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**ADDENDUM # 3**

June 4, 2021

To Drawings and Specifications for:

Administration and Training Center  
for  
Tri-County Board of Recovery and Mental Health Services  
1280 N County Rd. 25a  
Troy, Ohio 45373  
Project #1615.04

This Addendum must be acknowledged on the Form of Proposal.

**TO ALL CONTRACTORS:**

This Addendum modifies the original Drawings and Specifications and is to be taken into account in preparing proposals and will become part of the Contract Documents.

**NOTICE TO BIDDERS**, The date of the bid has been extended to **June 15, 2021 at 4:00pm.** pursuant to ORC 153.12. The location for receipt of bids is unchanged.

**SPECIFICATIONS**

**ITEM 1      SPECIFICATIONS 27 2100, Data Communications Network Equipment**

A. Replace specification section with **updated section** included in this addendum

**ITEM 2      SPECIFICATIONS 27 2133, Data Communications Wireless Access Points**

A.      A. Replace specification section with **updated section** included in this addendum

**ITEM 3      SPECIFICATIONS 28 1353, IP Network Compatible Intercom (IX System)**

A.      A. Replace specification section with **updated section** included in this addendum

## SECTION 272100 - DATA COMMUNICATIONS NETWORK EQUIPMENT

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. All provisions of the Division 00 and Division 01, apply to all work in Division 27 and Division 28.

#### 1.2 SCOPE OF WORK

- A. All Bidders shall have an established SPIN number from the federal government in order to participate in any E-Rate funding opportunities for the project. This can be obtained through USAC <http://www.usac.org/sl/service-providers/step01/default.aspx>
- B. Provide a main rack mounted file server including OS software. Mount server in server cabinet provided under section 27 11 00. Coordinate server and cabinet.
- C. Provide a main chassis based switch with 1000BASE FX, and 1000BASE TX uplink ports and copper GB station ports in the MER. Fiber 10GB ports to provide full duplex non-blocking Gigabit uplink for a total of **20GB per stack** over fiber optic cable to stacked switches in each remote wiring closet. Copper station ports to provide 1000BaseT and 802.3at PoE+ auto sensing ports to local outlets and devices fed from main wiring closet.
- D. Provide a stacked with layer 2 switch management capable in each wiring closet to activate each wired data jack terminated in each wiring closet (including the outlets served directly from the main wiring closet). Provide 20GB uplinks from each switch stack to the main core switch.
- E. Provide PoE+ enabled ports in each wiring closet switch to activate wired data jacks terminated in wiring closet (including the outlets served directly from the main wiring closet).
- F. UTP patch cables to connect network electronics to station cable patch panels in each wiring closet are furnished under specification Section 27 15 13. This contract shall be responsible for installing and labeling all patch cables from patch panels to network electronics.
- G. This contract shall be responsible for providing, installing and labeling all required fiber jumpers and copper patch cables to connect network electronics to the fiber backbones and to the core switch.
- H. Online UPS units to support network electronics as described herein and as shown on the contract documents.
- I. Network management software with licenses for all equipment installed under this project.
- J. Programing of each switch to coordinate with the Owner's LAN and WLAN Network Operating System configuration and requirements including establishing parameters and operations associated with QoS, CoS, VLANs, WLAN, etc.

- K. The systems/equipment installed shall be of the latest revision and of the latest technology. The data systems shall serve the building, as well as, satellite buildings located throughout the owner for the foreseeable future and shall be able to grow as the owner grows.
- L. Provide and install all labor, tools, materials and accessories for a complete Data Network LAN comprised of switch components as listed.
- M. The contractor shall furnish and install switches.
  - 1. Install in appropriate rack.
  - 2. Connect to UPS
  - 3. Patch to associated patch panel
  - 4. Label (coordinate labeling with Owner/Architect)
- N. The Contractor shall demonstrate to the Owner and Engineer that the system is complete and complies with all operational requirements set forth in the plans and specs. The contractor shall provide all miscellaneous items and accessories required to make the system operational whether or not such items are specifically mentions in the plans and specifications.
- O. The contractor shall review all plans and specifications for any detail that may impact the installation of the system. Any discrepancies discovered shall be brought to the attention or the engineer prior to installation.
- P. The data network and all its components shall be installed so that access is provided to all components for general maintenance and repair.
- Q. The new data network equipment shall connect to various wide area connections and interface types. The Contractor shall make all necessary arrangements with the Local Service Provider(s) to provide all connections to the WAN well in advance to project close out. Wan connections shall be routed through the MC.
  - 1. The contractor shall provide and configure all the equipment required for connecting the data network to the wide area network.
  - 2. The Contractor shall ensure the data network is compatible with any routers, gateways and firewall provided by others/Owner.
- R. The data network electronics may be used to support voice traffic. Configure the system to meet all requirements of a voice system.
- S. The contractor shall work with the Owner to develop a patching scheme for all devices attached to the data network.
  - 1. The contractor shall be responsible for patching all devices from the patch panel(s) to the network equipment and any patching between the network electronics.
  - 2. Contractor shall coordinate with the Installation Company providing patch cables under 27 15 13 and the Owner color schemes and lengths of patch cables.
- T. In these specifications the words "data network," "data system," network electronics" and "electronics" shall be interchangeable and shall refer to the data network system and electronics and all its components.

### 1.3 SYSTEM DESCRIPTION

#### A. Section Includes

1. Network Core Switch
2. Edge Switches
3. KVM Switch
4. Radius Server

B. The "Contractor" as referred to in these specifications, shall be the bidder whose bid is eventually chosen as the winner.

C. The "Engineer" as referred to in these specifications, shall be BCL and its representative on this project.

D. The "Owner" as referred to in these specifications, shall be and its representative on this project.

E. In the detailed specifications and on the contract drawings, the phrases "or equivalent," "approved equivalent," "approved equal," "or equal" and "engineer approved equivalent" shall be used interchangeably and shall mean the same thing.

F. All equals, equivalents, or alternates shall be approved by the Engineer prior to ordering or installation. Without approval, deviation from the products listed in the specifications and on the drawings shall be presumed to be nonconforming and shall be removed and replaced at the direction of the Engineer and at the Contractor's expense.

G. The network electronics shall provide full-duplex, auto-sensing 1000BaseTX UTP Ethernet ports for wired data jacks. The edge switches shall provide full layer 2 switching.

H. POE+ switches shall provide IEEE 802.3at compliant POE+ on all provided ports simultaneously.

I. The network electronics shall provide software management capabilities such as Virtual LANs (VLANs), multilevel access security, and group management protocol. Software management shall be web-based and utilize a standard web browser. VLAN trunks shall be capable of being created from any port on any switch using IEEE 802.1Q standards based tagging. The main switch chassis shall provide full layer 2 and full layer 3 switching and routing.

J. The network electronics shall provide features associated with Quality of Service (QoS) and Class of Service (CoS) as well as port-based prioritization. The QoS shall be based upon IEEE 802.1.

### 1.4 QUALITY ASSURANCE

A. All equipment shall be UL listed.

B. All equipment and Installation Practices shall comply with the latest ANSI/NFPA-70 National Electric Code.

C. All equipment Installation Practices shall comply with the Local Electric Code.

- D. All equipment shall comply with the latest ANSI-J-STD-607-B Commercial Building Grounding (Earthing) and Bonding Requirements for telecommunications Standard.
- E. All equipment and Installation Practices shall comply with the latest BICSI Telecommunications Distribution Methods Manual (TDMM). Current Revision 13.
- F. All equipment shall comply with the latest ANSI TIA/EIA-568, 569, 606, 607, 862, standards and all Technical Service Bulletins (TSB)..
- G. All work applicable shall conform to the following standards:
  - 1. IEEE802.3-2012: (also known as ANSI/IEEEStd 802.3-1990) or ISO8802-3: 1990 (E), Carrier Sense Multiple Access with Collision Detection (CSMA/CD)Access Method and Physical Layer Specifications.
  - 2. NERC1300: Cyber Security Standards from the North American Electrical Reliability Council
- H. The system shall be in compliance with all FCC Rules and Regulations.
- I. All materials furnished under this contract shall be new, of highest quality and shall be of a regularly manufactured line, currently in production at the time of installations. All switch components shall be of a single manufacturer.

#### 1.5 CONTACTOR QUALIFICATIONS

- A. The network electronics system shall be furnished, installed and programmed by a contractor who meets all the requirements listed herein. It shall not be acceptable for the contractor to utilize a sub-contractor for any portion of the work, unless the sub-contractor has been approved in writing by the Engineer based upon adherence to the qualifications listed herein.
- B. The Contractor shall maintain a fully equipped, factory certified service organization capable of providing full maintenance and service of the installed system within 24 hours. This facility shall be available for inspection by the Engineer.
- C. The Contractor shall employ factory trained service personnel for the service and maintenance of the system.
- D. The Contractor shall have has a minimum of 1 year experience with the specified network electronics. This experience shall include having completed a minimum of 2 installations in the past 12 months of similar size and scope. The Contractor shall provide references and contact information for the project sites in which the qualifying installations occurred.

#### 1.6 Shop Drawings and Submittals

- A. Completely detailed shop drawings shall be prepared prior to the procurement of equipment or commencement of work. Blue-line drawings shall be prepared and submitted on 30" x 42" paper. Equipment lists, data sheets, etc. Shall be 8-1/2" x 11" size properly bound into a single or multiple volumes.

