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## **SECTION 102113 - TOILET COMPARTMENTS**

### **PART 1 - GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Solid Color Reinforced Composite (SCRC) Substrate: (Bobrick SierraSeries).
  - 1. Toilet partitions.
  - 2. Urinal privacy screens.
  - 3. Dressing compartments.

#### **1.2 RELATED SECTIONS**

- A. Section 055000 - Metal Fabrications.
- B. Section 061053 – Miscellaneous Rough Carpentry.
- C. Section 102800 – Toilet, Bath and Laundry Accessories.

#### **1.3 SUBMITTALS**

- A. Submit under provisions of Division 01.
- 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. Installation methods.
- C. Shop Drawings: Submit manufacturer's shop drawings for each product specified, including the following:
  - 1. Plans, elevations, details of construction and attachment to adjacent construction.
  - 2. Show anchorage locations and accessory items.
  - 3. Verify dimensions with field measurements prior to final production of toilet compartments.
- D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square representing actual product, color, and patterns.

#### **1.4 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Minimum 10-year experience manufacturing similar products.
- B. Installer Qualifications: Minimum 2-year experience installing similar products.
- C. Single Source Requirements: To the greatest extent possible provide products from a single manufacturer.
- D. Accessibility Requirements: Comply with requirements applicable in the jurisdiction of the project, including but not limited to ADA and ICC/ANSI A117.1 requirements as applicable.

- E. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
  - 1. Finish areas designated by Architect.
  - 2. Do not proceed with remaining work until workmanship is approved by Architect.
  - 3. Refinish mock-up area as required to produce acceptable work.
- 1.5 PRE-INSTALLATION MEETINGS
  - A. Convene minimum two weeks prior to starting work of this section.
- 1.6 DELIVERY, STORAGE, AND HANDLING
  - A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.
  - B. Handling: Handle materials to avoid damage.
- 1.7 PROJECT 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 recommended limits.
- 1.8 SEQUENCING
  - A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.
- 1.9 WARRANTY
  - A. Manufacturer's Warranty: Manufacturer's standard 25-year limited warranty for panels, doors, and stiles against breakage, corrosion, delamination, and defects in factory workmanship. Manufacturer's standard 1 year guarantee against defects in material and workmanship for stainless steel door hardware and mounting brackets.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Acceptable Manufacturer: Bobrick Washroom Equipment, Inc. or equal approved by Architect prior to bidding.
  - B. Basis of Design Products: Based on the quality and performance requirements of the project, specifications are based solely on the products of Bobrick Washroom Equipment, Inc. [www.bobrick.com](http://www.bobrick.com). Location of manufacturing shall be the United States.
  - C. Substitutions: The Architect will consider products of comparable manufacturers as a substitution, pending the Contractor's submission of adequate documentation of the substitution in accordance with procedures in Division 01 of the Project Manual. Documentation shall include a list of five similar projects of equivalent size where products have been installed for a minimum of two years, and manufacturer's certification that products are fabricated in the United States.
- 2.2 SOLID COLOR REINFORCED COMPOSITE (SCRC) SUBSTRATE (SierraSeries)
- A. Solid Color Reinforced Composite (SCRC) Toilet Partitions: Bobrick SierraSeries; 1090 Series.

1. Design Type:
  - a. Standard Height.
    - 1) Door/Panel Height: 58 inches (147 cm).
    - 2) Floor Clearance: 12 inches (30 cm).
  2. Privacy Style Partitions: No sightlines with gap-free interlocking doors and stiles routed 0.300 inches (7.6 mm) from the edge to allow for 0.175 inch (4.4 mm) overlap to prevent line-of-sight into the toilet compartment. Privacy strips fastened or adhered onto the partition material are not acceptable.
  3. Mounting:
    - a. Ceiling-hung.
      - 1) Stile Height: 8 feet 0 inches (244 cm) or as required 10 feet 0 inches (305 cm) maximum.
- B. Solid Color Reinforced Composite (SCRC) Urinal Screens: Bobrick SierraSeries.
  1. Mounting Configuration:
    - a. Wall-hung.
      - 1) Screen Height: 42 inches (107 cm) with 18 inches (46 cm) floor clearance.
- C. Solid Color Reinforced Composite (SCRC) Dressing Compartments and/or Shower Dividers: Bobrick SierraSeries.
  1. Design Type:
    - a. Standard Height.
      - 1) Door/Panel Height: 58 inches (178 cm).
      - 2) Floor Clearance: 12 inches (30 cm).
    2. Privacy Style Partitions: No sightlines with gap-free interlocking doors and stiles routed 0.300 inches (7.6 mm) from the edge to allow for 0.175 inch (4.4 mm) overlap to prevent line-of-sight into the toilet compartment. Privacy strips fastened or adhered onto the partition material are not acceptable.
    3. Mounting Configuration:
      - a. Ceiling hung.
- D. Materials: Solid color reinforced composite (SCRC) material for stiles, panels, doors, and screens with Bobrick GraffitiOff coating, thermoset and integrally fused into homogenous piece; high density polyethylene (HDPE), high density polypropylene not acceptable.
  1. Composition: Dyes, organic fibrous material, and polycarbonate/phenolic resins.
  2. Surface Treatment: Non-ghosting, graffiti resistant surface integrally bonded to core through a manufacturing steps requiring thermal and mechanical pressure.
  3. Edges: Same color as the surface.
  4. Color:



