

SECTION 16710

DOOR MONITOR SYSTEM

1 **PART 1 - GENERAL**

1.1 **Reference:**

- A. All work under this Section shall be subject to Section 16010, "General Electrical Requirements" and any applicable conditions hereinbefore written for the entire work.

1.2 **Scope:**

- A. Provide all material, labor and incidentals necessary for the complete installation of a complete Door Monitoring System as described herein and shown on the drawings.

1.3 **System Description:**

- A. Performance Requirements: Provide door monitor equipment, which has been manufactured and installed to maintain performance criteria stated by manufacturer without defects, damage or failure.

1.4 **Submittals:**

- A. General: Submit the following according to Division 1 Specification Sections and Section 16010, "Basic Electrical Requirements:"
 - 1) Product data for each system component. Include list of materials and UL and/or FM listing data.
 - 2) Special Systems drawings as required by Section 16010.
 - 3) System operation description custom written for this specific project. Manufacturer's standard descriptions for generic systems are not acceptable.
 - 4) Operating instructions for inclusion in the Operation and Maintenance Manuals.
- B. Quality Assurance Submittals: Submit the following:
 - 1) Test Reports: Certified test reports showing compliance with specified performance characteristics.
 - 2) Manufacturer's Instructions: Manufacturer's installation instructions.
 - 3) Manufacturer's Field Reports: Manufacturer's field reports specified herein.
- C. Closeout Submittals: Submit the following:
 - 1) Operation and Maintenance Data: Operation and maintenance data for installed products in accordance with Division 1 Closeout Submittals (Maintenance Data and Operation Data) Section, and Section 16010, Operation and Maintenance

Manuals section.

- (a) Include methods for maintaining installed products and precautions against cleaning materials and methods detrimental to finishes and performance.
- (b) Include troubleshooting guide, wiring terminal identification and equipment parts list.

2) Warranty: Warranty documents specified herein.

1.5 Warranty:

- A. Warrant all materials, installation and workmanship for the period specified under Division 1 for the entire project and Section 16010, noting specifically requirements for phasing of the work, and its implications on warranties.

1.6 Basic System Operations:

- A. Each door (zone) switch shall contain a red and a green LED. Each time the zone switch is pressed, the zone status shall toggle between armed and disarmed.
- B. The green LED shall indicate disarmed status. The associated door may be opened without causing an alarm. A short and/or open in the door contact wiring shall cause the panel to go into the alarm condition.
- C. A steady red LED shall indicate armed status. If an armed door is opened, the alarm condition shall occur. The red LED shall flash and an intermittent audio tone shall sound. Pressing the cancel tone switch on the master panel shall silence the audio tone but shall not clear the alarm. If another door should go into the alarm condition, the tone shall again sound until the cancel tone switch is pressed or until all alarms are canceled.
- D. Pressing and releasing the door (zone) switch shall cancel an alarm. This shall return the zone to the disarmed status and automatically cancel the alarm.

1.7 Coordination with Other Trades:

- A. Coordinate the installation of Door Monitor System equipment, and the interface of the Door Monitor System with work specified under the following Specification Sections:
 - 1) Division 16 Section, Access Control
 - 2) Division 16 Section, WanderGuard
 - 3) Division 16 Section, Fire Alarm

1.8 Source Quality:

- A. Obtain door monitor equipment and system from a single manufacturer, and a single local vendor.

2 PART 2 - PRODUCTS

2.1 Door Monitor Equipment

- A. Door Monitor System shall be as manufactured by Cornell Communications, Inc., which shall form the Basis of Design:

Cornell Communications, Inc.
7915 N. 81st St.
Milwaukee, WI 53223-3830
Telephone: (800) 558-8957
(414) 351-4660
Fax: (414) 351-4657
Internet: www.cornell.com

- B. Subject to full compliance with all contract requirements, proposed equals shall be considered from other manufacturers.

2.2 Door Monitor System And Components

A. Power Supply:

- 1) The Cornell A-1000 Series Door Monitor System shall be designed to operate on regulated 12VDC power.
- 2) Provide Cornell power supplies: P-512243A or B-5243A, as appropriate for the system to be installed at this facility.
- 3) Wiring from power supply to the master panel shall be minimum 18 gauge 2 conductor. Provide larger conductors as required to suit length of run, or as recommended by the system manufacturer.

