINAL REPORT
4/2/2025 6:09:10 PM

Name: Helix Environmental Inc
Address: 1 Elizabeth Place
Suite 160
Dayton, OH 45417
Phone: 937-226-0650

Project Number: 7348
P.O. Number:
Project Name: App Architecture, Fire Station 16, 4111 Kings Hwy
Collected Date: 3/31/2025
Received Date: 4/2/2025 10:10:00 AM

Dear Benjamin Froehlich,

We at SanAir would like to thank you for the work you recently submitted. The 2 sample(s) were received on Wednesday, April 02, 2025 via Fax or Email request. The final report(s) is enclosed for the following sample(s): 7348-03-31-11, 7348-03-31-12.

These results only pertain to this job and should not be used in the interpretation of any other job. This report is only complete in its entirety. Refer to the listing below of the pages included in a complete final report.

Sincerely,



Maureen Y. Haley
Asbestos Laboratory Manager
SanAir Technologies Laboratory

Final Report Includes:
- Cover Letter
- Analysis Pages
- Disclaimers and Additional Information

Sample conditions:
- 2 samples in Good condition.

SanAir ID Number
25021480
FINAL REPORT
4/2/2025 6:09:10 PM

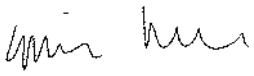
Name: Helix Environmental Inc
Address: 1 Elizabeth Place
Suite 160
Dayton, OH 45417
Phone: 937-226-0650

Project Number: 7348
P.O. Number:
Project Name: App Architecture, Fire Station 16, 4111 Kings Hwy
Collected Date: 3/31/2025
Received Date: 4/2/2025 10:10:00 AM

Analyst: Hedge, Emily

Asbestos Bulk EPA PLM 400 Point Count

	Stereoscopic	Components		
SanAir ID / Description	Appearance	% Fibrous	% Non-fibrous	Asbestos Fibers
7348-03-31-11 / 25021480-001 Tile Grout & Mortar, 1st Fl, Locker Room, Floor, Mortar Only, Mortar	Grey Non-Fibrous Homogeneous		100% Other	< 0.25% Chrysotile
7348-03-31-12 / 25021480-002 Tile Grout & Mortar, 1st Fl, Locker Room, Floor, Mortar Only, Mortar	Grey Non-Fibrous Homogeneous		100% Other	< 0.25% Chrysotile

Analyst: 

Approved Signatory: 

Analysis Date: 4/2/2025

Date: 4/2/2025

Disclaimer and Additional Information

400 Point Count Method EPA 600/R-93/116

EPA – 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples

EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials

This report is the sole property of the client named on the SanAir Technologies Laboratory, Inc. (SanAir) chain-of-custody (COC). Results in the report are confidential information intended only for the use by the customer listed on the COC. Neither results nor reports will be discussed with or released to any third party without our client's written permission. The final report shall not be reproduced except in full without written approval of the laboratory to assure that parts of the report are not taken out of context. This report and any information contained within shall not be edited, altered, or modified in any way by any persons or agencies receiving, viewing, distributing, or otherwise possessing a copy of this final report. The laboratory reserves the right to perform amendments to any finalized report, of which shall supersede and make obsolete any previous editions. Such changes, modifications, additions, or deletions shall be effective immediately upon notice thereof, which may be given by means including, but not limited to, posting on the SanAir client portal website, electronic or conventional mail, or by any other means. The information provided in this report applies only to the samples submitted and is relevant only for the date, time, and location of sampling. The accuracy of the results is dependent upon the client's sampling procedure, additions, exclusions, method deviations and information provided to the laboratory by the client on the COC. When the client requires samples to be tested in a way that deviates from a specific method or condition, all reported results may be affected by the deviation. SanAir assumes no responsibility for the sampling procedure and will provide evaluation reports based solely on the sample(s) in the condition in which they are received at the laboratory and information provided by the client on the COC, such as: project number, project name, collection dates, P.O. number, special instructions, samples collected by, sample numbers, sample identifications, sample type, selected analysis type, flow rate, total volume or area, and start-stop times that may affect the validity of the results in this report. Samples were received in good condition unless otherwise noted. SanAir assumes no responsibility or liability for the manner in which the results are used or interpreted. Limit of detection for this method is 0.25%. This report does not constitute and shall not be used to claim product, process, system, or person certification, approval, or endorsement by NVLAP, NIST, NELAC, AIHA LAP, LLC or any other U.S. governmental agencies; all or some tests contained in this report may not be accredited by every local, state, and federal regulatory agency. Refer to the SanAir website at www.sanair.com for copies of current certificates and scopes of various accreditations, certifications, and licenses or contact the laboratory at iaq@sanair.com for inquiries regarding the status or scope of an accreditation or certification. Samples are held for a period of 60 days.

Asbestos Accreditations, Certifications, and Licenses:
National Voluntary Laboratory Accreditation Program (NVLAP) Lab Code 600227-0
State of Connecticut Department of Public Health Registration Number: PH-0817
State of Rhode Island Department of Health Certification Number: PLM00144, TEM00144
State of West Virginia Bureau for Public Health Asbestos Laboratory Number: LT000637
Texas Department of State Health Services License Number: 300510

Revision#02, 6/21/2024

25021480

From: Benjamin Froehlich <bfroehlich@helixenv.com>
Sent: Wednesday, April 2, 2025 9:54 AM
To: Lab Reports <labreports@sanair.com>
Subject: Re: Analysis Report for Job 25021185 is complete.

EXTERNAL EMAIL: DO NOT CLICK on links or attachments unless you recognize the sender and know the content is safe.

Hello,

May I please have 2 day turn-around EPA PLM 400 point counts or EPA PLM NOB analyses on the following sample:

-7348-03-31-11 (25021185-011), mortar only
-7348-03-31-12 (25021185-012), mortar only

Thanks,
Ben Froehlich
Helix Environmental, Inc.
(937) 226-0650
7348-03-31-11 / 25021185-011 Mortar
7348-03-31-12 / 25021185-012 Mortar

On Apr 1, 2025, at 5:51 PM, SanAir Technologies Laboratory <labreports@sanair.com> wrote:

Your Analysis is complete. Your report in PDF format is attached. Information is periodically added to our additional information and disclaimer pages so please check them for updates.

Thank you for your continued business, SanAir

The information in this message may contain confidential information intended for use by the recipient only. If this information was received in error, please reply to the message and delete it.

<25021185_App Architecture, Fire Station 16, 4111 Kings Hwy_202541175120.pdf>

RMB APR 02 2025 10:10am

PACT 25021480

PLM 25021185

HELIX ENVIRONMENTAL, INC.
1 Elizabeth Place, Suite 160 • Dayton, Ohio 45417-3445
Phone: (937) 226-0650 Fax: (937) 226-0653 Email: helix@helixenv.com

RUSH - YES OR (NO)

LABORATORY: San Air
DATE SAMPLED: 3/31/2025
DATE REQUIRED: 24 HR TAT
JOB NO./LOCATION: 7348 Dayton, OH
CLIENT: App Architecture
BUILDING: Fire Station 16, 4111 Kings Highway
INSPECTOR: B Froehlich, RA Froehlich
JOB NUMBER: 7348

BULK SAMPLE DATA SHEET | ANALYSES REQUESTED: Asbestos PLM

HELIX SAMPLE ID NUMBER	AMOUNT	REPRESENTATIVE SAMPLE LOCATION	MATERIAL DESCRIPTION	FRIABLE/ NON	CONDITION	COMMENTS
7348-03-31-01	SF	1st Fl, Turnout Gear Locker Room, S. Wall Center, 6' Ht.	Yellow Coating on Concrete Block	N	F	
7348-03-31-02	—	1st Fl, Custodial Closet, West Wall Center, 6' Ht.	Yellow Coating on Concrete Block	N	F	
7348-03-31-03		1st Fl, Hall to Dormitory Room, W Wall 6' Ht.	Yellow Coating on Concrete Block	N	F	
7348-03-31-04	4 SF	1st Fl, Custodial Closet, N Wall Bottom E of Door	4" Cove Base Brown & Mastic	N	G	12 LF / 3 = 4 SF
7348-03-31-05	—	1st Fl, Locker room, SE Corner behind Door	Drywall & Joint Compound	N	G	
7348-03-31-06		1st Fl, Dormitory Room, NE Cubicle, N Wall 4' Ht.	Drywall & Joint Compound	N	G	
7348-03-31-07		1st Fl, Dormitory Room, SE Corner Divider 4' Ht.	4" Cove Base, Black & Mastic	N	G	
7348-03-31-08	—	1st Fl, Custodial Closet, N Wall Bottom, W of Door	4" Cove Base, Brown & Mastic	N	G	
7348-03-31-09	400 SF	1st Fl, Locker room, S Wall outside Center Toilet 7' Ht.	Tan Adhesive behind Tan Ceramic	N	G	Do not analyze Ceramic Tile
7348-03-31-10	—	1st Fl, Locker room, S Wall outside W Toilet 7' Ht.	Tan Adhesive behind Tan Ceramic	N	G	"
7348-03-31-11	60 SF	1st Fl, Locker room, Floor at Door to West Toilet	Tile Grout & Mortar	N	G	Toilet Room Floor
7348-03-31-12	—	1st Fl, Locker room, Floor at Door to East Toilet	Tile Grout & Mortar	N	G	"

THIS IS A CHAIN OF CUSTODY DOCUMENT. PLEASE COMPLETE, SIGN, AND DATE. PLEASE RETURN ORIGINAL TO HELIX ENVIRONMENTAL, INC.