- a. As selected by Architect from manufacturer's standard range.
5. Acceptable SCRC Products: Or manufacturer approved equal.
- a. Ultimate Corian System by Shower Shapes.
  - b. WilsonArt Gibraltar Material.
  - c. WilsonArt EarthStone Material.
- E. Performance Requirements:
1. Graffiti Resistance (ASTM D 6578): Passed cleanability test; 5 staining agents.
  2. Scratch Resistance (ASTM D 2197): Maximum load value exceeds 10 kilograms.
  3. Impact Resistance (ASTM D 2794): Maximum impact force exceeds 30 inch-pounds.
  4. Smoke Developed Index (ASTM E 84): Less than 450.
  5. Flame Spread Index (ASTM E 84): Less than 75.
  6. National Fire Protection Association/International Building Code Interior Wall and Ceiling Finish: Class B.
  7. Uniform Building Code: Class II.
- F. Finished Thickness:
1. Stiles and Doors: 3/4 inch (19 mm).
  2. Panels and Screens: 1/2 inch (13 mm).
- G. Wall Posts: Pre-drilled for door hardware, 18-8, Type 304, 16 gauge (1.6 mm) stainless steel with satin finish; 1 inch (25 mm) x 1-1/2 inches (38 mm) x 58 inches high (1473 mm).
- H. Anchors: Expansion shields and threaded rods at floor connections as applicable. Threaded rods secured to supports above ceiling as applicable. Supports above ceiling furnished and installed as Work of Section 055000 - Metal Fabrications.
- I. Hardware: Chrome-plated "Zamak", aluminum, extruded plastic hardware not acceptable.
1. Compliance: Operating force of less than 5 lb (2.25 kg).
  2. Emergency Access: Hinges, door latch allow door to be lifted over keeper from outside compartment on inswing doors.
  3. Materials: 18-8, Type 304, heavy-gauge stainless steel with satin finish.
  4. Doorstops: Prevents inswinging doors from swinging out beyond stile; on outswing doors, doorstop prevents door from swinging in beyond stile.
  5. Fastening: Hardware secured to door and stile by through-bolted, theft-resistant, pin-in-head Torx stainless steel machine screws into factory-installed, threaded brass inserts. Fasteners secured directly into core not acceptable.
    - a. Threaded Brass Inserts: Factory-installed; withstand direct pull force exceeding 1500 lb (680 kg) per insert.
  6. Clothes Hooks: Projecting no more than 1-1/8 inch (29 mm) from face of door.
  7. Door Latch: Track of door latch prevents inswing doors from swinging out beyond stile; on outswing doors, door keeper prevents door from swinging in beyond stile; 16 gauge (1.6 mm) sliding door latch, 14 gauge (2 mm) keeper.
  8. Locking: Door locked from inside by sliding door latch into keeper.
  9. Hinge Type:
    - a. Full-Height Institutional Hinge.
      - 1) Hinges: 16 gauge (1.6 mm) stainless steel, self-closing, 3 section hinges.

10. Mounting Brackets:
  - a. Full-Height.
    - 1) Mounting Brackets: 18 gauge (1.2 mm) stainless steel and extend full height of panel.
    - 2) U-Channels: Secure panels to stiles.
    - 3) Angle Brackets: Secure stiles-to-walls and panels to walls.