- B. Submit to the following for approval:
1. A complete equipment list, with manufacturers' names, model numbers, and quantities of each item.
  2. Manufacturer's data sheets on all equipment items.
  3. System block diagram(s)
  4. Equipment rack layouts showing all rack mounted equipment items.
  5. Certain other submittals as noted elsewhere in this specification, and as may be required for various equipment items prior to construction, fabrication, or finishing of that item.
- 1.7 Final Documentation: All final documentation shall be submitted and approved before final acceptance by the Owner will be granted. Within 45 days after completion of the work, deliver to the Owner, four (4) sets of the following:
- A. A complete as-installed equipment list, listed by room, with manufacturer's names, model numbers, serial numbers and quantities of each item.
  - B. A complete and correct system schematic, showing detailed connections for all parts of the system, including wire numbers, terminal block numbers, layouts and other designations and codings.
  - C. Complete equipment rack layouts showing all rack mounted equipment items.
  - D. Operations instructions for each major item of equipment furnished.
  - E. Manufacturer's warranty for each major item of equipment furnished.
  - F. Technical Systems Operations Manual, custom-written by the Contractor, for the purpose of instructing the Owner's operating personnel in the detailed step-by-step operation of the system and preventive maintenance procedures. This manual shall include descriptions of the system components and their relationship to system function. This manual shall be bound separately and labeled appropriately.
- 1.8 COORDINATION
- A. Coordinate the location of the data network electronics and racks with the Electrical Contractor for placement of electrical connections.
  - B. Coordinate the configuration of the data network electronics for compatibility with WAN connections, addressing and routing.
  - C. Coordinate UPS and Power Strip locations with other trades for placement of electrical connections.
  - D. Coordinate all UPS and Power Strip input connectors with electrical contractor.
  - E. Coordinate with the Network Integrators such that the UPS units are communicating with the network utilizing their SNMP cards or IP based web monitoring.

## 1.9 STORAGE OF MATERIALS

- A. All materials shall be secured when not in use by the Contractor.
- B. It shall be the Contractor's responsibility to secure all equipment including all material to be installed as part of the contract. No changes shall be made to the contract due to loss or theft of equipment and materials not officially accepted by the Owner.

## 1.10 SYSTEM WARRANTY

- A. The Local Area Network Electronics software shall be warranted by the contractor for a period of three (3) years from date of substantial completion.
- B. Provide advanced replacement for all Network Electronics for the three (3) year period.

## 1.11 RELATED WORK BY OTHERS

- A. All conduit with pull strings, all electrical pull boxes, and all outlet boxes shall be furnished and installed under the electrical section of Division 26. Coordinate as necessary for proper installation. All conduit systems shall be insulated from the equipment racks using non-metallic bushings or raceways.
- B. All power conductors and conduits associated with power circuits to all equipment locations shall be furnished and installed under the electrical section of Divisions 26. The power to the equipment racks shall be terminated inside the racks to Contractor - supplied isolated ground plugstrips or quad convenience outlets. All conduit systems shall be insulated from the equipment racks using non-metallic bushings or raceways.
- C. An insulated #6 AWG stranded copper ground wire from each equipment rack to the building main service ground.

## PART 2 - PRODUCTS

### 2.1 Product Equivalency

- A. Where products are listed with multiple manufacturers, these manufacturers will be approved as equals if all specified features are provided. Any equipment not specifically approved in writing prior to the bid date will not be considered regardless of qualifications. Failure to provide the "precise functional equivalent" shall result in the removal of the alternate equipment at the Contractor's expense.
- B. Different manufacturers may require various options, accessories, converters, patch cables, etc. to perform the specified features and functions. Therefore, all material and/or equipment necessary for proper operation of the system shall be deemed part of these specifications.

## 2.2 SYSTEM REQUIREMENTS

- A. The contractor shall be required to fully review the existing infrastructure prior to cutover to the new system.
- B. The Contractor shall verify that space is available in existing racks/cabinets for all new network electronics equipment.
- C. All network equipment shall mount in standard 19" relay racks or cabinets.
- D. The overall intent of the data network is to provide a high-speed Ethernet based system for connecting all the users to their applications, files and the Internet while providing management of all aspects of the user connectivity via a network management system (NMS).
- E. All electronics provided for the system shall be from the same manufacturer and shall be fully supported by the management system provided by the contractor.
- F. In each communications room the equipment shall be directly connected to a ground bar ground in the building. Follow manufacturer's recommendations for grounding.

## 2.3 MANUFACTURERS—DATA NETWORK

- A. Approved Vendors for Data Network Equipment:
  - 1. Aruba Networks
  - 2. Cisco
  - 3. Extreme

## 2.4 EDGE SWITCH—

- A. All switch ports shall be 1000BaseTX
- B. The switch stacks shall provide sufficient ports for full-duplex, 20GB SFP connections to MER main chassis switch over the installed fiber optic cable backbone patch cables as indicated on drawings and as specified herein.
- C. POE+ switches shall provide IEEE 802.3at compliant POE+ on all provided ports simultaneously.
- D. Dual power supply including power to integrated POE+ service modules. Dual power supply shall be primary and standby.
- E. Single switching fabric. Switching fabric shall be minimum full wire speed for all connected switches in the stack.
- F. Management module shall provide full layer 2 and full layer 3 switching and routing services. Layer 2 features including VLAN trunks, rapid spanning tree, 802.1Q link aggregation, IGMP multicast, and QoS/CoS. Layer 3 features including static IP routing, IP multicast, IGMP, IP routing protocols, IPv6. Hardware based IPv6.



- G. Port based QOS encompassing classification, scheduling and marking (QoS, ToS): including per configuration and strict priority queuing.
- H. Multicast management including hardware based, PIM and IGMP server.
- I. Flash memory to enable future software and hardware upgrades without taking the switch offline.
- J. Remote management via web-based graphical user interface, Telnet, SNMP.
- K. Telnet, Ethernet based SNMP and web based GUI remote management interface.
- L. Backplane connection min. 20GB per stack
- M. All switchports must support 802.1X and MAC address bypass (MAB).

## 2.5 PATCH CABLES

- A. The Contractor shall be responsible for providing and installing all required fiber and copper patch cables at each switch uplink port and main core switch uplink ports to make a complete and fully functioning network. The following patch cable requirements are considered part of these specifications:
  - 1. Fiber Jumper—provide fiber jumper cables at each edge switch requiring fiber uplink and duplex fiber jumpers at each fiber port in the chassis switch to fully connect the network. Coordinate jumper type and color with equipment and jumper length to provide a neat, orderly and workman like appearance after system patching is complete.
  - 2. Copper patch cable—provide patch cables at each edge switch requiring copper uplink ports and copper patch cables at each copper 1000BASE TX port in the chassis switch to fully connect the network. Patch cables to match the EIA/TIA channel configuration of the cabling system. Coordinate patch cable length and color to provide a neat, orderly and workman like appearance after system patching is complete.
- B. The Contractor shall be responsible for coordinating with the 27 15 13 Contractor regarding patch cables being supplied by the 27 15 13 Contractor for patch panel-to-switch patching. Final quantities and lengths of patch cables shall be arranged to provide the cleanest best managed patching solution. This Contractor is responsible for taking delivery of the patch cables, installing the patch cables and labeling each end for patch panel port and switch port identification.
- C. Ensure adequate strain relief for any fiber or copper patch cable supplied.
- D. The contractor shall work with the Owner to develop a patching scheme for all devices attached to the data network. The contractor shall be responsible for patching all devices from the patch panel(s) to the network equipment and any patching between the network electronics. The contractor shall provide (2)-two Cat-6 patch cord for every copper port provided under this contract. Contractor shall provide a fiber patch cord for every fiber port provided under this contract.

## PART 3 - EXECUTION

### 3.1 GENERAL INSTALLATION

- A. Install systems in accordance with UL, NEC and all other applicable codes. Install system to comply with drawings and final shop drawings in compliance with manufacturer instructions. Provide all required hardware and labor for rack mounting of system components.
- B. Some network electronics such as layer 2 switches, UPS units, etc., will be required to be mounted in relay racks and server cabinets provided under Section 27 11 00. Careful coordination with 27 11 00 contract will be required. This coordination shall include providing all required dimensional, weight and mounting data to the 27 11 00 Contractor to ensure a fully coordinated installation.
- C. It is the Contractor's responsibility to program the devices in this section according to the Owner's Network requirements. The Contractor shall meet with the Owner and/or Engineer and reach agreement on the programming.
- D. Provide any miscellaneous equipment such as identification tags, cable tie, wiring harnesses, patch cables (both copper and fiber), stacking cables etc. necessary for a complete TURNKEY system.
- E. Provide all required jumper and patch cables and coordination with the Owner to connect to the Owner's File Server(s).
- F. Install and setup all UPS equipment. Review power down procedure with the Owner.

### 3.2 EXAMINATION

- A. The Contractor shall be knowledgeable of the requirements and limitations at the site prior to submission of the Bid Response.

### 3.3 PREPARATION

- A. Each location where equipment of the data network will be placed shall be identified and reviewed prior to installation of the components.
- B. All work shall be done by trained professionals with a history of work on the equipment being installed.
- C. The Contractor shall provide all hardware, software, cable, connecting blocks, electronics, configuration, and labor required for a complete and operating system.

### 3.4 SYSTEM CONFIGURATION

- A. The Contractor shall configure and install the data network as per the detailed specifications and the configuration meetings with the Owner.