REC'D	Relinquished by:	Company:	Date/Time:	REC'D	Relinquished by:	Company:	Date/Time:	
		Helix Env. Inc.	3/31/2025 1500		RMB APR 01 2025		10:30am	
REC'D	Received by:	Company:	Date/Time:	REC'D	Relinquished by:	Company:	Date/Time:	

PLM 25021185
PCT 25021480

HELIX ENVIRONMENTAL, INC.
1 Elizabeth Place, Suite 160 • Dayton, Ohio 45417-3445
Phone: (937) 226-0650 Fax: (937) 226-0653 Email: helix@helixenv.com

RUSH - YES OR (NO)

LABORATORY: San Air
DATE SAMPLED: 3/31/2025
DATE REQUIRED: 24 HR TAT
JOB NO./LOCATION: 7348 Dayton, OH
CLIENT: App Architecture
BUILDING: Fire Station 16, 4111 Kings Highway
INSPECTOR: B Froehlich
JOB NUMBER: 7348

BULK SAMPLE DATA SHEET | ANALYSES REQUESTED: Asbestos PLM

HELIX SAMPLE ID NUMBER	AMOUNT	REPRESENTATIVE SAMPLE LOCATION	MATERIAL DESCRIPTION	FRIABLE/ NON	CONDITION	COMMENTS
7348-03-31-13	SF	N Exterior, E side door 4.5'Ht	Gray Exterior Caulk	N	G	
7348-03-31-14	—	S Exterior, E side Entrance Door 7.5'Ht	Grey Exterior Caulk	N	G	
7348-03-31-15	SF	W Exterior, N Window at 5'11 4'Ht	Lt. Grey Exterior Caulk	N	G	
7348-03-31-16	—	E Exterior, SE Corner, S Window 2'Ht	Lt. Grey Exterior Caulk	N	G	DK Grey Around Windows
7348-03-31-17	SF	1st Fl Kitchen, under S Sink, E Side 2'Ht	Black Sink Soundproofing	N	G	
7348-03-31-18	—	1st Fl Kitchen, under S Sink, E Side 2'Ht	Black Sink Soundproofing	N	G	
7348-03-31-						
7348-03-31-						
7348-03-31-						
7348-03-31-						
7348-03-31-						
7348-03-31-						

THIS IS A CHAIN OF CUSTODY DOCUMENT. PLEASE COMPLETE, SIGN, AND DATE. PLEASE RETURN ORIGINAL TO HELIX ENVIRONMENTAL, INC.

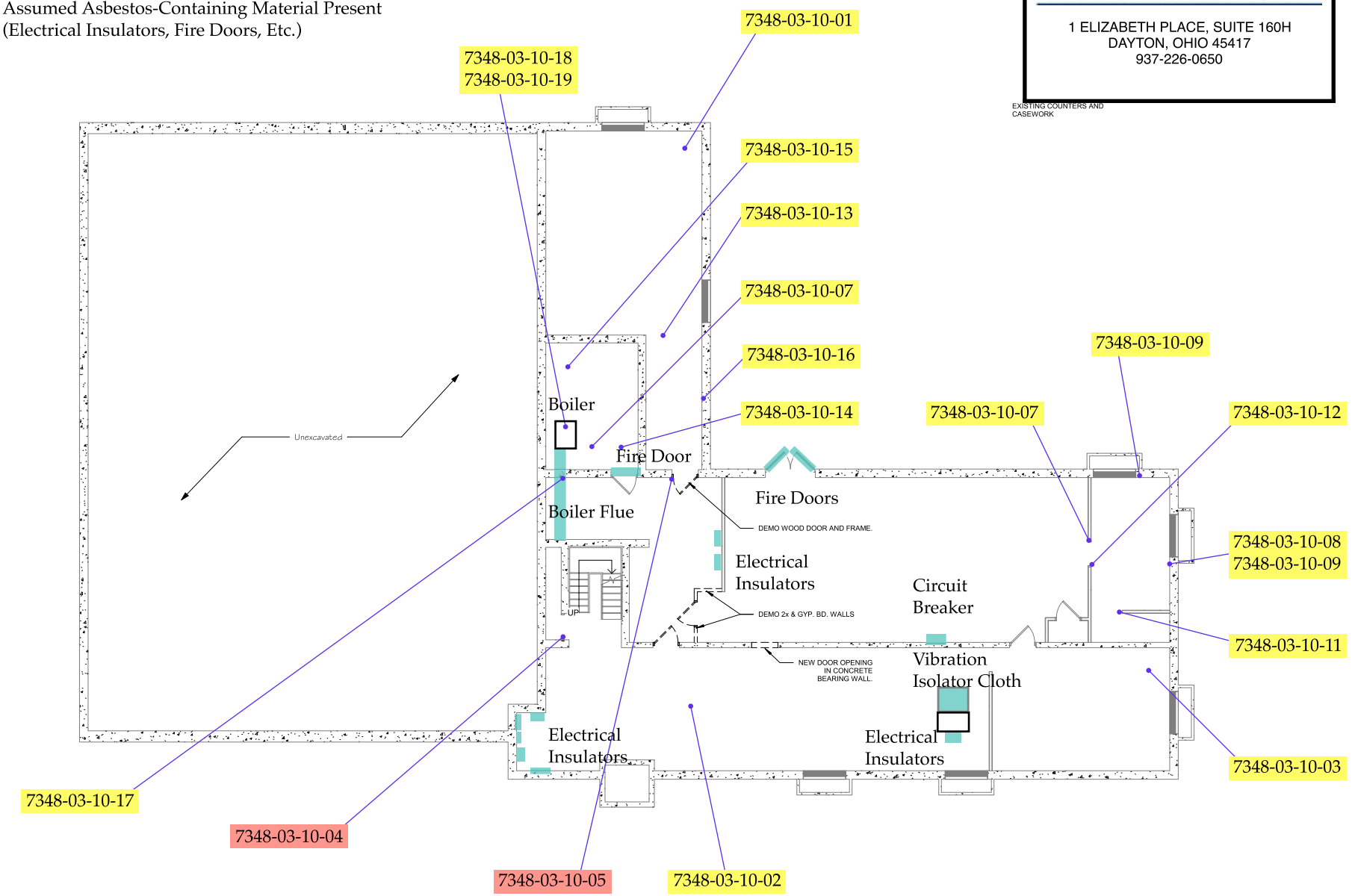
REC'D 1	Relinquished by:	Company: Helix Env. Inc.	Date/Time: 3/31/2025 1600	REC'D 3	Relinquished by: RWB	Company: APR 01 2025 10:30a	Date/Time:
REC'D 2	Received by:	Company:	Date/Time:	REC'D 4	Relinquished by:	Company:	Date/Time:

LEGEND

- Asbestos-Containing Material
- Non Asbestos-Containing Material
- Asbestos-Containing Material (Insulation, Flooring Etc.)
- Assumed Asbestos-Containing Material Present (Electrical Insulators, Fire Doors, Etc.)

ASBESTOS SAMPLE LOCATIONS, BASEMENT, FIRE STATION 16, 4111 KING'S HIGHWAY, DAYTON, OH

HELIX ENVIRONMENTAL, INC.
1 ELIZABETH PLACE, SUITE 160H
DAYTON, OHIO 45417
937-226-0650



LEGEND

- Asbestos-Containing Material
- Non Asbestos-Containing Material
- Asbestos-Containing Material (Insulation, Flooring Etc.)
- Assumed Asbestos-Containing Material Present (Electrical Insulators, Fire Doors, Etc.)

ASBESTOS SAMPLE LOCATIONS, 1st FLOOR, FIRE STATION 16, 4111 KING'S HIGHWAY, DAYTON, OH

HELIX ENVIRONMENTAL, INC.
1 ELIZABETH PLACE, SUITE 160H
DAYTON, OHIO 45417
937-226-0650

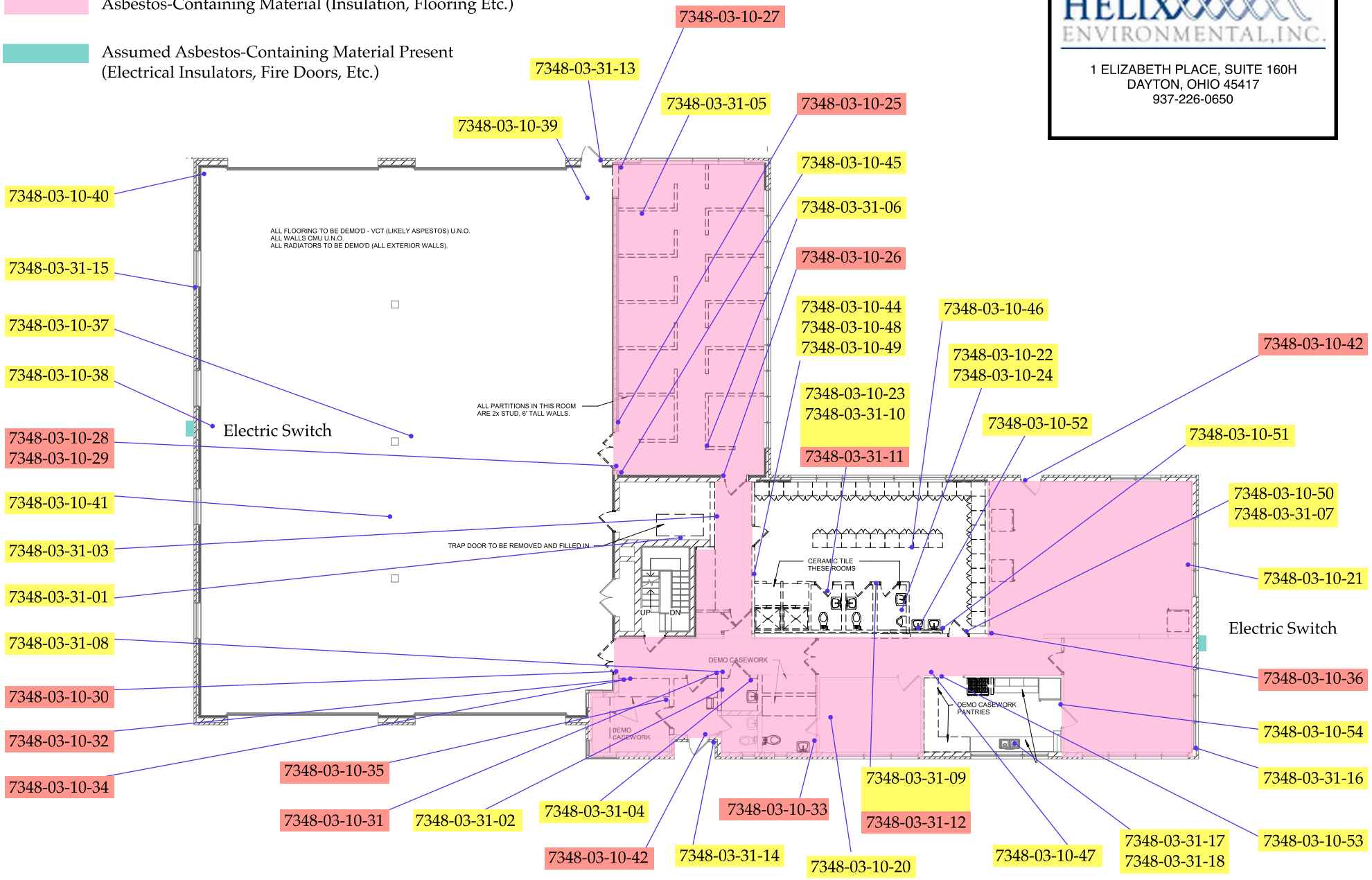




Photo 01- Sample# 7348-03-10-01, No Asbestos Detected in Cream/ Tan Insulation Sealant