### **PART 3 - EXECUTION**

#### **3.1 PREPARATION**

- A. Prepare substrates including but not limited to blocking and supports in walls and ceilings at points of attachment using methods recommended by the manufacturer for achieving the best result for the substrates under the project conditions.
  1. Inspect areas scheduled to receive compartments for correct dimensions, plumbness of walls, and soundness of surfaces that would affect installation of mounting brackets.
  2. Verify spacing of plumbing fixtures to assure compatibility with installation of compartments.
- B. If preparation is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.
- C. Do not proceed with installation until substrates have been properly prepared with blocking and supports in walls and ceilings at points of attachment and deviations from manufacturer's recommended tolerances are corrected. Commencement of installation constitutes acceptance of conditions.

#### **3.2 INSTALLATION**

- A. Install products in strict compliance with manufacturer's written instructions and recommendations, including the following:
  1. Verify blocking and supports in walls and ceilings has been installed properly at points of attachment.
  2. Verify location does not interfere with door swings or use of fixtures.
  3. Use fasteners and anchors suitable for substrate and project conditions
  4. Install units rigid, straight, plumb, and level.
  5. Conceal evidence of drilling, cutting, and fitting to room finish.
  6. Test for proper operation.

#### **3.3 ADJUSTING, CLEANING AND PROTECTION**

- A. Adjust hardware for proper operation after installation. Set hinge cam on in-swinging doors to hold doors open when unlatched. Set hinge cam on out-swinging doors to hold unlatched doors in closed position.
- B. Touch-up, repair or replace damaged products.
- C. Clean exposed surfaces of compartments, hardware, and fittings.

### **END OF SECTION 102113**

## 23 81 28 DX MINI SPLIT SYSTEMS – AIR-COOLED

### PART 1 - GENERAL

- 1.1 The cooling systems shall be variable capacity, DX split heat pump systems. The systems shall consist of indoor fan coil unit(s) matched to outdoor air-cooled condensing unit(s), singularly units on a single outdoor unit, and associated controls. Refer to drawings for capacities and arrangements.
- 1.2 The design is based on LG equipment. The other manufacturers listed in Part 2 are acceptable manufacturers but shall include in their bid price all necessary revisions from the basis of design required to install their system, including but not limited to variations in electrical services, branch controllers, pipe sizing, quantities and arrangements.
- 1.3 Equipment shall be rated in accordance with ARI 210/240 and so labeled, and shall be Listed by UL or ETL and so labeled.
- 1.4 The condensing units shall be factory charged with R-410A refrigerant.
- 1.5 Provide a set of spare filters for each indoor unit.
- 1.6 The systems shall carry a five (5) year warranty from date of installation. In addition, the compressors shall be covered by the manufacturer's limited warranty for a period of seven (7) years from date of installation. If, during these periods, any part shall fail to function properly due to defects in workmanship or material, it shall be replaced or, at the discretion of the manufacturer, repaired. The 2<sup>nd</sup> thru 5<sup>th</sup> year and 2<sup>nd</sup> thru 7<sup>th</sup> year warranties do not include labor.
- 1.7 Refer to the HVAC and Electrical drawings for electrical power feeds. Compare unit requirements to feeder sizes shown. Refer to 23 05 13 Electrical Requirements for HVAC Equipment.
- 1.8 Installing contractor shall be factory trained and certified to install the systems. Training shall be documented by the manufacturer and certification shall be submitted for review with shop drawings, prior to the installation of the systems.
- 1.9 Mechanical equipment, appliances and supports that are exposed to wind shall be designed and installed to resist the wind pressure determined in accordance with the building and mechanical code. Refer to specification 23 05 30 Bases and Supports for HVAC Equipment for additional requirements.

### PART 2 - PRODUCTS

#### 2.1 Each Air-Cooled Condensing Unit shall consist of:

##### A. General:

1. Each outdoor unit shall be specifically matched to the corresponding indoor unit size(s), factory assembled and pre-wired with all necessary electronic and refrigerant controls. The refrigeration circuit of the condensing unit shall consist of inverter scroll or rotary compressors, motors, fans, condenser coil, electronic expansion valves, solenoid valves, 4-way valve, distribution headers, capillaries, filters, shut off valves, oil separators, service ports and refrigerant regulator. High/low pressure gas line, liquid and suction lines, individually insulated between the outdoor and indoor units.
2. Accumulator with refrigerant level sensors and controls; high-pressure safety switch, over-current protection and DC bus protection.
3. High efficiency oil separator plus additional logic controls to ensure adequate oil volume in the compressor is maintained.