1. Meetings shall be scheduled with the Owner to discuss the configurations of all electronics and the capabilities of the system. The System shall be configured for all Ethernet IP systems installed such as: Video on Demand, VoIP, wireless network, IP cameras and Video Surveillance Control, Access Control, Etc. Contractor shall configure VLANs as well as OS set up with priority being given to voice and video.
  2. The owner shall be made aware of all the capabilities of the data network electronics and all possible configurations and shall be able to decide all aspects of the programming and configuration.
  3. The Contractor shall generate a report on the requirements of the owner and shall program and configure all the data electronics to meet the owner's needs. All costs associated with the meetings and programming are to be included in the bid.
  4. From the meetings the owner and contractor shall generate a plan for all configuration issues of the data network including but not limited to:
    - a. IP Numbering Scheme
    - b. VLAN Settings - possible VLANs for: Administration, HVAC, Management, Personnel, Video, Voice, Wireless, etc.
    - c. Quality of Service (QoS) Settings
    - d. Network Prioritization
    - e. New Data Connections.
    - f. Wireless Connectivity for Patrons and Administrators.
    - g. Wireless Security
    - h. Video Surveillance and Access Control
- B. The owner shall be able to be involved in all aspects of the configuration.
- C. The network electronics shall be configured with complex authentication credentials (passwords.)
- D. The network electronics shall NOT be configured with default usernames, default passwords or default SNMP community strings.
- E. Configured SNMP community strings shall be protected via an access control list such that only the NMS and Owner selected IP addresses can perform SNMP queries.
- F. The network electronics shall be configured to synchronize internal clocks to a designated internal NTP server.
- 3.5 USER CONNECTIVITY
- A. The Contractor shall meet with the owner as soon as the project has begun to discuss connectivity of the new data electronics to, but not limited to: Local/Remote users, WAN, WLAN, VLAN, LAN, Printers, etc.
  - B. The contractor shall provide a minimum of the detailed quantity of 10/100/1000 Ethernet ports shown on the drawings.
  - C. The Owner may provide additional locations where additional 10/100/1000 Ethernet connections shall be made and the contractor shall locate those cables and make plans to connect them to the new data electronics.

- D. When the new electronics are installed, the contractor shall provide all new patch cables for all data connectivity in the rack/cabinet and to the user's device.
  - 1. Patch cables shall be of same category has horizontal cables, fiber cables, etc. and shall be factory made and be matched to the length required between the user patch panel and the data electronics.
  - 2. When installing the new electronics the contractor shall ensure that all patch cables and ports are connected to a user PC or printer.

### 3.6 ELECTRONICS PLACEMENT

- A. The Contractor shall be responsible for the placement of the data electronics and all its components in the assigned Communications Rooms.
- B. Contractor shall consult with the owner about electronics placement prior to cutover.
- C. All equipment shall be secured in communication racks using the maximum number of screws as there are holes provided by vendor equipment.

### 3.7 TESTING

- A. The Contractor shall be responsible for energizing and testing each port. This test shall include “Rack-to-Jack” and from main switch and from main switch to switch “stacks”. The contractor shall be responsible for ensuring that the network is in proper working condition.
- B. The Contractor shall be responsible for testing and verifying that all software and management level functions of the system as required by the Owner’s Network system are programmed and operating properly. This includes but is not limited to:
  - 1. Set-up and segregation of VLANs as required by the Owner on a per port and per switch basis.
  - 2. Switch clustering and addressing through a single IP address.
  - 3. Operation of remote monitoring events such as alarm, history, statistics, events, etc.
  - 4. Set-up of multi-level security including MAC addressed-based and terminal access control to prevent unauthorized users from altering the configurations.
  - 5. Set-up and administration of prioritization, quality of service, IP clustering, video multi-casting, VoIP, etc.

### 3.8 LABELING

- A. All labeling and recording shall be approved by the Owner and the Engineer prior to application.
- B. Provide a printed, computer generated record of each connected port in each switch. Label shall indicate data jack label, port and switch label and closet label.
- C. All supplied devices shall have a label affixed in a visible location on the front and rear of the equipment.

1. The label shall identify the switch name and IP address.
- D. All labels shall be machine printed.
- E. All copper and fiber patch cables interconnecting switches shall have a self-laminating label affixed on each end of the patch cable.
1. The label shall identify the switch and port at the opposite end of the cable.
- F. All copper and fiber patch cables interconnecting switches to servers shall have a self-laminating label affixed on each end of the patch cable.
1. The label shall identify the switch and port at the server end of the cable and the server name at the switch end of the patch cable.
- G. All copper and fiber patch cables interconnecting switches to routers, firewalls and gateways shall have a self-laminating label affixed on each end of the patch cable.
1. The label shall identify the switch and port at the router end of the cable and the router name at the switch end of the patch cable.

### 3.9 WORK AREA

- A. The Contractor shall provide a clean and orderly area to work in during system installation.
1. The work areas shall be cleaned daily. All packing trash and other assorted junk items shall be removed at the end of each workday.
  2. Dust shall be kept to a minimum during the installation. All dust shall be removed prior to the cutover, and then again just prior to project closeout.
  3. The Owner and Engineer shall have access to the work area at any time during normal working hours.
  4. The Owner and Engineer have the right to stop work and seek answers to questions and concerns that may come up during the installation of the new data network.

### 3.10 UPS

- A. Contractor is to be familiar with other specification sections where system run time is specified in the event of a power outage. It is the contractor's responsibility to configure and provide the required extended battery packs to the UPS units to meet all specified system run times.
- B. Location of the UPS units and Power strips shall be finalized in the communications room or space shown on the drawings prior to installation.
- C. Locate all equipment to be installed, and make certain that space is available for maintenance and service during the life of the system.
- D. If any changes from the drawings are required, the Contractor shall submit a proposed layout of the communications room/racks to the Engineer for approval prior to installation.

- E. Placement of UPS units shall be in the Main Equipment Room and Telecommunications closets
  - 1. All UPS units shall be rack Mounted unless otherwise noted.
  - 2. Mount UPS units on the bottom of the communications racks or cabinets.
  - 3. Mount UPS units using all Manufactures recommended and required hardware.
  - 4. Provide support between the floor and the UPS unit. Wood or Plastic blocks cut to the width of the space between the UPS and the floor shall be installed.
  - 5. Provide all programming for SNMP setup of all UPS units to Owners LAN. Provide all cards and cords for connection to the LAN.
  
- F. Power strips shall be installed so that they do not interfere with the cable routing, or the installation of components into the rack.
  - 1. Modular plug for the outlet strip shall be installed at the bottom of the outlet strip.
  - 2. All power strips shall plug into UPS units. UPS units shall be plugged into 1 of 2 duplex receptacles installed at the bottom of the rack. Refer to the detailed drawings for receptacle locations.
  - 3. Coil any extra cord from the outlet strip and tie wrap it to the bottom of the vertical cable ladder.
  - 4. Securely attach the outlet strips to the back edge of the vertical cable ladder or Wallfield as per detailed drawings.
  - 5. Electrical outlets are installed by others. Communications Contractor shall be responsible for connecting the power strips to the UPS unit(s) and the UPS unit(s) to the power receptacles.

### 3.11 TRAINING

- A. Provide the Owner with a minimum of 8 hours of training designed to make all users familiar with the operation of the system. Appropriate hands on training as well as manuals and detailed troubleshooting guides should be given to Owner personnel.
- B. Provide all training and utilize specified manuals and record documentation. All training shall be provided at the project site and coordinated with the Owner.
- C. Training shall include multiple four-hour sessions encompassing all instructions required for system operation. Provide operators manuals and user guides with training. Provide follow up training after initial training.
- D. Training shall utilize the equipment provided at the project site. Coordinate use, time and availability of equipment with the Owner.
- E. Demonstrate adjustment, operation and maintenance of the system including each component and control.

### 3.12 AS-BUILT DOCUMENTATION

- A. The Contractor shall furnish the Owner two (2) CDs with complete as-built manuals and drawings in an indexed PDF file format. Drawings shall be a minimum of 11”x17” engineering format. These manuals shall contain:

1. System Operating Instructions
  2. System Functional Block Diagram(s)
  3. System Schematic Diagram(s)
  4. System Wiring Diagrams
  5. As-Built Drawings of Entire System including Equipment Rack Elevations
  6. Component Technical Operation Manuals
  7. Component Service Manuals
  8. Software Operating Manuals
  9. Port and Switch Labeling
  10. Final Endurance Test Report
- B. Maintenance Manual: The maintenance manual shall describe maintenance for all equipment including inspection, periodic preventive maintenance, fault diagnosis, and repair or replacement of defective components.
- C. The contractor shall provide a new owner network map indicating all new buildings included in this scope of work. Network map shall include equipment information, IP addresses, VLAN information, etc. Network map shall be prepared utilizing a computer drafting program such as AutoCAD or Visio, and shall be presented in electronic format.

### 3.13 WARRANTY

- A. If any defects are found within the three (3) year full warranty period, the defective system component shall be replaced at no extra cost to the Owner for part or labor. Provide a statement of this warranty with the O&M Manuals.
- B. During the warranted operation, the Contractor shall perform two inspections at 6-month intervals or less. This work shall be performed during regular working hours, Monday through Friday, excluding legal holidays. Resolve any previous outstanding problems.
- C. Make available a service contract offering continuing factory authorized service of this system after the initial warranty period.
- D. The Contractor shall be responsible to provide service during normal working hours on a normal business day within (4) hours after notification by the Owner for normal service or within (2) hours for emergency service. Emergency service is defined as the loss of 25% or more of system components operation, or the loss of the main switch or other dead-end equipment which renders the entire system beyond 50% inactive or un-usable. Provide an on-site authorized factory technician within 24 hours if required.
- E. If equipment cannot be repaired within 24 hours of service visit, Contractor shall supply “loaner” equipment to the Owner at no charge.