Photo 02- Sample# 7348-03-10-02, No Asbestos Detected in Cream/ Tan Insulation Sealant



Photo 03- Sample# 7348-03-10-03, No Asbestos Detected in Cream/ Tan Insulation Sealant



Photo 04- Sample# 7348-03-10-04, 2% Chrysotile Asbestos Detected in Grey Interior Caulk



Photo 05- Sample# 7348-03-10-05, 2.5% Chrysotile Asbestos Detected in Grey Interior Caulk



Photo 06- Sample# 7348-03-10-06, No Asbestos Detected in Cream/ Tan Insulation Sealant



Photo 07- Sample# 7348-03-10-07, No Asbestos Detected in Drywall and Joint Compound



Photo 08- Sample# 7348-03-10-08, No Asbestos Detected in Drywall and Joint Compound



Photo 09- Sample# 7348-03-10-09, No Asbestos Detected in 4" Cove Base and Mastic



Photo 10- Sample# 7348-03-10-10, No Asbestos Detected in 4" Cove Base and Mastic



Photo 11- Sample# 7348-03-10-11, No Asbestos Detected in 12" x 12" Tan Mottled Floor Tile and Tan Mastic



Photo 12- Sample# 7348-03-10-12, No Asbestos Detected in 12" x 12" Tan Mottled Floor Tile and Tan Mastic



Photo 13- Sample# 7348-03-10-13, No Asbestos Detected in Hard Plaster



Photo 14- Sample# 7348-03-10-14, No Asbestos Detected in Hard Plaster



Photo 15- Sample# 7348-03-10-15, No Asbestos Detected in Hard Plaster



Photo 16- Sample# 7348-03-10-16, No Asbestos Detected in Pipe Penetration Plaster



Photo 17- Sample# 7348-03-10-17, No Asbestos Detected in Pipe Penetration Plaster



Photo 18- Sample# 7348-03-10-18, No Asbestos Detected in Grey Boiler Sealant



Photo 19- Sample# 7348-03-10-19, No Asbestos Detected in Grey Boiler Sealant



Photo 20- Sample# 7348-03-10-20, No Asbestos Detected in 2' x 4' Ceiling Tile



Photo 21- Sample# 7348-03-10-21, No Asbestos Detected in 2' x 4' Ceiling Tile



Photo 22- Sample# 7348-03-10-22, No Asbestos Detected in 2' x 2' Ceiling Tile



Photo 23- Sample# 7348-03-10-23, No Asbestos Detected in 2' x 2' Ceiling Tile



Photo 24- Sample# 7348-03-10-24, No Asbestos Detected in Drywall and Joint Compound



Photo 25- Sample# 7348-03-10-25, 0.3% Chrysotile Asbestos Detected in Grey Interior Caulk



Photo 26- Sample# 7348-03-10-26, 4% Asbestos Detected in 9"x9" Tan Streak Floor Tile, No Asbestos in Black Mastic



Photo 27- Sample# 7348-03-10-27, 4% Asbestos Detected in 9"x9" Tan Streak Floor Tile, No Asbestos in Black Mastic



Photo 28- Sample# 7348-03-10-28, 4% Asbestos Detected in 9"x9" Pink Streaked Floor Tile, No Asbestos in Black Mastic



Photo 29- Sample# 7348-03-10-29, 4% Asbestos Detected in 9"x9" Pink Streaked Floor Tile, No Asbestos in Black Mastic



Photo 30- Sample# 7348-03-10-30, 4% Asbestos Detected in 9"x9" Terracotta Streaked Floor Tile, No Asbestos in Black Mastic



Photo 31- Sample# 7348-03-10-31, 4% Asbestos Detected in 9"x9" Terracotta Streaked Floor Tile, No Asbestos in Black Mastic



Photo 32- Sample# 7348-03-10-32, 2.2% Asbestos Detected in 9"x9" Grey and Green Streaked Floor Tile, No Asbestos in Black Mastic



Photo 33- Sample# 7348-03-10-33, 3.5% Asbestos Detected in 9"x9" Grey and Green Streaked Floor Tile, No Asbestos in Black Mastic



Photo 34- Sample# 7348-03-10-34, 4% Asbestos Detected in 9"x9" Green Streaked Floor Tile, No Asbestos in Black Mastic



Photo 35- Sample# 7348-03-10-35, 4% Asbestos Detected in 9"x9" Green Streaked Floor Tile, No Asbestos in Black Mastic



Photo 36- Sample# 7348-03-10-36, 0.9% Chrysotile Asbestos Detected in Grey Interior Caulk

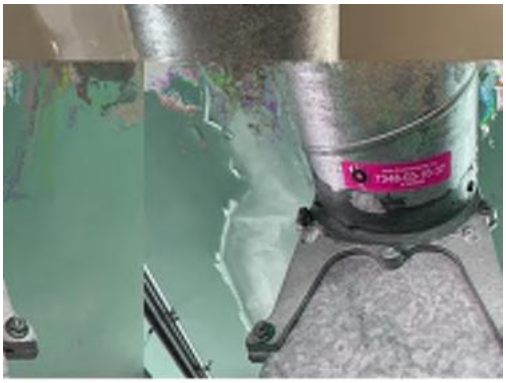


Photo 37- Sample# 7348-03-10-37, No Asbestos Detected in Grey Duct Sealant



Photo 38- Sample# 7348-03-10-38, No Asbestos Detected in Grey Duct Sealant



Photo 39- Sample# 7348-03-10-39, No Asbestos Detected in Tan Pipe Insulation Sealant



Photo 40- Sample# 7348-03-10-40, No Asbestos Detected in Hard Plaster



Photo 41- Sample# 7348-03-10-41, No Asbestos Detected in Hard Plaster and Skim Coat



Photo 42- Sample# 7348-03-10-42, 0.5% Asbestos Detected in 9"x9" Maroon Streaked Floor Tile, No Asbestos in Black Mastic



Photo 43- Sample# 7348-03-10-43, 1.3% Asbestos Detected in 9"x9" Maroon Streaked Floor Tile, No Asbestos in Black Mastic



Photo 44- Sample# 7348-03-10-44, No Asbestos Detected in Tan Pipe Insulation Sealant

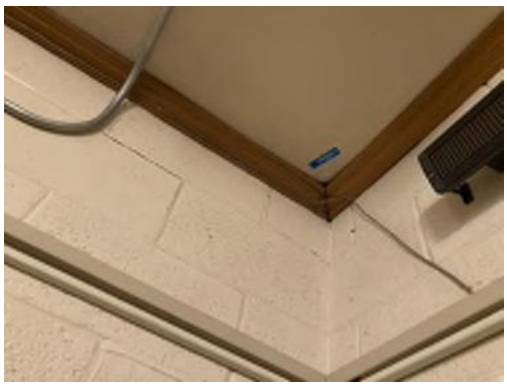


Photo 45- Sample# 7348-03-10-45, No Asbestos Detected in Hard Plaster

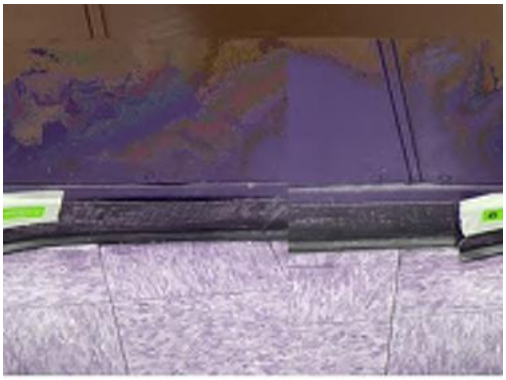


Photo 46- Sample# 7348-03-10-46, No Asbestos Detected in 4" Cove Base and Mastic



Photo 47- Sample# 7348-03-10-47, No Asbestos Detected in Hard Plaster and Skim Coat



Photo 48- Sample# 7348-03-10-48, No Asbestos Detected in Hard Plaster and Skim Coat

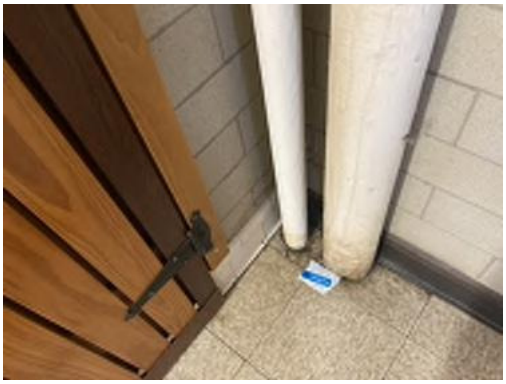


Photo 49- Sample# 7348-03-10-49, No Asbestos Detected in 12"x12" Tan Mottled Floor Tile and Black Mastic