4. Auto-charging feature and a refrigerant charge check function. The unit shall be capable of metering the refrigerant charge as additional refrigerant is added to the system and will calculate how much additional refrigerant is to be added to the system.
  5. Oil recovery cycle shall be automatic occurring after start of operation and then at re-occurring intervals during unit operation.
  6. Cooling operation down to 0 degF dry bulb ambient temperature. Provide accessories as necessary to achieve the low ambient operation.
  7. The system shall automatically restart operation after a power failure and will not cause any settings to be lost, thus eliminating the need for re-programming.
  8. Unit shall have a sound rating no higher than 55 dB(A) measured at 3 feet from any side of the unit.
- B. Cabinet shall be fabricated of galvanized or rust-proofed steel, bonderized and finished with a powder coated baked enamel. The outdoor unit shall come furnished with four (4) mounting feet, mounted across the base pan, to allow bolting to an equipment rails.
- C. Condenser fans shall be statically and dynamically balanced direct drive, variable speed propeller type. Fan motor shall have inherent protection, permanently lubricated bearings, and be completely variable speed. Fan motor shall be mounted for quiet operation. Fan shall be provided with a raised guard to prevent contact with moving parts.
- D. Condenser coils shall be copper or other nonferrous construction with corrugated fin tube. Condenser coils shall have cabinet finish and coil fins with factory applied protective coating to resist a minimum of 500-hour salt spray test without corrosion, per ASTM B117 for sea coastal environments. Field applied coatings or paint shall not be allowed for whole casing or coil during installation. Where coating is scratched or damaged during equipment transportation and installation, clean the surface affected, and apply manufacturer's recommended touch up coating/paint in-kind with manufacturer supplied coating on equipment, per manufacturer's instructions to prevent voiding the equipment warranty.
- E. Compressor
1. Compressors shall be inverter scroll or rotary type, inverter-driven variable speed, capable of changing the speed to follow the variations in total cooling and heating load.
  2. Each compressor shall be equipped with a crankcase heater (if required for specified design and operating conditions), high pressure safety switch, and internal thermal overload protector.
  3. The capacity control range shall be minimum 10% to 100%.
  4. Compressor assembly shall be installed on vibration isolators.
  5. The following safety devices shall be included on the condensing unit: high pressure switch, control circuit fuses, fusible plug, high pressure switch, overload relay, inverter overload protector, thermal protectors for compressor and fan motors, over current protection for the inverter and anti-recycling timers.
- F. Units shall be rated under AHRI 210/240 and 340/360. Single-Phase units shall meet or exceed the DOE requirement of 19 SEER and 14 HSPF.

Note: Shop drawing submittals shall include AHRI ratings to show compliance with the requirements.