### 3.14 CERTIFICATION

- A. Upon completion of the testing, the manufacturer or representative shall issue to the Owner a letter of certification attesting to the fact that he has tested and adjusted the system, that all components are properly installed and free of defects, and that the system is in compliance with this specification.





## SECTION 272133 - DATA COMMUNICATIONS WIRELESS ACCESS POINTS

### PART 1 GENERAL

#### 1.1 RELATED DOCUMENTS

- A. All provisions of the Division 00 and Division 01, apply to all work in Division 27.

#### 1.2 SCOPE OF WORK

- A. This specification section is intended to provide a complete system Wireless Local Area Network Electronics (WLAN) system as indicated herein and as shown on the contract documents.
- B. Provide an IEEE 802.11 Wi-Fi 6 standard and WiFi compliant system of wireless access points (AP), antennas (interior and exterior), Plenum rated AP housings, cabling, RF Management platforms, RF site survey, Mobil Device Management (MDM), Application management, programming, and testing as required to provide a complete and comprehensive WLAN within the specified areas.
- C. The WLAN shall provide support for 4:1 ratio with adequate client support as well as total system throughput:
  - 1. 7Mbps per attached user minimum with the ability to control throughput on a per user level
  - 2. Provide minimum of -65dB signal level at all locations in building for 802.11ax coverage.
  - 3. Provide capacity coverage of 30-90 devices per radio
  - 4. Provide capacity coverage for 30 people per room
- D. Programming of each AP to coordinate with the Owner's LAN Network Operating System and mobile wireless client device configuration and requirements including establishing parameters and operations associated with security, QoS, CoS, VLANs, etc.
- E. Provide and install all labor, tools material and accessories for a complete Data Network WAN comprised of components as listed in Part 2.
- F. This contractor is responsible for supplying the proper configuration to OWNER with quantities and model numbers for a complete working system.
- G. Perform an RF Survey Utilizing a WiFi Survey software tool to verify coverage. Contractor shall provide a written survey report to the Owner technical staff prior to installation. Contractor shall provide an electronic copy of the Project file with the written report.
- H. Owner may opt to have third party site survey verification of the wireless coverage provided by Contractor.
- I. The Contractor shall demonstrate to the Owner and Engineer that the system is complete and complies with all operational requirements set forth in the plans and specs. The contractor shall

provide all miscellaneous items and accessories required to make the system operational whether or not such items are specifically mentions in the plans and specifications.

- J. The contractor shall review all plans and specifications for any detail that may impact the installation of the system. Any discrepancies discovered shall be brought to the attention of the engineer prior to installation.

### 1.3 SYSTEM DESCRIPTION

- A. The WLAN system shall be an 802.11ax standard and WiFi standard compliant and shall conform to the following minimum requirements:
  - 1. WPA2-AES compliant, WPA3 upgradable with 192-bit encryption
  - 2. Fully WiFi6 and WiFi5 Compliant, including full MU-MIMO, downlink and uplink OFDMA.
  - 3. BLE 5
  - 4. Advanced Cellular Coexistence
  - 5. VoWiFi compliant
  - 6. Comply with all appropriate FCC regulations. This shall be deemed to include the equipment as well as the installation.
  - 7. Provide ubiquitous coverage throughout the facility regardless of frequency band.
  - 8. Utilize POE+ IEEE 802.3at standards for access points.
- B. Provide a system of RF management with features such as Intrusion Detection, seamless Layer 3 roaming, load balancing, self-healing, etc. The WLAN system shall provide real-time awareness and location of all authorized access points and shall provide means and methods to isolate and remove rogue access points automatically.
- C. The WLAN system shall provide intelligent management with such features as support for VLANs and 802.11e QoS features to ensure highest priority to the most sensitive data (such as VoIP and video conferencing).
- D. Patch cables to connect the WLAN AP to the LAN electronics are provided under section 27 21 00. This contract shall be responsible for connection of cable to AP and coordination of exact AP locations with 27 15 13 contractor.
- E. The wireless network and all its components shall be installed so that access is provided to all components for general maintenance and repair.
- F. The wireless network equipment shall connect to various types of new or existing equipment.
  - 1. The contractor shall provide and configure all the equipment required for connecting the wireless network to the local area network.
  - 2. The Contractor shall ensure the wireless network is compatible with any routers, gateways, firewall etc. provided by others.
- G. The contractor shall be responsible for working with the owner, owner's representative or other contractors for the final layout and configuration of the wireless network. This shall include but not be limited to all aspects of Security, VLANS, traffic shaping, IP addressing, integration with servers, DHCP address assignments, traffic prioritization, routing and all other aspects of the configuration of the data electronics.

#### 1.4 QUALITY ASSURANCE

- A. The Contractor shall maintain a fully equipped factory certified service organization which under normal business operations will provide full maintenance and service of the installed system within 24 hours.
- B. The equipment supplier shall have been an authorized distributor of the equipment provided for a minimum of 1 year. The equipment supplier shall provide factory trained technicians for programming, installation support and training of Owner personnel.
- C. All components of the system shall be newly manufactured products. Remanufactured, refurbished or show floor equipment is not permissible.
- D. The system shall be installed with the latest revision of all hardware, firmware and software supported by the manufacturer; as of the date of the solution implementation.
- E. All equipment shall be UL listed.
- F. All equipment and Installation Practices shall comply with the latest ANSI/NFPA-70 National Electric Code.
- G. All equipment Installation Practices shall comply with the Local Electric Code.
- H. All equipment shall comply with the latest ANSI-J-STD-607 Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications Standard.
- I. All equipment and Installation Practices shall comply with the latest BICSI Telecommunications Distribution Methods Manual (TDMM).
- J. All equipment shall comply with the latest ANSI TIA/EIA-568, 569, 606, 607, 862, standards.
- K. All equipment shall provide protection and containment of unwanted wireless signals and prevent people access to unwanted networks and content, in accordance with CIPA requirements.
- L. FCC/Industry of Canada
- M. CE Marked
- N. R&TTE Directive 1995/5/EC
- O. Low Voltage Directive 72/23/EEC
- P. EN 300 328
- Q. EN 301 489
- R. EN 301 893

- S. UL/IEC/EN 60950
- T. EN 60601-1-1, EN60601-1-2
- U. CB Scheme Safety, cTUVus
- V. UL2043 plenum rating
- W. Wi-Fi Alliance certified 802.11a/b/g/n/ac

#### 1.5 CONTRACTOR QUALIFICATIONS

- A. The Network Electronics system shall be furnished, installed and programmed by a contractor who meets all the requirements listed herein. It shall not be acceptable for the contractor to utilize a sub-contractor for any portion of the work, unless the subcontractor has been approved in writing by the Engineer based upon adherence to the qualifications listed herein.
- B. The contractor shall maintain a fully equipped, factory certified service organization capable of providing full maintenance and service of the installed system within 24 hours. This facility shall be available for inspection by the Engineer.
- C. The Contractor shall employ factory trained service personnel for the service and maintenance of the system.
- D. The Contractor shall have had a minimum of 1 year experience with the specified Network Electronics. This experience shall include having completed a minimum of 2 installations in the past 12 months of similar size and scope. The contractor shall provide references and contract information for the project sites in which the qualifying installations occurred.

#### 1.6 SHOP DRAWINGS AND SUBMITTALS

- A. Completely detailed shop drawings shall be prepared prior to the procurement of equipment or commencement of work. Blue-line drawings shall be prepared and submitted on 30" x 42" paper. Equipment lists, data sheets, etc. Shall be 8-1/2" x 11" size properly bound into a single or multiple volumes.
- B. Submit to the following for approval:
  - 1. A complete equipment list, with manufacturers' names, model numbers, and quantities of each item.
  - 2. Manufacturer's data sheets on all equipment items.
  - 3. System block diagram(s)
  - 4. Equipment rack layouts showing all rack mounted equipment items.
  - 5. Certain other submittals as noted elsewhere in this specification, and as may be required for various equipment items prior to construction, fabrication, or finishing of that item.

- 1.7 Final Documentation: All final documentation shall be submitted and approved before final acceptance by the Owner will be granted. Within 45 days after completion of the work, deliver to the Owner, four (4) sets of the following:
- A. A complete as-installed equipment list, listed by room, with manufacturer's names, model numbers, serial numbers and quantities of each item.
  - B. A complete and correct system schematic, showing detailed connections for all parts of the system, including wire numbers, terminal block numbers, layouts and other designations and codings.
  - C. Complete equipment rack layouts showing all rack mounted equipment items.
  - D. Operations instructions for each major item of equipment furnished.
  - E. Manufacturer's warranty for each major item of equipment furnished.
  - F. Technical Systems Operations Manual, custom-written by the Contractor, for the purpose of instructing the Owner's operating personnel in the detailed step-by-step operation of the system and preventive maintenance procedures. This manual shall include descriptions of the system components and their relationship to system function. This manual shall be bound separately and labeled appropriately.
- 1.8 COORDINATION
- A. Coordinate the location of the data network electronics and racks with the Electrical Contractor for placement of electrical connections.
  - B. Coordinate the configuration of the data network electronics for compatibility with WAN connections, addressing and routing.
  - C. Coordinate UPS and Power Strip locations with other trades for placement of electrical connections.
  - D. Coordinate all UPS and Power Strip input connectors with electrical contractor.
  - E. Coordinate with the Network Integrators such that the UPS units are communicating with the network utilizing their SNMP cards or IP based web monitoring.
- 1.9 STORAGE OF MATERIALS
- A. All materials shall be secured when not in use by the Contractor.
  - B. It shall be the Contractor's responsibility to secure all equipment including all material to be installed as part of the contract. No changes shall be made to the contract due to loss or theft of equipment and materials not officially accepted by the Owner.