Photo 50- Sample# 7348-03-10-50, No Asbestos Detected in 12"x12" Tan Mottled Floor Tile and Black Mastic



Photo 51- Sample# 7348-03-10-51, No Asbestos Detected in 12"x12" Taupe Mottled Floor Tile and Black Mastic



Photo 52- Sample# 7348-03-10-52, No Asbestos Detected in 12"x12" Taupe Mottled Floor Tile and Black Mastic



Photo 53- Sample# 7348-03-10-53, No Asbestos Detected in 12"x12"Bronze Mottled Floor Tile and Black Mastic



Photo 54- Sample# 7348-03-10-54, No Asbestos Detected in 12"x12"Bronze Mottled Floor Tile and Black Mastic



Photo 55- Sample# 7348-03-31-01, No Asbestos Detected in Yellow Block Coating



Photo 56- Sample# 7348-03-31-02, No Asbestos Detected in Yellow Block Coating



Photo 57- Sample# 7348-03-31-03, No Asbestos Detected in Yellow Block Coating



Photo 58- Sample# 7348-03-31-04, No Asbestos Detected in 4" Cove Base and Mastic



Photo 59- Sample# 7348-03-31-05, No Asbestos Detected in Drywall and Joint Compound



Photo 60- Sample# 7348-03-31-06, No Asbestos Detected in Drywall and Joint Compound



Photo 63- Sample# 7348-03-31-07, No Asbestos Detected in 4" Cove Base and Mastic

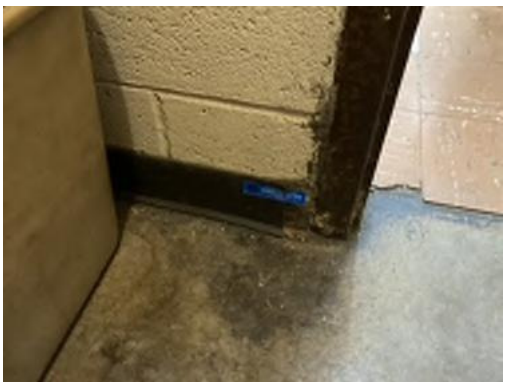


Photo 62- Sample# 7348-03-31-08, No Asbestos Detected in 4" Cove Base and Mastic



Photo 63- Sample# 7348-03-31-09, No Asbestos Detected in Tan Ceramic Tile Adhesive



Photo 64- Sample# 7348-03-31-10, No Asbestos Detected in Tan Ceramic Tile Adhesive



Photo 65- Sample# 7348-03-31-11,<0.25% Asbestos Detected in Mortar, No Asbestos Detected in Ceramic Tile and Adhesive



Photo 66- Sample# 7348-03-31-12,<0.25% Asbestos Detected in Mortar, No Asbestos Detected in Ceramic Tile and Adhesive

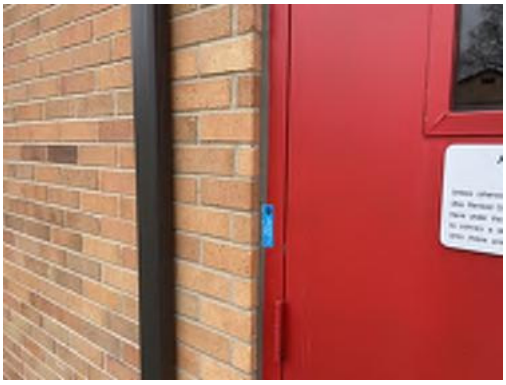


Photo 67- Sample# 7348-03-31-13, No Asbestos Detected in Grey Exterior Caulk



Photo 68- Sample# 7348-03-31-14, No Asbestos Detected in Grey Exterior Caulk



Photo 69- Sample# 7348-03-31-15, No Asbestos Detected in Light Grey Exterior Caulk



Photo 70- Sample# 7348-03-31-16, No Asbestos Detected in Light Grey Exterior Caulk



Photo 71- Sample# 7348-03-31-17, No Asbestos Detected in Black Sink Soundproofing



Photo 72- Sample# 7348-03-31-18, No Asbestos Detected in Black Sink Soundproofing



Photo 73- Basement, Boiler Room Entrance Door, All Fire Doors Are Assumed to Contain Asbestos



Photo 74- Basement, Maintenance Room Entrance Door, All Fire Doors Are Assumed to Contain Asbestos



Photo 75- Basement, Boiler Room, Boiler Flue is Assumed to Contain Asbestos, Under the Metal Jacket



Photo 76- Basement, West Central Hallway, Boiler Flue is Assumed to Contain Asbestos, Under the Metal Jacket



Photo 77- Basement, SW Room, East Area, White Vibration Isolator Cloth is Assumed to Contain Asbestos

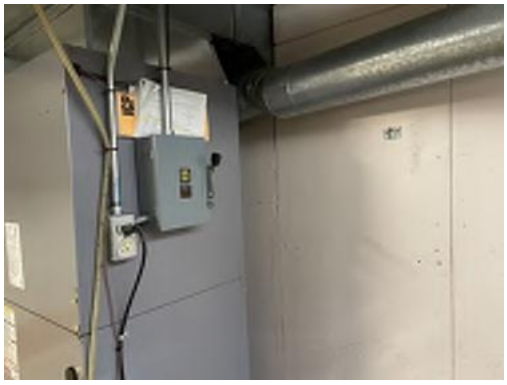


Photo 78- Basement, SW Room, East Area, Electrical Insulators in Safety Switch are Assumed to Contain Asbestos



Photo 79- Exterior, West Side, Safety Switch, All Electrical Insulators are Assumed to Contain Asbestos

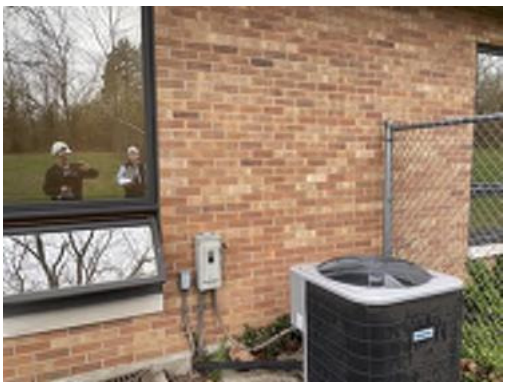


Photo 80- Exterior, East Side, Safety Switch, All Electrical Insulators are Assumed to Contain Asbestos



Photo 81- Exterior, Roof, East Side, Safety Switches, All Electrical Insulators are Assumed to Contain Asbestos



Photo 82- Basement, West Central Hallway, East Wall, Safety Switches, All Assumed to Contain Asbestos

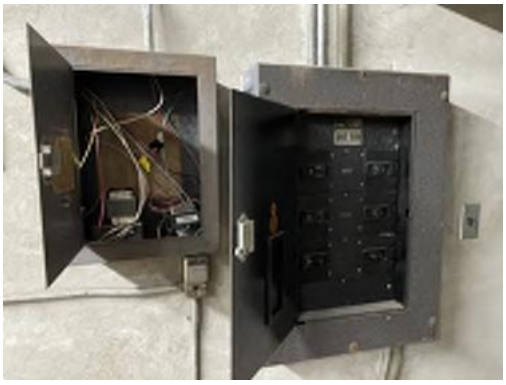


Photo 83- Boiler Room, East Wall, Circuit Breaker, All Electrical Insulators are Assumed to Contain Asbestos

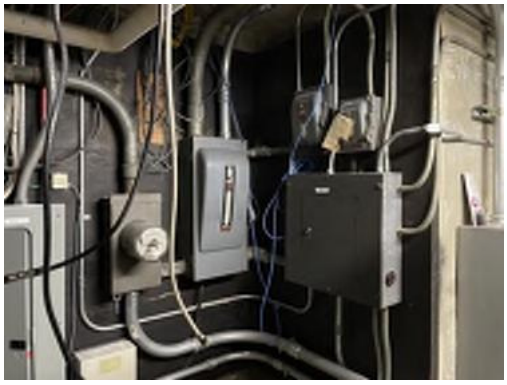


Photo 84- Basement, SW Room, West Wall, All Electrical Insulators are Assumed to Contain Asbestos



Photo 85- Maintenance Room, South Wall, Circuit Breaker, All Electrical Insulators are Assumed to Contain Asbestos



Photo 86- Exterior, Roof, East Side, Safety Switches, All Bituminous Roofing is Assumed to Contain Asbestos



Photo 87- Exterior, North Side of West Vehicle Bay

HELIX ENVIRONMENTAL, INC.

April 29, 2025

Mr. Curt Sparks, AIA, ACHA, EDAC
App Architecture
615 Woodside Drive
Englewood, Ohio 45322

Telephone (937) 836-8898 ext. 110

RE: Pre-Renovation Preliminary Lead-Containing Paint Inspection of Fire Station 16, 4111 Kings Highway, Dayton, Ohio, March 10, 2025.
Helix Project No. 7348.

Dear Mr. Sparks:

App Architecture contracted with Helix Environmental, Inc. to perform a pre-renovation preliminary lead-containing paint inspection of the accessible portions of the Fire Station 16 located at 4111 Kings Highway, Dayton, Ohio. The inspection was necessary to determine if lead-containing paint materials were present so that plans could be made to remove them in accordance with current regulatory requirements prior to a planned renovation project at the building. This letter report summarizes the results of the inspection performed on March 10, 2025 and the analytical results of samples collected on that date. A companion report documents the asbestos inspection of the fire station building.