## 2.2 Fan Coil Units

### A. In-Ceiling Cassette Units

#### 1. General

- a. Ceiling cassette fan coil units shall be designed to fit into a 2x2 ceiling grid system, as a lay-in device. Each unit shall be equipped with an electronic expansion valve, air panel return grille, four-way air distribution louvers, ivory white, impact resistant, and washable decoration panel. The supply air louvers shall be adjustable from 4-way throw to 3-way and 2-way throws. Refer to drawings for throw types. The indoor units sound pressure shall be no greater than 44 dB(A) at high speed measured at 5 feet below the unit.
  - b. Refer to drawings for required capacities.
  2. Unit Cabinet
    - a. Cabinet shall be constructed of zinc-coated steel. Fully insulated discharge and inlet grilles shall be attractively styled, high-impact polystyrene. Cabinet shall have a mildew-proof, polystyrene air filter accessible from below with a 1/4 turn fastener.
    - b. Three auto-swing positions shall be available to choose, which include standard, draft prevention and ceiling stain prevention. The airflow of the unit shall have the ability to shut down one or two sides allowing for custom pattern control.
  3. Fans shall be direct-drive fan with statically and dynamically balanced impeller with high and low fan speeds available. The airflow rate shall be available in high, medium, and low settings. The fan motor shall be thermally protected. Air louvers shall be adjustable for 2, 3, or 4-way discharge.
  4. Coils shall be a 2-row copper tube with aluminum fins and galvanized steel tube sheets. Fins shall be bonded to the tubes by mechanical expansion. Fin spacing shall no greater than 17 fins per inch. A drip pan under the coil shall have a drain connection for hose attachment to remove condensate.
  5. Motors shall be totally enclosed and permanently lubricated with inherent protection. Fan motor shall be 3-speed.
  6. Electrical Requirements
    - a. Unit shall operate on 115 volt, 208 volt, or 230 volt, 60 Hz single-phase power supply as specified on the equipment schedule. Power and control connections shall have terminal block connections.
  7. Controls
    - a. Controls shall consist of a microprocessor-based control system, which shall control space temperature, determine optimum fan speed, and run self-diagnostics. The space temperature control range shall be from 64F to 84F.
    - b. Provide hard wired wall-mounted local programmable controller for each unit, with features as specified in the "Controllers" paragraph below.
    - c. Controls shall be 24 volt, and shall be easily operated by the user from the wall-mounted local controller.
  8. Accessories
    - a. Condensate Overflow Switch -- A level sensor on the condensate pan shall stop cooling operation and local alarm if the level in the condensate pan is near overflow condition.
    - b. Condensate Pump – Provide a factory-furnished UL 2043 plenum-rated condensate pump and sensing unit compatible with the fan coil voltage to remove condensate from the drain pan. Pump shall be thermally-protected (auto reset) and designed for quiet operation (less than 27 dBA) and consist of two parts: a reservoir/sensor assembly, and a remote sound-shielded pump assembly. The lift capability of the condensate pump shall be minimum 21". Pump shall be powered and wired from the fan coil unit power connection, downstream of safeties.
- B. Wall Mounted Units
1. General
    - a. Wall mounted units shall be completely factory assembled and tested. Included in the unit shall be factory wiring with on/off switch, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, self-diagnostics, auto-restart function, time delay fusing, and test run switch. The unit shall have an auto-swing louver which ensures efficient air

- distribution, which closes automatically when the unit stops. The local controller shall be able to adjust the discharge angle.
- b. A mildew-proof, polystyrene air filter and condensate drain pan shall be included. The indoor units sound pressure shall be no more than 50 dB(A) at high speed measured at 3.3 feet from the unit.
  - c. Refer to drawings for required capacities.
2. Cabinet shall be zinc-coated bonderized steel finished with a baked enamel paint. Inlet grilles shall be attractively styled, high-impact polystyrene. Matching mounting brackets shall be provided.
  3. Fans
    - a. Fan shall be tangential direct-drive blower type with air intake at the upper front face of the unit and discharge at the bottom front. Automatic, motor-driven vertical air sweep shall be provided standard.
    - b. Horizontal and vertical air sweep operations shall be user selectable.
    - c. Motors shall be open drip-proof, permanently lubricated ball bearing with inherent overload protection. Fan motors shall be 3-speed.
  4. Coil shall be a 2-row copper tube with aluminum fins and galvanized steel tube sheets. Fins shall be bonded to the tubes by mechanical expansion. A drip pan under the coil shall have a drain connection for hose attachment to remove condensate. Condensate pan shall have internal trap and auxiliary drip pan under coil header. The drain pipe shall be able to be fitted from either left or right sides.
  5. Electrical Requirements
    - a. Unit shall operate on 115 volt, 208 volt, or 230 volt, 60 Hz single-phase power supply as specified on the equipment schedule. Power and control connections shall have terminal block connections.
  6. Controls
    - a. Controls shall consist of a microprocessor-based control system, which shall control space temperature, determine optimum fan speed, and run self-diagnostics. The space temperature control range shall be from 64F to 84F.
    - b. Provide hard wired wall-mounted local programmable controller with integral space sensor for each unit, with features as specified in the "Controllers" paragraph below.
    - c. Controls shall be 24 volt, and shall be easily operated by the user from the wall-mounted local controller.
  7. Accessories
    - a. Condensate Overflow Switch -- A level sensor on the condensate pan shall stop cooling operation and local alarm if the level in the condensate pan is near overflow condition.
    - b. Condensate Pump – Provide a factory-furnished UL 2043 plenum-rated condensate pump and sensing unit compatible with the fan coil voltage to remove condensate from the drain pan. Pump shall be thermally-protected (auto reset) and designed for quiet operation (less than 27 dBA) and consist of two parts: a reservoir/sensor assembly, and a remote sound-shielded pump assembly. The lift capability of the condensate pump shall be minimum 36". Pump shall be powered and wired from the fan coil unit power connection, downstream of safeties.
    - c.