#### 1.10 SYSTEM WARRANTY

- A. The Wireless Area Network Electronics software shall be warranted by the contractor for a period of three (3) years from date of substantial completion.
- B. Provide advanced replacement for all Network Electronics for the three (3) year period.
- C. Provide proof of warranty from manufacturer.

#### 1.11 RELATED WORK BY OTHERS

- A. All conduit with pull strings, all electrical pull boxes, and all outlet boxes shall be furnished and installed under the electrical section of Division 26. Coordinate as necessary for proper installation. All conduit systems shall be insulated from the equipment racks using non-metallic bushings or raceways.
- B. All power conductors and conduits associated with power circuits to all equipment locations shall be furnished and installed under the electrical section of Divisions 26. The power to the equipment racks shall be terminated inside the racks to Contractor - supplied isolated ground plugstrips or quad convenience outlets. All conduit systems shall be insulated from the equipment racks using non-metallic bushings or raceways.
- C. An insulated #6 AWG stranded copper ground wire from each equipment rack to the building main service ground.

### PART 2 - PRODUCTS

#### 2.1 PRODUCT EQUIVALENCY

- A. Where products are listed with multiple manufacturers, these manufacturers will be approved as equals if all specified features are provided. Any equipment not specifically approved in writing prior to the bid date will not be considered regardless of qualifications. Failure to provide the “precise functional equivalent” shall result in the removal of the alternate equipment at the Contractor’s expense.
- B. Different manufacturers may require various options, accessories, converters, patch cables, etc. to perform the specified features and functions. Therefore, all material and/or equipment necessary for proper operation of the system shall be deemed part of these specifications.

#### 2.2 MANUFACTURERS

- A. Approved Vendors for Wireless Network Equipment:
  - 1. Aruba
  - 2. Ruckus

3. Extreme

## 2.3 WIRELESS NETWORK--GENERAL

- A. Provide all necessary licenses required for a fully operational system.
- B. Provide Centrally Powered, 802.11ax Wi-Fi AP with 2.5Gbps NBASE-T uplink Wireless Access Points and associated Wireless Network Controller(s) or cloud-based controller, to support wireless Network Devices and Phones throughout the building and the associated campus.
- C. Shall have the ability to manage the AP directly
- D. Dual radios shall support 2.4GHz: 575Mbps (11ax) and 5GHz: 4.8 Gbps (11ax)
- E. Coordinate 802.1X, VLAN and Security Settings/Requirements with the Owner.
- F. Provide ubiquitous wireless coverage for the entire building and associated perimeter area based on capacity (assumption of 2 devices per individual).
- G. Provide minimum of:
  1. 3:1 ratio of devices per person
  2. -65 dB signal level throughout building for ubiquitous 802.11ax coverage.
  3. 7 Mbps throughput per user with the ability to control throughput on a per user level
  4. 30-90 devices per AP/radio
- H. Supply sufficient Access Points to provide for expected throughput and load sharing.
- I. The users shall “see” at least 3 Access points to provide for load sharing and balancing.
- J. Wireless Survey
  1. Prior to installation of cabling for Access Points, the contractor shall perform an on-site Validation Survey. This survey shall be utilized to obtain actual site conditions including RF environment and RF properties of the construction. Prepare an AP placement plan utilizing the Validation Survey information and using the AP controllers “planning” tools. Provide a report to the Owner and Technology Consultant for review and approval.
  2. After complete install of all AP’s, perform a final survey to verify coverage. Move any AP’s required to guarantee that coverage and performance requirements are met. Provide final report to the Owner and Technology Consultant for review and approval.
- K. Coordinate with local Law Enforcement and Safety Forces regarding their requirements for remote and wireless access into building Security and Energy Management Systems.
- L. Law Enforcement and Safety Forces shall be responsible for providing their own remote access equipment.

## 2.4 WIRELESS SOFTWARE FOR CLOUD MANAGED

- A. Scalability and performance

1. 1024 access points
  2. 24,000 clients
  3. 4096 VLANs
- B. RF management
1. Proactively identifies and mitigates signal interference for better performance
  2. Provides both real-time and historical information about RF interference affecting network performance across controllers, through system wide integration
- C. Multimode with indoor, outdoor mesh access points
1. Controller with support for centralized, distributed, and mesh deployments to be used at different places in the network
  2. Centralized control, management, and client troubleshooting
  3. Seamless client access in the event of a WAN link failure (local data switching)
  4. Access point upgrade optimizes the WAN link utilization for downloading access point images
  5. Technology that supports corporate wireless service for mobile and remote workers with secure wired tunnels to indoor access points
- D. Security
1. Client data should be securely encrypted and tunneled from APs to Controller
  2. Management frame protection detects malicious users and alerts network administrators
  3. Rogue access point detection and detection of denial-of-service attacks
- E. Voice Support
1. Supports Unified Communications for improved collaboration through messaging, presence, and conferencing
  2. Supports all Unified IP Phones for cost-effective, real-time voice services
- F. Fault tolerance and high availability
1. Sub-second access point and client failover for uninterrupted application availability
  2. Multi 1 Gigabit or NBASE-T Ethernet connectivity
  3. Solid-state device-based storage – no moving parts
  4. Hot-swappable redundant AC or DC power supply and solid-state storage with no incremental system downtime
- G. Service provider Wi-Fi
1. Wi-Fi Alliance Passpoint (Hotspot 2.0) certified, facilitating hotspot operation for mobile data offloads
  2. Network-based mobility management
- H. Enterprise Wireless Mesh
1. Enterprise Wireless Mesh is ideal for locations where extending a wired connection may prove difficult or aesthetically unappealing: parking lots, playgrounds, stadiums, campus environments



- I. Mobility, security, and management for IPv6 and dual-stack clients
  - 1. Highly secure, reliable wireless connectivity and consistent end-user experience
  - 2. Increased network availability through proactive blocking of known threats
- J. Licensing
  - 1. Provide right-to-use (with End-User License Agreement [EULA] acceptance) license enablement for faster time to deployment, with flexibility to add additional access points as business needs grow.
  - 2. Additional access point capacity licenses can be added over time.
  - 3. Right-to-use licensing (with EULA acceptance) for faster and easier license enablement.
- K. Wireless
  - 1. IEEE 802.11a, 802.11b, 802.11g, 802.11d, WMM/802.11e, 802.11h, 802.11n, 802.11k, 802.11r, 802.11u, 802.11w, 802.11ax Wave1 and Wave2, 802.11ax
- L. Data request for comments (RFC)
  - 1. RFC 768 UDP
  - 2. RFC 791 IP
  - 3. RFC 2460 IPv6
  - 4. RFC 792 ICMP
  - 5. RFC 793 TCP
  - 6. RFC 826 ARP
  - 7. RFC 1122 Requirements for Internet Hosts
  - 8. RFC 1519 CIDR
  - 9. RFC 1542 BOOTP
  - 10. RFC 2131 DHCP
- M. Security standards
  - 1. Wi-Fi Protected Access 2 and 3 (WPA2, WPA3)
  - 2. IEEE 802.11i (WPA2, RSN)
  - 3. RFC 1321 MD5 Message-Digest Algorithm
  - 4. RFC 1851 ESP Triple DES Transform
  - 5. RFC 2104 HMAC: Keyed Hashing for Message Authentication
  - 6. RFC 2246 TLS Protocol Version 1.0
  - 7. RFC 2401 Security Architecture for the Internet Protocol
  - 8. RFC 2403 HMAC-MD5-96 within ESP and AH
  - 9. RFC 2404 HMAC-SHA-1-96 within ESP and AH
  - 10. RFC 2405 ESP DES-CBC Cipher Algorithm with Explicit IV
  - 11. RFC 2407 Interpretation for ISAKMP
  - 12. RFC 2408 ISAKMP
  - 13. RFC 2409 IKE
  - 14. RFC 2451 ESP CBC-Mode Cipher Algorithms
  - 15. RFC 3280 Internet X.509 PKI Certificate and CRL Profile
  - 16. RFC 4347 Datagram Transport Layer Security
  - 17. RFC 4346 TLS Protocol Version 1.1

N. Encryption

1. Wired Equivalent Privacy (WEP) and Temporal Key Integrity Protocol-Message Integrity Check (TKIP-MIC): RC4 40, 104 and 128 bits (both static and shared keys)
2. Advanced Encryption Standard (AES): Cipher Block Chaining (CBC), Counter with CBC-MAC (CCM), Counter with Cipher Block Chaining Message Authentication Code Protocol (CCMP)
3. Data Encryption Standard (DES): DES-CBC, 3DES
4. Secure Sockets Layer (SSL) and Transport Layer Security (TLS): RC4 128-bit and RSA 1024- and 2048-bit
5. DTLS: AES-CBC
6. IPsec: DES-CBC, 3DES, AES-CBC
7. 802.1AE MACsec encryption