INSPECTION AND ANALYTICAL PROCEDURES

Mr. Ralph Froehlich, CIH, CSP, QEP performed preliminary lead paint film sampling at representative locations in the accessible renovation areas at the Fire Station 16 building, 4111 Kings Highway in Dayton, Ohio. Mr. Ralph A. Froehlich is a Certified Industrial Hygienist with more than thirty years experience in the fields of occupational and environmental health, and is certified by the Ohio Department of Health as an Asbestos Hazard Evaluation Specialist and Asbestos Abatement Project Designer (Certification Nos. ES3074 and PD60148, respectively).

Painted surfaces will be disturbed during the planned renovation, and were assumed to contain lead given the ages of the buildings (approximately 100 years). Helix Environmental, Inc. collected fourteen (14) paint film samples in representative locations to evaluate the accuracy of this assumption.

Paint film samples were collected using cleaned hand tools and packaged in labeled zip-lock plastic bags. The sample bags were placed into a larger zip-lock bag, with the original sample data/chain-of-custody and analytical request forms. Helix Environmental, Inc. retained copies of these forms.

The samples were shipped by overnight courier to SanAir Technologies Laboratory, Inc., a National Voluntary Laboratory Accreditation Program (NVLAP) and Ohio Certified Professional accredited environmental lead laboratory, where they were analyzed for lead in accordance with the U.S. Environmental Protection Agency's SW846/M 050B/ 7000B Method. Under this method, the limit of detection for lead is 10 μg/sample.

SanAir Technologies Laboratory, Inc. maintains accreditation from the American Industrial Hygiene Association as an environmental lead laboratory and has received accreditation through successful participation in the NIST National Voluntary Laboratory Accreditation Program (NVLAP) for bulk asbestos and as an environmental microbiology laboratory. AIHA-accredited laboratories are scrutinized on a regular basis to ensure that personnel, equipment, facilities and data are maintained. In addition, AIHA-accredited laboratories have well-developed assurance/quality control programs to ensure that analytical results accurately reflect conditions present during the sampling periods.

APPLICABLE STANDARDS

Lead

The U. S. Environmental Protection Agency (EPA) has established regulations that identify paint with lead content in excess of 0.5 percent as "Lead-Based Paint", as determined by chemical testing methods or more than 1.0 mg/cm2 as determined by approved X-Ray Fluorescence monitor. These regulations establish required notification, removal techniques, and disposal of Lead-Based Paint. The Ohio Department of Health has established equivalent regulations for Ohio (Ohio Administrative Code 3745-20, 22).

The Occupational Safety and Health Administration (OSHA) has promulgated an eight-hour Time-Weighted Average (TWA) Permissible Exposure Limit of 0.050 mg/m^3 (50 $\mu g/m^3$) for airborne lead exposures (29 CFR 1910.1025, 29 CFR 1926.62). An Action Level of 0.030 mg/m^3 ($30\mu g/m^3$) has also been included with the standards. Lead-containing materials are defined as those that contain any detectable concentration of lead. These regulations include complex requirements for Lead-Based Paint abatement. OSHA requires employers to monitor employee exposures to lead and to protect worker health until lead exposure levels are measured by requiring lead training, blood lead testing, respiratory protection, protective clothing, hand-washing facility and clean change areas (29 CFR 1926.62(d)(2)(v)).

The U.S. Environmental Protection Agency (EPA) has established clearance criteria for for lead-based paint abatement projects in residences (40 CFR 763.91).

The American Conference of Governmental Industrial Hygienists (ACGIH) recommends an airborne eight-hour TWA Threshold Limit Value of 0.050 mg/m^3 (ACGIH, *2024 TLVs and BEIs*). ACGIH TLVs denote concentrations and conditions to which it is believed that nearly all workers may be repeatedly exposed day after day without adverse effect.

The National Institute for Occupational Safety and Health (NIOSH) recommends and eight-hour TWA Recommended Exposure Limit of 0.050 mg/m^3 (NIOSH *Pocket Guide to Chemical Hazards*, 2007). NIOSH also identifies 100 mg/m^3 as the Immediately Dangerous to Life or Health concentration for lead.

ANALYTICAL RESULTS

TABLE 1: LEAD-CONTENT OF PAINT AT FIRE STATION 16, 4111 KINGS HIGHWAY, DAYTON, OHIO, COLLECTED MARCH 10, 2025. HELIX PROJECT NO. 7348.

Helix Sample No. Lab Sample No.	Sample Location	Description	Lead Concentration (% Lead)
7348-03-10-61 25016044-1	1st Floor, West Vehicle Bay, South Central Area, 0′ Ht.	Yellow Paint Stripe on Concrete	**0.352**
7348-03-10-62 25016044-2	1st Floor, West Vehicle Bay, Central Area, 0′ Ht.	White Paint Stripe on Concrete	ND <0.009
7348-03-10-63 25016044-3	1st Floor, West Vehicle Bay, East Wall, South Central Area, On Doorframe to Turnout Gear Room, 5′ Ht.	Brown Paint on Metal Door Frame	**1.448**
7348-03-10-64 25016044-4	1st Floor, North Central Dormitory, Southwest Cubicle, East Wall, 2′ Ht.	Tan Paint on Drywall	ND <0.009
7348-03-10-65 25016044-5	1st Floor, South Central Custodial Room, West Wall, 5′ Ht.	Tan and Yellow Paint on Concrete Block Wall	**0.014**
7348-03-10-66 25016044-6	1st Floor, South Central Custodial Room, West Wall, Door Frame, 4′ Ht.	Brown and Red Paint on Metal Door Frame	**0.704**
7348-03-10-67 25016044-7	1st Floor, Southeast Media Room, West Wall, North Area, On Door Frame, 4′ Ht.	Brown Paint on Metal Door Frame	**0.677**
7348-03-10-68 25016044-8	1st Floor, South Central Stairwell, Southeast Area, On Handrail, 1.5′ Ht.	White Paint on Metal Railing	**0.644**
7348-03-10-69 25016044-9	1st Floor, South Central Stairwell, Northwest Central Area, On Underside of Staircase to 2nd Floor	Tan Paint on Wooden Staircase	**0.494**
7348-03-10-70 25016044-10	Basement, Southwest Central Laundry Room, North Wall, Central Area, Door to Boiler Room, 5′ Ht.	Aqua Paint on Fire Door	**2.142**
7348-03-10-71 25016044-11	Basement, Boiler Room, On Water Tank, On Top, 4′ Ht.	Grey Paint on Metal Water Tank	ND <0.009
7348-03-10-72 25016044-12	Basement, Northwest Exercise Room, North Wall, West Central Area, 5′ Ht.	White Paint on Concrete Wall	ND <0.009

Ohio Dept. of Health LEAD-BASED PAINT	**>0.5%**
US EPA LEAD-BASED PAINT	**>0.5%**
OSHA REGULATED LEAD-CONTAINING MATERIAL	**Detectable**

TABLE 1 (CONTINUED): LEAD CONTENT OF PAINT AT FIRE STATION 16, 4111 KINGS HIGHWAY, DAYTON, OHIO, COLLECTED MARCH 10, 2025. HELIX PROJECT NO. 7348.

Helix Sample No. Lab Sample No.	Sample Location	Description	Lead Concentration (% Lead)
7348-03-10-73 25016044-13	Basement, Southeast Central Office, South Closet, West Wall, 4' Ht.	Beige Paint on Drywall	ND <0.009
7348-03-10-74 25016044-14	Top Floor, Stairwell, South Wall, Central Area, Under Light, 5' Ht.	Tan Paint on Concrete Block Wall	**0.086**
7348-03-10-75 25016044-15	Basement, South Central Maintenance Room, North Wall, West Area, At Double Door Frame, West Side, 4' Ht.	Red Paint on Metal Door Frame	ND <0.010
7348-03-10-76 25016044-16	Basement, South Central Maintenance Room, North Wall, East Area, 5' Ht.	Terra Cotta Paint on Concrete Wall	ND <0.009
7348-03-10-77 25016044-17	Basement, Southwest Room, North Wall, Central Area, Loose Door, 4' Ht.	Brown Paint over Aqua on Wood Door	**1.707**
7348-03-10-78 25016044-18	Basement, Southwest Central Hose Drainage Closet, Southeast Door Frame, 4' Ht.	Brown Paint over Aqua on Wood Door Frame	**0.864**
7348-03-10-79 25016044-19	1st Floor, West Vehicle Bay, North Area, Center of Ceiling, 14' Ht.	Taupe Paint on Plaster	**0.026**

Ohio Dept. of Health LEAD-BASED PAINT	**>0.5%**
US EPA LEAD-BASED PAINT	**>0.5%**
OSHA REGULATED LEAD-CONTAINING MATERIAL	**Detectable**

DISCUSSION AND RECOMMENDATIONS

Since the building was built prior to 1978 when lead was banned for interior coatings, it was assumed that all paint present in the renovation area contains detectable levels of lead. Demolition contractors which will disturb assumed lead-containing painted surfaces must comply with the requirements of the OSHA Construction Industry Lead regulations prior to and during any work which may disturb lead-containing coatings.

A total of fourteen (19) paint film samples of suspect lead-containing paint were collected from the Fire Station 16 renovation areas. Samples were collected from representative surfaces in the accessible renovation areas.

Analytical results confirmed that twelve (12) of 19 paint film samples collected at Fire Station 16, 4111 Kings Highway contain detectable concentrations of lead, or approximately 63% of paint film samples contain lead.

Current OSHA regulations require that employers measure airborne exposures to lead during any work which disturbs potential lead-containing paint. In addition, employers are required to safeguard employee health until exposure monitoring results are available by:

- Respiratory Protection
- Protective Clothing
- Change Areas
- Hand washing facilities
- Biological monitoring including blood sampling and analysis, and
- Training under Hazard Communication and Respirator Standards

When exposure monitoring results are available, then OSHA may require additional controls such as airtight barriers, warning signs, regulated areas and restrictions for entry by untrained workers.

Other potential environmental issues may also be present in the renovation areas, including mercury-containing materials, suspect PCB-containing fluorescent light ballasts, and Freon®-containing refrigerants.