### 2.3 Controllers:

#### A. Local Controllers (Room Thermostats)

1. Wall mounted local remote controllers (thermostats) shall be provided to allow the user to change on/off, temperature setting, and fan speed setting for each fan coil unit. The room temperature shall be sensed at this wall mounted remote controller (thermostat) unless noted otherwise. The controller shall display a four-digit error code in the event of system abnormality/error.
2. The Local Controller shall be mounted into a standard 2" x 4" junction box.



3. Unit Display
  - a. The Local Remote Controller shall be a backlit LCD display with contrast adjustment.
  - b. The controller shall display On/Off Status, Operation Mode, Setpoint, and Fan Speed. The controller shall display temperature setpoint in one degree increments with a range of 60-90 degF. On/Off status shall be displayed with an LED.
  - c. Error codes shall be displayed in the event of system abnormality/error.
  - d. The following system temperatures shall be capable of being displayed to assist service personnel in troubleshooting:
    - 1) Return air temperature
    - 2) Liquid line temperature
    - 3) Gas line temperature
    - 4) Discharge air temperature (if available on the unit)
    - 5) Remote temperature sensor temperature (if applicable)
    - 6) Indoor space temperature setpoint
4. Operation
  - a. The following operation groups shall be controlled:
    - 1) On/Off, Operation Mode (Cool, Heat, Fan, Dry and Auto\*)
    - 2) Independent cooling and heating setpoints in the occupied mode
    - 3) Independent cooling setup and heating setback
    - 4) Fan speed
    - 5) Airflow direction
    - 6) The controller shall be able to limit the user adjustable setpoint ranges individually for cooling and heating in the occupied period
    - 7) Lock out key settings
5. Program Functions
  - a. Controller shall support schedule settings with selectable weekly pattern options.
    - 1) Seven day week
    - 2) Weekday + weekend
    - 3) Weekday + Saturday + Sunday
    - 4) Independently settable Cooling and/or Heating setpoints when unit is on (occupied).
    - 5) Setup (Cooling) and Setback (Heating) setpoints when unit is off (unoccupied)
    - 6) A maximum of 5 operations schedulable per day
    - 7) Time setting in 1-minute increments.
  - b. The Controller shall support auto-changeover allowing the optimal room temperature to be maintained by automatically switching the indoor unit's mode between Cool and Heat according to the room temperature and temperature setpoint.
    - 1) Changeover to cooling mode shall occur at cooling setpoint + 1oF .
    - 2) Changeover to heating mode shall occur at heating setpoint - 1oF .
  - c. The Controller shall support an Auto-Off-Timer for temporarily enabling indoor unit operation during the unoccupied period.
    - 1) When the Off Timer is enabled and when the unit is manually turned on at the remote controller, the controller shall shut off the unit after a set time period.
    - 2) The time period shall be configurable in the controller menu with a range of 30-180 minutes in 10 minute increments.
  - d. The space temperature shall be sensed at the local controller.

#### 2.4 Refrigerant Piping:

- A. Refrigerant piping shall be copper tubing conforming to ANSI B31.5 and ASTM B280. Refrigerant piping systems and components shall be engineered, installed, tested and placed in operation in accordance with ASME B31.5, latest edition.
- B. Copper tubing shall be Type ACR, hard-drawn straight lengths. Fittings shall be copper, UL or ETL tested to UL 207, and certified to a working pressure of 600 psig. All joints shall be brazed using silver brazing alloy while flowing an inert gas such as dry nitrogen through the piping.

Copper tubing that is .625" size and smaller may be Type ACR soft annealed coils for lengths under 25 ft if approved by the equipment manufacturer. Refer to 23 23 00 for additional information.

- C. Pipe arrangement, devices and sizing information shown on the drawings is limited due to variations in equipment manufacturers' requirements. The equipment supplier shall prepare project-specific drawings of each piping system showing numbers and sizes of piping, devices and accessories, coil circuitry, traps, double suction risers and other such detail required for the application shown on the drawings and as specified herein. Drawings shall be submitted to the Engineer for review with the equipment shop drawings.
- D. The equipment supplier shall provide piping installation instructions to the Contractor and supervision as needed to ensure that the piping system is installed in accordance with the equipment manufacturer's recommendations.
- E. Units shall be manufactured by LG, Mitsubishi, Carrier, Daikin, **Trane, or Samsung.**

### **PART 3 - EXECUTION**

3.1 Installers shall have received training by the manufacturer of the systems being supplied for the project. If they have not received training the system manufacturer shall schedule and perform required installation training.