O. Authentication, authorization, and accounting (AAA)

1. IEEE 802.1X
2. RFC 2548 Microsoft Vendor-Specific RADIUS Attributes
3. RFC 2716 PPP EAP-TLS
4. RFC 2865 RADIUS Authentication
5. RFC 2866 RADIUS Accounting
6. RFC 2867 RADIUS Tunnel Accounting
7. RFC 3576 Dynamic Authorization Extensions to RADIUS
8. RFC 3579 RADIUS Support for EAP
9. RFC 3580 IEEE 802.1X RADIUS Guidelines
10. RFC 3748 Extensible Authentication Protocol (EAP)
11. Web-based authentication
12. TACACS support for management users

P. Management

1. Simple Network Management Protocol (SNMP) v1, v2c, v3
2. RFC 854 Telnet
3. RFC 1155 Management Information for TCP/IP-Based Internets
4. RFC 1156 MIB
5. RFC 1157 SNMP
6. RFC 1213 SNMP MIB II
7. RFC 1350 TFTP
8. RFC 1643 Ethernet MIB
9. RFC 2030 SNTP
10. RFC 2616 HTTP
11. RFC 2665 Ethernet-Like Interface types MIB
12. RFC 2674 Definitions of Managed Objects for Bridges with Traffic Classes, Multicast Filtering, and Virtual Extensions
13. RFC 2819 RMON MIB
14. RFC 2863 Interfaces Group MIB
15. RFC 3164 Syslog
16. RFC 3414 User-Based Security Model (USM) for SNMPv3
17. RFC 3418 MIB for SNMP
18. RFC 3636 Definitions of Managed Objects for IEEE 802.3 MAUs

- Q. Management Interfaces
1. Web-based: HTTP/HTTPS
  2. Command-line interface: Telnet, Secure Shell (SSH) Protocol, serial port
  3. Cloud based or on premise Network Management Software support

- R. Interfaces and Indicators
1. 20Gb of uplink capacity minimum (2 x SFP+ or greater)
  2. 1 x console port: Serial port (RJ-45 or USB)
  3. LED indicators: Network Link, Diagnostics

- S. Regulatory compliance
1. CE Markings per directives 2004/108/EC and 2006/95/EC Safety:
    - a. UL 60950-1 Second Edition
    - b. CAN/CSA-C22.2 No. 60950-1 Second Edition
    - c. EN 60950-1 Second Edition
    - d. IEC 60950-1 Second Edition
    - e. AS/NZS 60950-1
    - f. GB4943 2001
  2. EMC - Emissions:
    - a. 47CFR Part 15 (CFR 47) Class A
    - b. AS/NZS CISPR22 Class A
    - c. EN55022 Class A
    - d. ICES003 Class A VCCI Class A
    - e. EN61000-3-2 EN61000-3-3 KN22 Class A
    - f. CNS13438 Class A
  3. EMC - Immunity:
    - a. EN55024
    - b. CISPR24
    - c. EN300386
    - d. KN24

- T. Warranty three (3) year license with maintenance

## 2.5 WIRELESS ACCESS POINTS

- A. Basis of Design: Aruba 515
- B. The Owner requires a new wireless data network that will attach to the wired data network in the communications room. The system shall consist of wireless access points (AP) and management software.
- C. Changes to the AP's shall be able to be made globally from one interface.
- D. The AP shall be able to be deployed across any Layer 2 or Layer 3 network and bridge traffic onto the local network, tunnel to a central location
- E. AP shall be able to be deployed as a stand-a-lone AP or as part of a centrally managed wireless LAN

- F. Each AP shall have at least two (2) Gigabit Ethernet ports for aggregated bandwidth
  - a. v
- G. The AP's shall provide for rapid traffic forwarding and capabilities that will enable effective real-time and air traffic-management through load balancing.
- H. Traffic management shall be used to ensure maximum network uptime. Clients shall be routed around a failed access point to the closest available alternative on a real-time basis without manual intervention.
- I. Each AP shall be able to support VoIP wireless phones and dynamically throttle back non-VoIP traffic.
- J. Each AP shall have dual channels (2.4GHZ and 5 GHz) and conform to IEEE 802.11ax.
- K. Integrated antennas

## 2.6 ANTENNAS

- A. Provide each access point with the integral antennas based upon system configuration and site survey results. Utilize wall mounted antennas for exterior applications.
- B. Exterior—Shall be rated for outdoor environment and shall be provided with lightning protection on the cabling. Provide drip loop on cabling entering the building. Both AP and antennas must be external and outdoor rated.

## 2.7 NEMA RATED ENCLOSURES

- A. Used for rugged areas, areas exposed to moisture and outdoor areas.
- B. Basis of Design: Oberon 1021 or equal.
- C. Design: Rugged polycarbonate AP enclosure designed for surface mounting AP indoors or outdoors, including wall mounting, or light pole mounting. Conceal and protect AP, antennas, and cabling
- D. Performance: Designed to NEMA 1, 2, 4, 4X, 12, and 13, and IEC529-IP66 specifications for indoor/outdoor wet, dirty, or corrosive environments. UV-stabilized for exposure to direct sunlight. Transparent to wireless signals. Paintable
- E. Oberon Skybar™-shaped screw on cover with gasket; cover screws must be torqued to 8 in-lbs.; cover screws are recessed into cover
- F. Includes internal universal T-bar bracket and universal mounting panel
- G. Large enough for external antenna, and AP
- H. AP max. operating temperature should be de-rated by 5° C inside the enclosure, when solar loading is not present (See Oberon application note in resources section below)

- I. For outdoor installation, the 1021 is white to reduce solar loading. Painting the 1021 a darker color will increase solar loading. Avoid mounting the 1021 where it is directly exposed to the sun. Temperature rating: -40 to 120° C
- J. Construction: White UL 94 V-0 Polycarbonate Enclosure, Gray UL 94-HB ABS Plastic Universal Mounting Panel, Gray UL 94-HB ABS Plastic Wall Mount Brackets, 18 Ga. White Powder Coated Steel T-bar Bracket

## 2.8 SYSTEM REQUIREMENTS

- A. Self-Healing—The system shall detect and automatically re-route traffic due to loss of communications with an access point.
- B. Load Balancing—The system shall monitor AP usage in real-time and shift traffic between adjacent or over-lapping Aps to ensure the most efficient use of wireless bandwidth. The system shall also be able to dynamically allocate signal power between Aps to compensate for changing network traffic and system configuration.
- C. The contractor shall be required to fully review the existing infrastructure and conditions.
- D. The Contractor shall verify that space is available in existing racks/cabinets for all new wireless equipment.
- E. All wireless controller equipment shall mount in standard 19" relay racks or cabinets.
- F. All patch cables required for the entire connectivity of the wireless network shall be provided and installed by the contractor.
- G. The overall intent of the wireless network is to provide complete coverage of the specified area(s) as shown on the detailed drawings.
- H. All electronics provided for the system shall be from the same manufacturer and shall be fully supported by the management system provided by the contractor.
- I. In each communications room the equipment shall be directly connected to a ground bar that is connected to the electrical ground in the building.

## 2.9 SPARE AP

- A. The contractor shall include with the bid, no less than two (2) additional APs that will be applied as needed during the site survey to correct for RF coverage issues. The contractor shall include 250' of data cable along with termination and testing with each AP for a fully installed and operational AP. In the event that the additional Aps are not required, they shall be turned over to the Owner as "attic stock".

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. The Contractor shall make construction manager aware of any the site issues prior to submission of the Bid Response.

### 3.2 GENERAL INSTALLATION

- A. Install systems in accordance with UL, NEC and all other applicable codes. Install system to comply with drawings and final shop drawings in compliance with manufacturer instructions. Provide all required hardware and labor for rack mounting of system components.
- B. Prior to installation of cabling for access points, the contractor shall perform an on-site validation survey. This survey shall be utilized to obtain actual site conditions including RF environment and RF properties of the construction. The validation survey shall be used by the contractor to fine tune the AP design/lay-out, and set the final quantities and locations of access points. The site validation survey shall be conducted to meet the following minimum requirements:
  - 1. Utilize the appropriate RF sensing equipment to locate, identify and document any sources of RF activity within the area that could degrade or interfere with the WLAN.
  - 2. Evaluate construction and possible obstacles to RF operation to determine final location of all Aps and proper selection of antenna types.
  - 3. Evaluate potential for RF signal leakage outside the building and adjust AP locations, power settings and antennas typed to minimize leakage. The exception is specific areas of the site specifically requested to have WLAN coverage.
  - 4. It is the Contractor's responsibility to program the devices in this section according to the Owner's Network requirements. The Contractor shall meet with the Owner and/or Engineer and reach agreement on the programming.
  - 5. Provide any miscellaneous equipment such as identification tags, cable tie, wiring harnesses, patch cables (both copper and fiber), stacking cables, etc. necessary for a complete TURNKEY system.
  - 6. Provide all required jumper and patch cables and coordination with the Owner to connection the wired LAN.
  - 7. Install and setup all UPS equipment. Review power down procedures with the Owner.
  - 8. Review and modify document design to achieve minimum -65dBm coverage throughout the building and to support true 1-to-1 client support. Provide detailed report to engineer indicating any proposed changes to the quantity/locations of APs shown on the bid documents.
  - 9. After the system is installed, the contractor shall perform a Network Validation Survey. This survey shall test the actual RF environment with the access points operating and the WLAN system functioning including all APPS designed to operate via the WLAN. The network validation will test, document and provide certification that the various operating parameters of the WLAN are being met to a degree required by the various APPS running over the WLAN. The network validation survey shall be conducted to meet the following minimum requirements.