Mercury-containing fluorescent light bulbs in the building have sufficient concentrations of mercury to be considered universal hazardous waste. In addition,

thermostats in the buildings may contain small amounts of mercury, and one mercury-containing thermostat was observed during inspection. Batteries associated with emergency lighting may also contain mercury, and are considered to be universal hazardous waste. These universal waste materials should be carefully removed from the building and recycled in accordance with current regulations.

Fluorescent light ballasts were made with PCBs until 1979. Ballasts made after that date are required to be marked with the legend "No PCBs". Given the age of the building, PCB-containing fluorescent light ballasts and other PCB-containing electrical capacitors and transformers may be present in the building, and each ballast, capacitor or transformer should be examined to determine if it is labeled "No PCBs". If necessary, ballasts, capacitors and transformers that are not so labeled should be carefully removed from the building and packaged and labeled for recycling or incineration in accordance with current regulations.

Refrigerated cooling systems in the building, including water coolers, window air-conditioners, and refrigerators, typically contain Freon® refrigerants that must be recovered by licensed refrigerant recycler if removed, in accordance with current regulations. No unauthorized venting of Freon® refrigerants to the atmosphere is permitted under current regulations, since these materials deplete the stratospheric ozone layer (Ozone Depleting Substances).

Finally, no significant accumulations of hazardous waste were observed during the building inspection that could require special remediation, although small amounts of maintenance and custodial chemicals including interior paint were observed in or near the renovation area. It was assumed that the remaining maintenance and custodial chemicals present in the renovation area will be relocated for use during normal custodial and maintenance operations. If not, then these materials may need to be labeled, packaged and transported to a licensed hazardous waste Treatment, Storage and Disposal site in compliance with federal and state hazardous waste regulations.

The results of this inspection can only reflect the condition of the property at the date and time of the site visit within the limits of the proposed work. There are limitations to asbestos inspections without dismantling or destroying the building or its systems. No inspection was performed in inaccessible locations. Recommendations are based on the professional judgment of the inspectors, and the results of the samples collected and analyzed. Helix Environmental, Inc. and its agents are neither responsible nor liable for the non-discovery of any defects in

materials, craftsmanship, or other conditions, or any problems that may be discovered or manifest after the site visit date and time. Helix Environmental, Inc. and its agents make no warranty, expressed or implied, and accept no liability for the presence absence of asbestos or other hazardous materials in or on building products, materials, or areas. Helix Environmental, Inc. and its agents assume no responsibility for the cost of repairing, replacing, or removing any undiscovered or unreported condition or defect, or any future condition or defect.

If you have any questions or comments concerning the inspection or analytical results, please call me at (937) 226-0650.

Sincerely,

HELIX ENVIRONMENTAL, INC.

Ralph A. Froehlich, CIH, CSP, QEP
President
Attach.

ATTACHMENTS

- **ANALYTICAL RESULTS AND SAMPLE DATA SHEETS**
- **SAMPLE LOCATIONS**
- **PHOTOGRAPHS**

SanAir Technologies Laboratory

The Identification Specialists

Analysis Report prepared for Helix Environmental Inc

Report Date: 3/12/2025

Project Name: Fire Station 16 411 Kings Highway

Project #: 7348

SanAir ID#: 25016044

10501 Trade Court, North Chesterfield, Virginia 23236
888.895.1177 | 804.897.1177 | fax: 804.897.0070 | LabReports@SanAir.com | SanAir.com

SanAir ID Number
25016044
FINAL REPORT
3/12/2025 4:13:25 PM

Name: Helix Environmental Inc
Address: 1 Elizabeth Place
Suite 160
Dayton, OH 45417
Phone: 937-226-0650

Project Number: 7348
P.O. Number:
Project Name: Fire Station 16 411 Kings Highway
Collected Date: 3/10/2025
Received Date: 3/11/2025 10:40:00 AM

Dear Benjamin Froehlich,

We at SanAir would like to thank you for the work you recently submitted. The 19 sample(s) were received on Tuesday, March 11, 2025 via UPS. The final report(s) is enclosed for the following sample(s): 7348-03-10-61, 7348-03-10-62, 7348-03-10-63, 7348-03-10-64, 7348-03-10-65, 7348-03-10-66, 7348-03-10-67, 7348-03-10-68, 7348-03-10-69, 7348-03-10-70, 7348-03-10-71, 7348-03-10-72, 7348-03-10-73, 7348-03-10-74, 7348-03-10-75, 7348-03-10-76, 7348-03-10-77, 7348-03-10-78, 7348-03-10-79.

These results only pertain to this job and should not be used in the interpretation of any other job. This report is only complete in its entirety. Refer to the listing below of the pages included in a complete final report.

Sincerely,



Abisola Kasali
Metals Laboratory Director
SanAir Technologies Laboratory

Final Report Includes:
- Cover Letter
- Chemistry Analysis
- Disclaimers and Additional Information

Sample conditions:
- 19 samples in Good condition.

SanAir ID Number
25016044
FINAL REPORT
3/12/2025 4:13:25 PM

Name: Helix Environmental Inc
Address: 1 Elizabeth Place
Suite 160
Dayton, OH 45417
Phone: 937-226-0650

Project Number: 7348
P.O. Number:
Project Name: Fire Station 16 411 Kings Highway
Collected Date: 3/10/2025
Received Date: 3/11/2025 10:40:00 AM

Analyst: Seward, Spencer
Test Method: SW846/M3050B/7000B

Lead Paint Analysis

PAINT Sample	Description	µg Pb In Sample	Sample Size (grams)	Calculated RL	Sample Results	Sample Results
25016044 - 1	7348-03-10-61 Floor Stripe Yellow Track Area, South Center Floor	402	0.1143	87.5	3516 µg/g (ppm)	0.352 % By Weight
25016044 - 2	7348-03-10-62 Floor Stripe, White Track Area, Center Floor	< 10	0.1146	87.3	<87.3 µg/g (ppm)	<0.009 % By Weight
25016044 - 3	7348-03-10-63 Door Frame, Parapet Truck Area, Door Frame To Turnout Gear	1038	0.0717	139.5	14480 µg/g (ppm)	1.448 % By Weight
25016044 - 4	7348-03-10-64 Drywall Wall, Tan Dormity Room, SW Cubicle, E Wall	< 10	0.1075	93	<93 µg/g (ppm)	<0.009 % By Weight
25016044 - 5	7348-03-10-65 Block Wall, Tan Yellow Custodial Room, W Wall	16	0.1136	88	143.3 µg/g (ppm)	0.014 % By Weight
25016044 - 6	7348-03-10-66 Metal Door Frame Brown/Red Custodial Room, W Door Frame	751	0.1067	93.7	7040 µg/g (ppm)	0.704 % By Weight
25016044 - 7	7348-03-10-67 Metal Door Frame Brown SE Corner TV Room Hall Door Frame	756	0.1117	89.5	6768 µg/g (ppm)	0.677 % By Weight
25016044 - 8	7348-03-10-68 White Paint On Metal Rod Stairwell	722	0.1122	89.1	6439 µg/g (ppm)	0.644 % By Weight
25016044 - 9	7348-03-10-69 Tan Paint On Wood Under Stairs Stairwell	584	0.1181	84.7	4943 µg/g (ppm)	0.494 % By Weight
25016044 - 10	7348-03-10-70 Aqua Partition Fire Door Basement Door To Boiler Room	1354	0.0632	158.2	21420 µg/g (ppm)	2.142 % By Weight
25016044 - 11	7348-03-10-71	< 10	0.1068	93.6	<93.6	<0.009 %

Method Reporting Limit <10 µg/0.1 g paint
Sample 7348-03-10-67 contained substrate

Signature: 
Date: 3/12/2025

Reviewed: 
Date: 3/12/2025

SanAir ID Number
25016044
FINAL REPORT
3/12/2025 4:13:25 PM

Name: Helix Environmental Inc
Address: 1 Elizabeth Place
Suite 160
Dayton, OH 45417
Phone: 937-226-0650

Project Number: 7348
P.O. Number:
Project Name: Fire Station 16 411 Kings Highway
Collected Date: 3/10/2025
Received Date: 3/11/2025 10:40:00 AM

Analyst: Seward, Spencer
Test Method: SW846/M3050B/7000B

Lead Paint Analysis

PAINT Sample	Description	µg Pb In Sample	Sample Size (grams)	Calculated RL	Sample Results	Sample Results
	Grey Paint On Tank Top Basement, Boiler Room Water Tank				µg/g (ppm)	By Weight
25016044 - 12	7348-03-10-72	< 10	0.1129	88.6	<88.6	<0.009 %
	White Paint On Corner Wall Basement Exercise Room, N Wall				µg/g (ppm)	By Weight
25016044 - 13	7348-03-10-73	< 10	0.1144	87.4	<87.4	<0.009 %
	Beige Paint On Drywall Basement, NE Office W Wall				µg/g (ppm)	By Weight
25016044 - 14	7348-03-10-74	103	0.1202	83.2	859.4	0.086 %
	Tan Paint On Block Wall Stairwell, Top Loud S Wall Under				µg/g (ppm)	By Weight
25016044 - 15	7348-03-10-75	< 10	0.1053	95	<95	<0.010 %
	Red Paint On Metal Door Frame Basement, Maintenance Room, N				µg/g (ppm)	By Weight
25016044 - 16	7348-03-10-76	< 10	0.1132	88.3	<88.3	<0.009 %
	Terracotta Paint On Concrete Wall Basement Maintenance Room				µg/g (ppm)	By Weight
25016044 - 17	7348-03-10-77	1854	0.1086	92.1	17070	1.707 %
	Brown Paint Over Aqua On Wood Door Basement, S Center Room				µg/g (ppm)	By Weight
25016044 - 18	7348-03-10-78	933	0.108	92.6	8637	0.864 %
	Brown Over Aqua On Woo dFrame Basement, Hose Room Door Frame				µg/g (ppm)	By Weight
25016044 - 19	7348-03-10-79	31	0.1209	82.7	255.3	0.026 %
	Taupe Paint On Plaster Truck Area, N Center Leg Overhead				µg/g (ppm)	By Weight

Method Reporting Limit <10 µg/0.1 g paint
Sample 7348-03-10-67 contained substrate

Signature: 
Date: 3/12/2025

Reviewed: 
Date: 3/12/2025

Disclaimer

SanAir Technologies Laboratory, Inc. participates in the Environmental Lead Accreditation Program (ELAP) administered by AIHA LAP, LLC (Laboratory ID LAP-162952). Refer to our accreditation certificate and scope on our website or www.aihaaccreditedlabs.org for an up to date list of the Fields of Testing for which we are accredited. SanAir also participates in the State of New York's DOH-ELAP (Lab Id 11983), and has met the EPA's NLLAP program standards. This report does not constitute nor shall be used by the client to claim product, process, system, or person certification, approval, or endorsement by AIHA LAP, LLC, NELAC, NIST, and/or any other U.S. governmental agencies; and test results in this report may not be accredited by every local, state or federal regulatory agency.