#### 3.2 Piping Installation

- A. Pipe arrangement, devices and sizing information shown on the drawings is schematic in nature, limited due to variations in equipment manufacturers' requirements. The equipment supplier shall prepare project-specific drawings of each piping system showing numbers and sizes of piping, devices and accessories, coil circuitry, traps, double suction risers and other such detail required for the application shown on the drawings and as specified herein. Exact routing, and pipe quantities and sizing shall be per manufacturer's requirements. Refrigerant piping shall conform to ANSI B31.5 and ASTM B280. Refrigerant piping systems and components shall be engineered, installed, tested and placed in operation in accordance with ASME B31.5, latest edition. Drawings shall be submitted to the Engineer for review with the equipment shop drawings. Exact routing, and pipe quantities and sizing shall be per manufacturer's requirements.
- B. At time of equipment submittal approval a piping diagram shall be provided by the equipment manufacturer to the Installing Contractor for each split system. The equipment manufacturer shall review the piping diagram with the Installing Contractor.
- C. A copy of the Approved piping diagrams shall be kept at the jobsite.
- D. The Installing Contractor shall update the piping diagrams with any field changes such as re-routing, shortening, lengthening or changing diameter of a pipe segment, adding or eliminating elbows and or fittings, resizing adding or eliminating indoor units, changing the mounting height, or moving the location of a device or fitting during installation. Those changes shall be communicated to the equipment manufacturer PRIOR TO INSTALLATION. The equipment manufacturer shall review and provide written approval or required modifications prior to installation.



- E. The equipment manufacturer shall update their Piping Program to an “As-Built” program. Proper refrigerant charge shall be calculated and communicated to the Commissioning/Startup Technician along with the As-Built piping program.
  - F. The equipment manufacturer's representative shall inspect the piping system prior to charging and start-up, and document their approval or required changes.
  - G. System shall be leak checked, evacuated and charged by the Installing Contractor. Refer to 23 23 00.
- 3.3 Control wiring shall be installed between indoor units, condensing units, in strict accordance with the manufacturer's instructions. All control wiring shall be low-voltage plenum rated type.
- 3.4 Furnish and install all controls, wiring and accessories for a complete and operational system.
- 3.5 Locate equipment so as to afford adequate service space.
- 3.6 Outdoor condensing units shall be installed in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances. Set with Type C2 isolators and secure to equipment rails on roof. Piping shall be connected utilizing flexible connectors.
- 3.7 Install fan coil units in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances. For gravity drained units, provide a drain pipe with trap from fan coil drain pans and extend piping to a floor drain or other point of discharge as shown and terminated per the Code. For fan coils fitted with condensate pumps, install pump and sensing devices in evaporator condensate drain piping, and provide and/or extend power and control and safety wiring, all in strict accordance with the manufacturer's instructions. Condensate piping shall be extended to a floor drain or other point of discharge as shown and terminated per the Code.
- 3.8 Roof mounted condensing units shall be installed a minimum of 10'-0" from any roof edge not protected with a code compliant guard rail regardless of location indicated on plans. Units shall be installed in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances. Set with Type C2 isolators and secured to roof equipment rails attached to the roof deck and flashed into the roofing system. All bases and curbs for roof mounted equipment shall be constructed and attached to the roof deck such that installed equipment can withstand a minimum of 186 mph wind loads. Piping shall be connected utilizing flexible connectors.
- 3.9 Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division-26. Do not proceed with equipment start-up until wiring installation is acceptable to equipment Installer.
- 3.10 The system shall be checked, started, tested, adjusted and commissioned by a factory trained service agent of the manufacturer prior to operation. The unit manufacturer will be responsible for the start-up, programming, and commissioning of the entire variable refrigerant volume system. This shall include coordinating the interface requirements and system points with the temperature controls contractor. Manufacturer shall test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.
- 3.11 Provide services of manufacturer's technical representative for 1 days to instruct Owner's personnel in operation and maintenance of units. Schedule training with Owner.

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- 3.12 In addition to the adjustments and fine tuning, the Contractor shall include as a part of this contract the equivalent of one (1) man days of service technician time for work as may be specified by the Engineer.
- 3.13 The control equipment supplier shall provide 4 hours of 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. Site training classes shall not be scheduled for longer than 4 hours duration except at the discretion of the Owner. Contractor shall videotape the demonstrations and make copies available to the Owner.

END OF SECTION