10. Finalize channel and power settings of each AP based upon location, proximity to adjacent APs, desired data throughput, desired exterior WLAN coverage and possible sources of RF interference.
11. Review antenna selection and make adjustments to individual APs as required.
12. Verify that the system can meet or exceed the minimum recommendation of 20- 25dB SIR for VoWiFi applications.
13. It is the Contractor's responsibility to program the devices in this section according to the Owner's Network requirements. The Contractor shall meet with the Owner and/or Engineer and reach agreement on the programming.

### 3.3 WIRELESS ELECTRONICS PLACEMENT

- A. The Contractor shall be responsible for the placement of the wireless electronics and all of its components in the assigned Communications Rooms.
- B. As per the Drawings, wireless AP cabling drops have been shown based on standard cabling design for AP's.
- C. The actual AP placement on the drawings is for reference only and a means of showing quantities to provide.
- D. Once the RF survey has been completed the contractor shall mount the AP's based on the actual field data gathered from the surveys. This may require the contractor to run patch cords from the existing AP cable drop locations to final mounting locations.
- E. All equipment shall be secured in communication racks using the maximum number of screws as there are holes provided by vendor equipment.

### 3.4 INTALLATION AND CONFIGURATION

- A. Contractor shall provide and install a wireless system and all associated cabling, POE devices, central controllers/switches and console.
- B. It is the Contractor's responsibility to program the system in this section according to the Owner's wishes. The Contractor shall meet with the Owner and/or Engineer and reach agreement on the programming. The programming agreement shall then be written out in detail and forwarded to the Engineer for approval. After approval is granted, proceed with final programming.
- C. WLAN Electronics shall provide seamless communications between Windows and Apple machines running TCP/IP protocol. Access points shall be able to accept, route and process Ethernet traffic from either platform provided they are using WiFi compliant client adapters.
- D. Develop a minimum of three levels of wireless access.
  1. Guest
  2. Staff
  3. People
  4. Coordinate access privileges, VILAN, Sub-Net Assignments, Resource Allocation, etc. for each group.

5. Contractor shall configure the wireless network to support Seamless Roaming and Fast roaming among all access points
- E. Enforce User Load Balancing to continually monitor user load and automatically redirect new users to alternative APs.
- F. Configure Dynamic RF Management to calculate optimal 802.11 channel assignments and radio power transmission levels for all associated APs and adapts to user load, interference, RF obstacles and jamming attacks.
- G. User RF Optimization shall assimilate client RF data and usage patterns along with basic RF data from access points for improved RF tuning and user performance.
- H. The switch shall be configured to be VPN and Firewall Compatible. It shall be configured to provide local control of access points and not require any reconfiguration of WAN routers, VPN gateways or firewalls.
- I. Configure the network to take advantage of the latest Security Standards. It shall include WPA, WPA2, WPA3, 802.11i/802.11w with WEP, Dynamic WEP, TKIP, CCMP, EAP-TLS, TTLS and PEAP, PEAP-TLS.
- J. Rogue Access Point Protection shall be configured to identify, classify and locate rogue APs.
- K. Configure the system to allow patrons simple and immediate access to the internet if so directed by the owner.
- L. The system shall allow administrators to get to local and wide area applications.
- M. Contractor shall be onsite and shall complete a wireless site survey to coordinate placement of the data cables for the wireless access points. Complete a site survey to ensure that the AP's are placed so that they will cover the entire building for both wireless voice and data and video connectivity.
- N. Provide the results of the site survey to the owner and engineer prior to installation of the Access Points.
- O. Balance wireless access points to ensure complete coverage with minimal services degradation.
- P. Setup Wireless Security and provide for CIPA compliance.
- Q. The contractor shall be responsible for establishing the graphical floor plans of each building, along with the information required for complete RF management on a building-by-building basis. The floor plans shall be updated with final AP Layouts.
- R. Then contractor shall be responsible for developing and programming RF characteristics of major building components (walls, floors, windows, doors) of each floor plan to ensure more accurate RF design tool predictions.
- S. The Contractor shall take information from the Owner with regards to wireless assets (laptops, PDA, wireless phone, etc.) and popular asset database to accomplish asset tracking.



- T. Provide complete policy creation and enforcement as required by Owner IT staff. Coordinate with network administrators to create virtual LAN (VLAN), RF, quality of service (QoS), and security policies. Provide multiple unique service set identifiers (SSIDs) with individual security parameters in each building. For example, a “guest” SSID can be secured with Web authentication; a “voice” SSID might be required to take advantage of the WEP, and normal data traffic can be secured using 802.11i or IPsec.)
- U. Provide additional programming related to the radius server in each building to establish additional policy, authentication, and user based privileges.

### 3.5 IDENTIFICATION/LABELING

- A. Contractor shall identify all major items of equipment and tag all cables with permanent markers to demote equipment served. Cables shall be tagged at both ends and at each point where the cable is administered.
- B. All labeling and recording shall be approved by the Owner and the Engineer prior to application.
- C. Provide a printed, computer generated record of each connected port in each switch. Label shall indicate AP served, port and switch label and closet label.
- D. Supply a label for each AP that is installed above the ceiling with the Owner designated coding.

### 3.6 GROUNDING

- A. The installing contractor shall be responsible for ensuring the grounding integrity of all installed equipment to eliminate the potential for equipment or personnel hazards due to improperly or inadequately grounded systems.
- B. All grounding and bonding shall be in conformance with the NEC article 250 and as recommended by EIA/TIA—607.
- C. The Division 26 Contractor has provided 120V branch circuitry for use by the contractor. The branch circuitry is run with a dedicated equipment grounding conductor which shall be utilized by the system equipment. In no case shall the installation compromise the integrity of the Building Electrical Grounding System.

### 3.7 TESTING

- A. The Contractor shall be responsible for energizing and testing Aps. The contractor shall be responsible for ensuring that the WLAN is in proper working condition.
- B. The Contractor shall perform a minimum series of on-site RF survey with network verification and include the results in the O&M manuals
  - 1. Visual Inspection—Note condition of interior spaces along with potential barriers/obstacles to RF transmission that may not be shown on the architectural floor plans.

2. RF Spectrum Test—The Contractor shall walk the site and record the general RF environment that currently exists throughout the building. Special attention shall be paid to RF signals in the 802.11 band.
  3. Ping Test—The Contractor shall walk the site recording a continuous network ping test to validate that there are no significant quantities or response time out events. Areas which result in a high number of time-out request (more than 5%) consistently long ping times (more than 5 ms) shall be flagged for further evaluation in the RF survey and AP configuration.
  4. Packet Analyzer—The final AP configuration showing channel utilization, SSIDs, device MAC addresses and associated compiled signal strength measurements of a site walk.
  5. Active Test—Perform active network tests in a minimum of 5 rooms throughout the building. The Media Center, and the Cafeteria utilizing a variety of typical network applications such as email, Web browsing, file downloads, and streaming video. Test shall be witnessed by the Owner/Engineer.
- C. After the system is installed, the contractor shall perform a Network Validation Survey while building is fully occupied. This survey shall test the actual RF environment with the Aps operation and the WLAN system functioning including all applications designed to operate via the WLAN. The network validation with test, document and provide certification that the various operating parameters of the WLAN are being met to a degree required by the various applications running over the WLAN. The network validation survey shall be conducted to meet the following minimum requirements:
1. Finalize channel and power settings of each AP based upon location, proximity to adjacent Aps, desired data throughput, desired exterior WLAN coverage and possible sources of RF interference.
  2. Review antenna selection and make adjustments to individual Aps as required.
  3. Verify that the system can meet or exceed the minimum recommendation of 20-25dB SIR for VoWiFi applications.
- D. The Contractor shall be responsible for testing and verifying that all software and management level functions of the system as required by the Owner's Network system are programmed and operating properly. This includes but is not limited to:
1. Set-up and segregation of user groups. VLANs, security and authentication as required by Owner.
  2. Set-up of multi-level security including authentication and encryption.
  3. Set-up and administration of prioritization, quality of service, VoIP, etc.
- 3.8 TRAINING
- A. Provide a minimum of eight (8) hours of training to the Owner's personnel and/or designated representative. Plan for multiple training trips to the site. Training session(s) shall cover the following topics at a minimum:
1. System Equipment Connectivity
  2. Device Configurations
  3. Operation, maintenance, and upgrade procedures.
- B. Trainer must be certified by the manufacturer.

- C. Training shall be coordinated with the Owner. Coordinate time, use and availability of equipment with the Owner.
- D. Demonstrate adjustment, operation and maintenance of the system including each component and control.
- E. Provide a copy of a sign off sheet (signed by Owner staff) for the completed training with the close-out documents.
- F. Provide two (2) video copies of the training sessions.

### 3.9 AS-BUILT DOCUMENTATION

- A. The contractor shall furnish the Owner complete as-built manuals in an indexed PDF format. They shall contain:
  - 1. System Operating Instructions
  - 2. System Functional Block Diagrams
  - 3. System Schematic Diagrams
  - 4. System Wiring Diagrams
  - 5. As-Built Drawings of Entire System including Equipment Rack elevations
  - 6. Component Service Manual
  - 7. Software Operating Manuals
  - 8. Final Endurance Test Report
- B. Maintenance Manual: The maintenance manual shall describe maintenance for all equipment including inspection, periodic preventive maintenance, fault diagnosis, and repair or replacement of defective components.