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AIHA LAP, LLC Lab ID: LAP-162952
Commonwealth of VA Department of General Services DCLS, VELAP Laboratory ID#460251
New York State Department of Health Laboratory ID No: 11983
California State Environmental Laboratory Accreditation Program Certificate No: 2915
State of Connecticut Department of Public Health Environmental Laboratory Registration Number: PH-0105
New Jersey Department of Environment Protection Environmental Laboratory Certification ID# VA014
Ohio Department of Health Environmental Lead Laboratory Approval Number E10049
State of Rhode Island Department of Health Environmental Lead Laboratory No LAO00371

25016044

HELIX ENVIRONMENTAL, INC.
1 ELIZABETH PLACE, SUITE 160H
DAYTON, OHIO 45417-3445
(937) 226-0650

LABORATORY: San Ar
DATE SAMPLED: 3/10/2025
RUSH – YES OR NO DATE REQUIRED: 24 HR TAT
LOCATION: Dayton, OH
CONTRACTOR/CLIENT: App Architecture
ADDRESS: Fire Station 16, 4111 Kings Highway
INSPECTOR: R.J. Froehlich
JOB NUMBER: 7348

DETERIORATED PAINT SAMPLING FORM

ANALYSES REQUESTED: Pb Paint (by weight %)

LAB SAMPLE NO.	HELIX SAMPLE NUMBER	ROOM	BUILDING COMPONENT	CONDITION	SAMPLE AREA	COMMENTS
	7348-03-10-61	Truck Area, South Center Floor	Floor Stripe Yellow	P	2"x3"	on concrete
	7348-03-10-62	Truck Area, Center Floor	Floor Stripe, White	P	2"x2"	on concrete
	7348-03-10-63	Truck Area, Door Frame to Terminal Gear Room	Door Frame, Brown 5'Ht	G	2"x2"	on Metal
	7348-03-10-64	~~Dormitory~~ Room, SW Cubicle, E Wall 2'Ht	Drywall Wall, Tan 2'Ht	G	2"x2"	Drywall
	7348-03-10-65	Custodial Room, W Wall	Block Wall, Tan over Yellow 5'Ht	G	1"x1"	
	7348-03-10-66	Custodial Room, W Door Frame	Metal Door Frame, Brown/Red 4'Ht	F	1"x3"	
	7348-03-10-67	SE Corner TV Room Hall Door Frame	Metal Door Frame, Brown 4'Ht	G	2"x3"	
	7348-03-10-68	Stair well	White Paint on Metal Rail 1.5'Ht	P	1"x2"	

THIS IS A CHAIN OF CUSTODY DOCUMENT. PLEASE COMPLETE, SIGN AND DATE. PLEASE RETURN ORIGINAL TO HELIX ENVIRONMENTAL, INC.

RECD 1	RELINQUISHED BY: RJ Froehlich	COMPANY: Helix Env. Inc.	DATE/TIME: 3/10/2025	RECD 3	RELINQUISHED BY:	COMPANY:	DATE/TIME:
RECD 2	RECEIVED BY: IRM	COMPANY:	DATE/TIME: 311125	RECD 4	RELINQUISHED BY:	COMPANY:	DATE/TIME:

25016044

HELIX ENVIRONMENTAL, INC.
1 ELIZABETH PLACE, SUITE 160H
DAYTON, OHIO 45417-3445
(937) 226-0650

LABORATORY: SunAir
DATE SAMPLED: 3/10/2025
RUSH – YES OR NO DATE REQUIRED: 24 HR TAT
LOCATION: Dayton, OH
CONTRACTOR/CLIENT: App Architecture
ADDRESS: Fire station 16, 4111 Kings Highway
INSPECTOR: BA Hoelscher
JOB NUMBER: 7348

DETERIORATED PAINT SAMPLING FORM

ANALYSES REQUESTED: Pb Paint (by weight %)

LAB SAMPLE NO.	HELIX SAMPLE NUMBER	ROOM	BUILDING COMPONENT	CONDITION	SAMPLE AREA	COMMENTS
	7348-03-10-69	Stairwell	Tan Paint on Wood under Stairs to Exit	P	2"x2"	
	7348-03-10-70	Basement, Door to Boiler Room	Agua Paint on Fire Door 5'4"	G	1"x "	
	7348-03-10-71	Basement, Boiler Room Water Tank	Grey Paint on Tank Top 4'4"	F	2"x2"	
	7348-03-10-72	Basement Exercise Room, N Wall	White Paint on Concrete Wall 5'4"	G	1"x2"	
	7348-03-10-73	Basement, NE Office W Wall 4'4"	Beige Paint on Drywall	G	2"x2"	
	7348-03-10-74	Stairwell, Top level S Wall under light	Tan Paint on Block Wall 5'4"	F	1"x3"	
	7348-03-10-75	Basement, Maintenance Room, N Door Frame	Red Paint on Metal Door Frame 4'4"	G	1"x3"	
	7348-03-10-76	Basement, Maintenance Room, N Wall	Terracotta Paint on Concrete Wall 5'4"	G	2"x2"	N Wall Concrete S Wall Concrete

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	RELINQUISHED BY	COMPANY	DATE/TIME		RELINQUISHED BY	COMPANY	DATE/TIME
RECD 1	BA Hoelscher	Helix Env. Inc.	3/10/2025	RECD 3			
RECD 2	RECEIVED BY: TRM	COMPANY:	DATE/TIME: 3/11/25 10:40am	RECD 4	RELINQUISHED BY	COMPANY	DATE/TIME

2501604

HELIX ENVIRONMENTAL, INC
1 ELIZABETH PLACE, SUITE 160H
DAYTON, OHIO 45417-3445
(937) 226-0650

LABORATORY: EMSL
DATE SAMPLED: 3/10/2025
RUSH – YES OR NO DATE REQUIRED: 24 HR TAT
LOCATION: Dayton, OH
CONTRACTOR/CLIENT: App Architecture
ADDRESS: Fire Station 16, 4111 Kings Highway
INSPECTOR: R. Afroshtich
JOB NUMBER: 7348

DETERIORATED PAINT SAMPLING FORM

ANALYSES REQUESTED: Pb Paint (by wt %)

LAB SAMPLE NO.	HELIX SAMPLE NUMBER	ROOM	BUILDING COMPONENT	CONDITION	SAMPLE AREA	COMMENTS
	7348-03-10-77	Basement, S Center Room, Door at N Wall 4'Ht	Brown Paint over Acqua on Wood Door	P	2"x2"	Loose dor from Hose Room
	7348-03-10-78	Basement, Hose Room Door Frame 4'Ht	Brown over Acqua on Wood frame	P	2"x2"	
	7348-03-10-79	Truck Area, N Center by Overhead Doors 14'Ht	Taupe Paint on Plaster	F	2"x 4"	Loose
	7348-03-10-80					
	7348-03-10-					
	7348-03-10-					
	7348-03-10-					
	7348-03-10-					

THIS IS A CHAIN OF CUSTODY DOCUMENT. PLEASE COMPLETE, SIGN AND DATE. PLEASE RETURN ORIGINAL TO HELIX ENVIRONMENTAL, INC.

RECD 1	RELINQUISHED BY: R. Afroshtich	COMPANY: Helix Env Inc	DATE/TIME: 3/10/2025	RECD 3	RELINQUISHED BY	COMPANY	DATE/TIME
RECD 2	RECEIVED BY: 12m	COMPANY	DATE/TIME: 3/11/25 10:10 am	RECD 4	RELINQUISHED BY	COMPANY	DATE/TIME

LEGEND

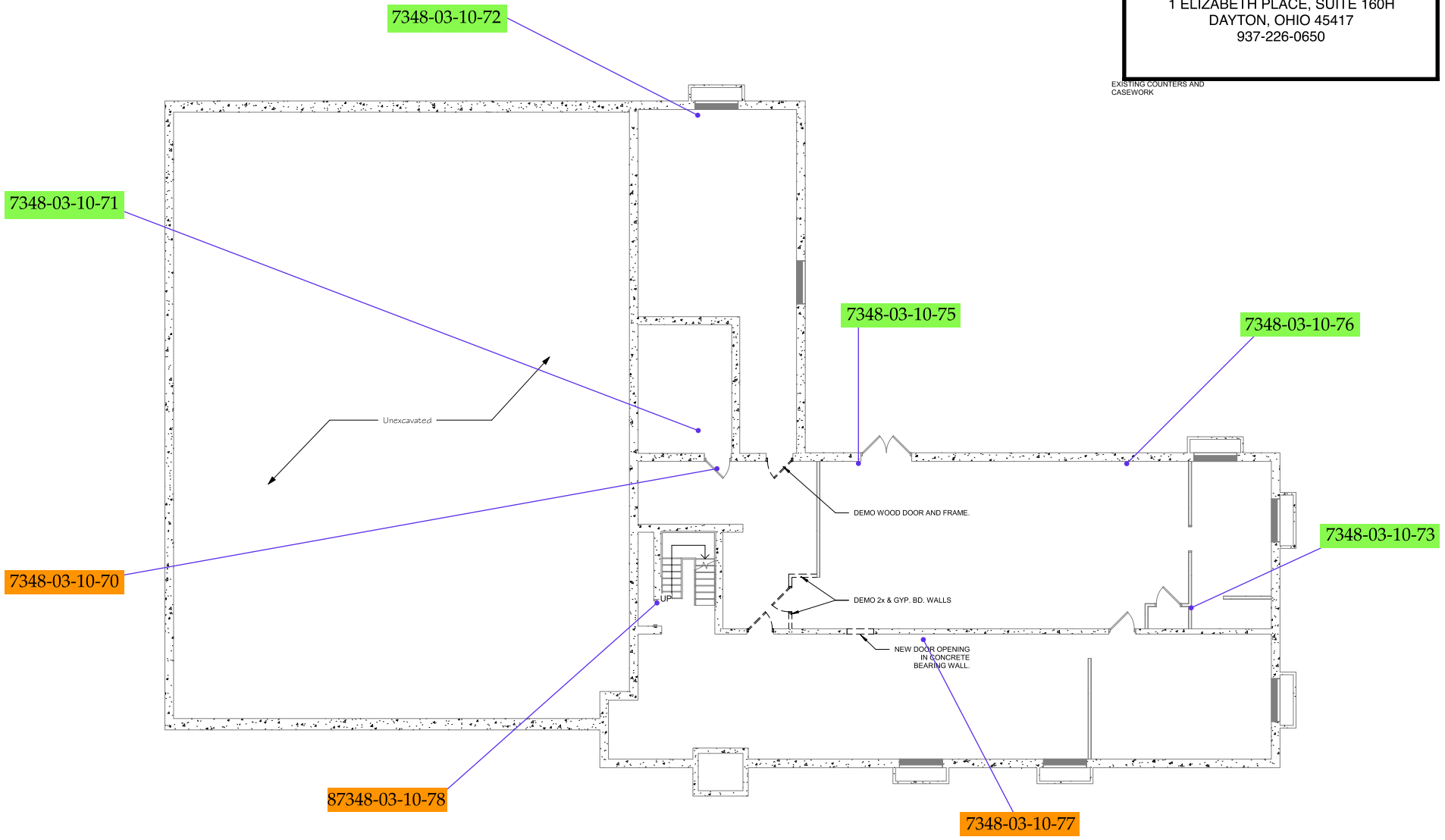
Lead-Containing Paint

Non Lead-Containing Paint

LEAD SAMPLE LOCATIONS, BASEMENT, FIRE STATION 16, 4111 KING'S HIGHWAY, DAYTON, OH

HELIX ENVIRONMENTAL, INC.

1 ELIZABETH PLACE, SUITE 160H
DAYTON, OHIO 45417
937-226-0650



LEGEND

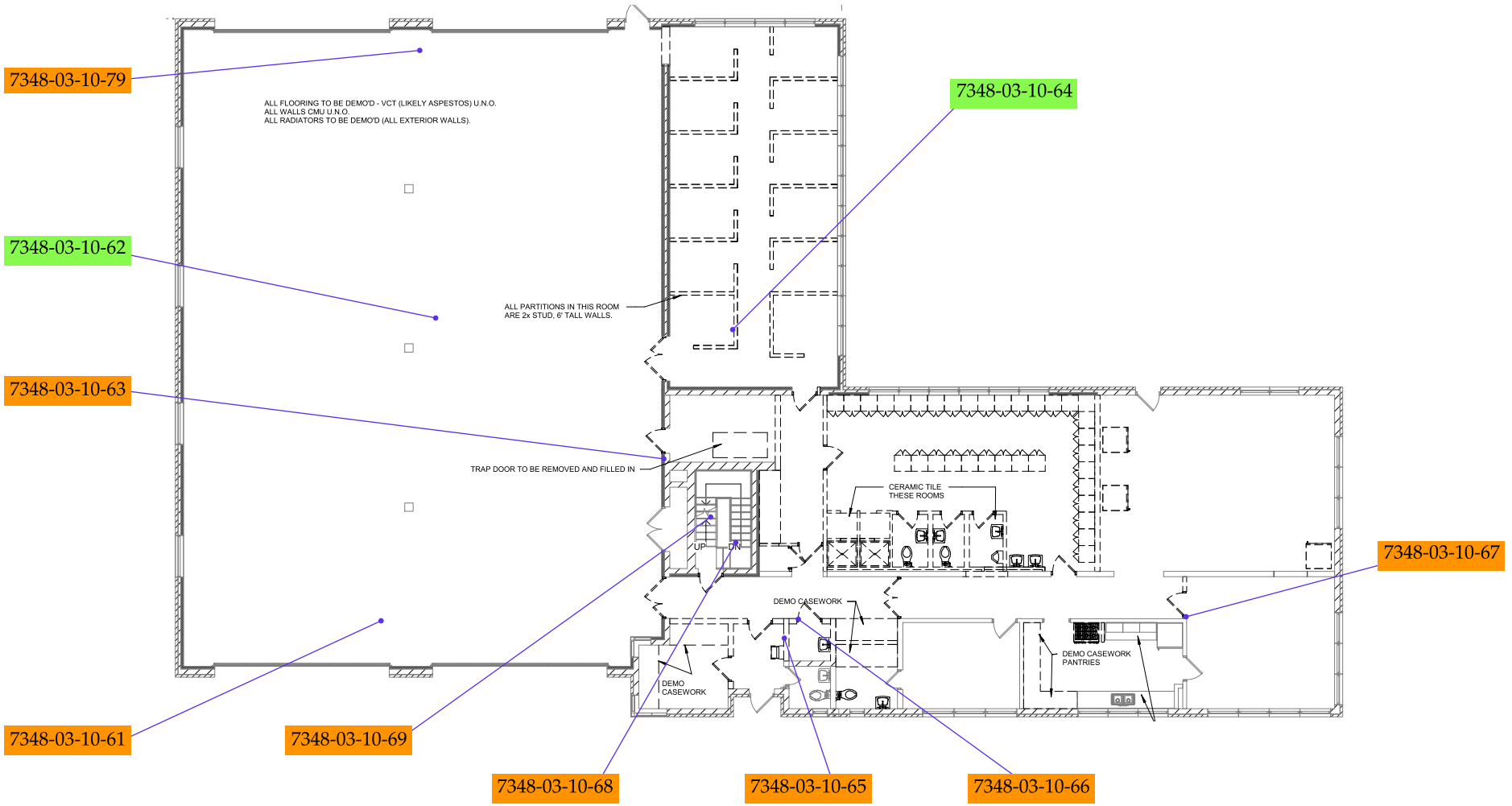
Lead-Containing Paint

Non Lead-Containing Paint

**LEAD PAINT SAMPLE LOCATIONS,
1st FLOOR, FIRE STATION 16,
4111 KING'S HIGHWAY,
DAYTON, OH**

HELIX ENVIRONMENTAL, INC.

1 ELIZABETH PLACE, SUITE 160H
DAYTON, OHIO 45417
937-226-0650

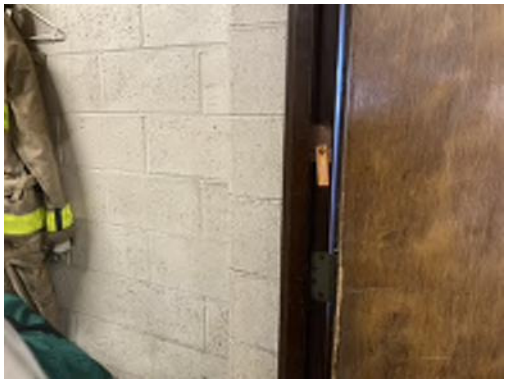




Sample 7348-03-10-61 with 0.352% lead



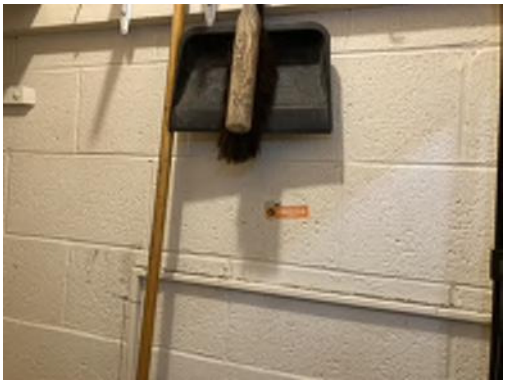
Sample 7348-03-10-62 with no detectable lead



Sample 7348-03-10-63 with 1.448% lead



Sample 7348-03-10-64 with no detectable lead



Sample 7348-03-10-65 with 0.014% lead



Sample 7348-03-10-66 with 0.704% lead



Sample 7348-03-10-69 with 0.494% lead



Sample 7348-03-10-70 with 2.142% lead



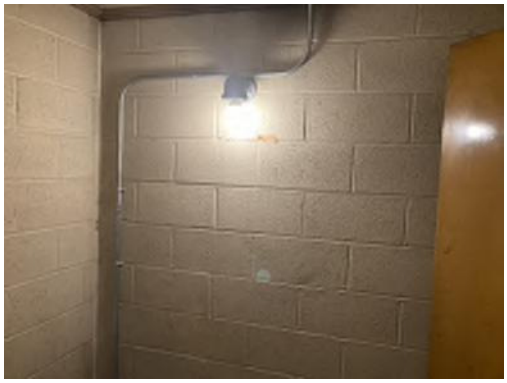
Sample 7348-03-10-71 with no detectable lead



Sample 7348-03-10-72 with no detectable lead



Sample 7348-03-10-73 with no detectable lead



Sample 7348-03-10-74 with 0.086% lead



Sample 7348-03-10-75 with no detectable lead



Sample 7348-03-10-76 with no detectable lead



Sample 7348-03-10-77 with 1.707% lead



Sample 7348-03-10-79 with 0.026% lead