### 3.10 WARRANTY

- A. If any defects are found within the three (3) year full warranty period, the defective system component shall be replaced at no extra cost to the Owner for parts or labor. Provide a statement of this warranty with the O&M Manuals.
- B. During the warranted operation, the Contractor shall perform two inspections at 6-month intervals or less. This work shall be performed during regular working hours, Monday through Friday, excluding legal holidays. Resolve any previous outstanding problems.
- C. Make available a service contract offering continuing factory authorized service of this system after the initial warranty period.
- D. The contractor shall be responsible to provide service during normal working hours on a normal business day within (4) hours after notification by the Owner for normal service or within (2) hours for emergency service. Emergency service is defined as the loss of 25% or more of system components operation, or the loss of the main switch or other head end equipment which renders the entire system beyond 50% inactive or un-usable. Provide an on-site authorized factory technician within 24 hours if required.

- E. If equipment cannot be repaired within 24 hours of service visit, the Contractor shall provide “loaner” equipment to the Owner at no charge.
- F. APs shall have a “Limited Lifetime” warranty minimum.

### 3.11 CERTIFICATION

- A. Upon completion of the testing, the manufacturer or representative shall issue to the Owner a letter of certification attesting to the fact that he has tested and adjusted the system, that all components are properly installed and free of defects, and that the system is in compliance with this specification.

END OF SECTION 272133

## SECTION 28 13 53—IP NETWORK COMPATIBLE INTERCOM (IX SYSTEM)

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. IP Video Intercom. (Aiphone IS Series)

#### 1.2 RELATED SECTIONS

- A. Section 27 15 13 – Copper Horizontal Cabling
- B. Section 28 13 00 – Access Control

#### 1.3 REFERENCES

- A. American National Standards Institute (ANSI/TIA/EIA) 568 - Commercial Building Telecommunications Cabling Standard.
- B. International Organization for Standards (ISO) 9001:2000 - Quality Management Systems - Requirements.

#### 1.4 SYSTEM DESCRIPTION

- A. IP Network Compatible Video Intercom System: A network-based communication and security system featuring video entry security, internal communication, emergency stations, and paging. All units and app in the systems shall be able to unlock doors remotely on a network, assist onsite visitors from an offsite location, broadcast emergency announcements, and communicate using a PoE network.
  1. Power Source: Power over Ethernet (802.3af).
  2. Network Interface: 10 BASE-T / 100 BASE-TX Ethernet (RJ-45).
  3. Network Protocols: IPv4, IPv6, TCP, UDP, SIP, HTTP, HTTPS, MJPEG, RTSP, RTP, RTCP, IGMP, MLD, SMTP, DHCP, NTP, DNS.
  4. Bandwidth Usage:
    - a. G.711: 64Kbps x 2 per video call.
    - b. 64Kbps per monitor.
    - c. H.264: 24Kbps ~ 2,048Kbps.
  5. Communication: Hands-free (VOX), push-to-talk (simplex), or handset (full-duplex).
  6. Video Display: 7 inch color LCD.
  7. Camera: Type:
    - a. 1/3 inch color CMOS. 1.23 Megapixels.
    - b. View Area at 0 degree camera angle mounted at 4 feet 11 inches (1500 mm) AFF: 2 feet 3 inches (700 mm) vertical x 3 feet 9 inch (1150 mm) horizontal at 19 inches (500 mm).
  8. Video Stream: ONVIF Profile S.
  9. Door Release: Programmable Form C dry contact, 24V AC/ DC, 500mA (use RY-24L for larger contact rating, which requires 24V DC power supply) or use RY-IP44 with 4 multipurpose relays.
  10. Wire Type: CAT-5e or CAT-6.
  11. Distance:

- a. Any station to Network Node: 330 feet (100 meters).

## 1.5 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- 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 the following:
  1. Wiring Diagrams: Indicate wiring for each item of equipment and interconnections between items of equipment.
  2. Include manufacturer's names, model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.
- D. Installation and Operation Manuals:
  1. Submit manufacturer's installation and operation manual, including operation instructions and component wiring diagrams.
  2. Provide detailed information required for Owner to properly operate equipment.
- E. Warranty: Submit manufacturer's standard warranty.
- F. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- G. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

## 1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: ISO 9001:2015 certified company.
- B. Installer Qualifications: Factory trained and experienced with system installations of scope and size required for the Project.
- C. 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.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Storage: Store materials in clean, dry area indoors in accordance with manufacturer's instructions.
- C. Handling: Protect materials during handling and installation to prevent damage.

## 1.8 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 absolute limits.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Aiphone IP Video Intercom System: IX Series Intercom System as manufactured by Aiphone Corporation.
- B. Equals by Commend or N2

### 2.2 SYSTEM DESIGN

- A. Master Station(s): Provide master stations as indicated on drawings.
- B. Audio Video Door Stations:
  - 1. Model IX-DV (Video Door Station - Surface Mount - Hands Free): Provide per drawings.
- C. Provide Selective Door/Gate Release.
- D. Provide Audio/video streaming via ONVIF Profile S.
- E. Provide ONVIF Profile S camera input (max 500).
- F. Provide Overhead paging.
- G. Provide Contact input at door station.

### 2.3 FUNCTIONAL COMPONENTS:

- A. Functional Components: As indicated on the drawings or as required to complete system.
  - 1. Video Master Station Series IX-MV7:
    - a. Model IX-MV7-B (Master Station - Black, Hands Free).
    - b. An IP addressable video master station with a 7 inch color LCD monitor. It can be wall or desk mounted (desk stand included). The IX-MV7 offers handset (duplex) and hands-free (VOX/PTT) communication and call up to 500 other IX stations. It connects directly to a network using CAT-5e/6 cable. This station requires a 802.3af compliant Power-over-Ethernet network.
  - 2. RY-IP44 IP Programmable Relay Adaptor:
    - a. 4 contact inputs and 4 relay outputs (compatible with the IX Series, IS-IP Series, and IPW-1A only).
  - 3. 2-Wire Network Adapter Model IX-1AS:
    - a. One 2-wire input with 2 built-in contact outputs; door release and camera call-up. Powered via PoE, Compatible with Aiphone's LE and NE series audio door or substations for connection to Video Master Station Model IX-MV7 over a network.
  - 4. 30 Degree Angle Box Model KAW-D 30:
    - a. Designed for use with one gang mountable video door stations.

5. Electric Door Strike Model EL-12S:
  - a. The door strike is designed for wood framed wooden doors. The unit operates on 12~16 V AC.
6. Stainless Steel Enclosure Model SBX-ISDVF:
  - a. 18-Gauge Stainless Steel Surface Mount Box for IS-SS/IS-DVF/IS-IPDVF/IX-DF(SS)/IX-DF-HID/RP10 designed for surface mounting door stations.
  - b. Size: 10-7/16 inches x 5-15/16 inches x 3-5/16 inches (top); 2-5/16 inches (bottom) (265 mm x 151 mm x 84 mm (top); 59 mm (bottom).
  - c. Weather resistant.
  - d. Vandal-resistant.
  - e. Inside space for cabling.
  - f. Mounts to flat wall surface.
  - g. Opening at bottom for drainage.
7. Stainless Steel Enclosure Model SBX-IDVFRA:
  - a. 18-Gauge Stainless Steel Surface Mount Box for IS-DVF-(2)RA, IX-DF-2RA, IX-SS-(2)RA.
  - b. Size: 11-11/16 inches x 7 inches x 3-5/16 inches (top); 2-5/16 inches (bottom) (297 mm x 178 mm x 84 mm (top); 59 mm (bottom).
  - c. Weather resistant.
  - d. Vandal-resistant.
  - e. Inside space for cabling.
  - f. Mounts to flat wall surface.
  - g. Opening at bottom for drainage.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Examine areas to receive integrated security and communication system.
- B. Notify Architect of conditions that would adversely affect installation or subsequent use.
- C. Do not begin installation until unacceptable conditions are corrected.

### 3.2 PREPARATION

- A. Verify the following compliance before starting installation.
  1. The unit turns inoperative during power failure.
  2. Keep the intercom wires at least 1 foot (30 cm) away from strong electrical wiring (AC 100-240 V) including, in particular, wiring for inverter electrical appliances. Noise and malfunction could result.
  3. If a strong light shines on the main unit screen, the picture may turn white or only silhouettes will be visible.
  4. Other manufacturer's devices (such as sensor, detectors, door releases) used with this system, comply with the manufacturer's installation requirements.
  5. The LCD panel is manufactured with very high precision techniques, inevitably will have a very small portion of its picture elements always lit or not lit at all. This is not considered a unit malfunction. Please be aware of this in advance.

### 3.3 INSTALLATION

- A. Install integrated security and communication system in accordance with manufacturer's



instructions at locations indicated on the Drawings.

- B. Mount equipment plumb, level, square, and secure. For video entrance stations and video door stations, comply with manufacturer's design requirements to provide optimum picture quality of station monitoring.

### 3.4 SET-UP AND ADJUSTING

- A. Adjust integrated security and communication system for proper operation in accordance with manufacturer's instructions.

### 3.5 DEMONSTRATION AND TRAINING

- A. Demonstration:
  - 1. Demonstrate that integrated security and communication system functions properly.
  - 2. Perform demonstration at final system inspection by qualified representative of manufacturer.
- B. Instruction and Training:
  - 1. Provide instruction and training of Owner's personnel as required for operation of integrated security and communication system.
  - 2. Provide hands-on demonstration of operation of system components and complete system, including user-level program changes and functions.
  - 3. Provide instruction and training by qualified representative of manufacturer.

### 3.6 PROTECTION

- A. Protect installed integrated security and communication system from damage during construction.

END OF SECTION