B. System Features:

- 1) Adjustable alarm volume: Volume of intermittent tone shall be adjustable with a screwdriver from the front of the master panel.
- 2) Door contacts - The system shall be capable of using either normally open (N.O.) or normally closed (N.C.) contacts. Provide two (2) #22 AWG wires between door switch and zone card.
- 3) Auxiliary output per zone - Each A1211/A-1511 zone card shall provide a switched negative (open collector) transistor output at terminal 9, which shall turn on whenever that zone is in the alarm condition. Contact Rating shall be 500mA, 40VDC.
- 4) Auxiliary output, system - The "RM" terminal on the tone board shall be a switched negative (open collector) transistor output, which shall turn on whenever any zone is in the alarm condition. Shall automatically turn off when all alarms are canceled. Rating: 500mA, 40VDC
- 5) Door status output - Each A-1211/A1511 zone card shall have a door status

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output at terminal 11 switched negative, (open collector) transistor that shall turn on whenever the door is open, regardless of armed/disarmed status. Rating: 500mA, 40VDC.

- 6) Zone switch disable - Cutting the factory installed Zone Switch Enable jumper between terminals 1 and 3 of an A-1211/A-1511 zone card shall disable the zone switch from making changes in the armed/disarmed status of the door. Status changes shall then only be possible using a remote zone control product.
- 7) Zone switch disable during Alarm Automation - Cutting jumper J1 on an A-1211/A-1511 shall disable the zone switch from making changes in the armed/disarmed status of the door only when the zone is in the alarm condition. The zone switch shall still function while the zone is either disarmed or armed. Once in the alarm condition, clearing the alarm shall only be possible from a remote zone control product.
 - (a) Note: if the zone switch enable jumper is cut, the zone switch shall be disabled under all conditions.

C. Remote Zone Monitor/Control Products

- 1) A-1600 - The Remote Control Panel duplicates the functions of the Master Panel except it has a high/low switch instead of a "Cancel Tone" switch for control of the alarm tone. When the Master Panel tone is silenced the tone for the Remote Control Panel is also silenced. Individual zones (A-1601) have one green LED, one red LED, and a momentary three position, center neutral toggle switch. Activating the toggle switch to the left or right shall disarm or arm the zone, respectively. More than one A-1600 panel may be used.
 - (a) Wiring - Two 18 gauge conductors, one 22 gauge conductor plus four 22 gauge conductors per zone, all to master panel.
- 2) A-1700 - The Remote Monitor Panel provides a visual and audible indication of any or all zones. Each zone (A1701) contains one green LED and one red LED. The panel contains a tone hi/low switch to control the audible alarm tone volume. When the Master Panel tone is silenced, the tone at the A-1700 panel is also silenced. More than one A-1700 panel may be used.
 - (a) Wiring - Two 22 gauge conductors, one 22 conductor plus two 22 gauge conductors per zone, all to master panel.
- 3) A-1800 - Remote Control Station - for a single zone comprised of one green LED, one red LED, a key switch, and a toggle switch on a single gang stainless steel plate. The key switch shall enable/disable the use of the toggle switch. When enabled, the toggle switch shall change the status of that zone.
 - (a) Wiring - Requires 5 conductor 22 gauge cable to Master panel.
- 4) A-1801 - A key operated switch with built in timer designed to permit authorized personnel to pass through the door when the zone is armed. The A-1801 has a key witch and red LED mounted on a single gang stainless steel plate. The red

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LED shall glow when the zone is armed. The red LED shall flash when the zone is in the alarm condition. Operating the key switch shall disarm the zone and start the timer allowing the user to pass through the door. After the user adjustable time period (1 second to one minute, approximately) that zone shall automatically re-arm itself.

- (a) Wiring - Requires 5 conductor 22 gauge cable from switch to Master Panel.
 - (b) A-1802 - A key Switch and a red LED on a single gang stainless steel plate. It is designed to be used in conjunction with the
 - (c) A-1801. A typical application would consist of an A-1802 installed on the outside of a secured door allowing entry into the building when the zone is armed. Operating the key switch starts the timer in the A-1801 disarming the door. After the delay period of the
 - (d) A-1801 timer, the zone shall automatically re-arm itself. The red LED shall glow when the zone is armed and shall flash when the zone is in the alarm condition.
 - (e) Wiring - Requires four 22 gauge conductors to A-1801.
- 5) A-1806 - A keypad station with arm/disarm exit-delay feature.
- (a) The exit delay feature shall disarm the zone for a user programmable period of 10-60 seconds allowing passage through an armed door. At the end of the delay period, the zone shall automatically re-arm itself. The A-1806 contains a 12-key pad, a red LED, a green LED, and a yellow LED on a two-gang stainless steel plate. The green LED glows when the zone is disarmed. The red LED glows when the zone is armed and flashes when the zone is in the alarm condition. The yellow LED glows during the exit-delay period.
 - (b) Wiring - Requires six 22 gauge conductors to Master Panel.
- 6) A-1808 - A keypad station with the exit delay feature. The Zone cannot be armed or disarmed using the A-1808.
- (a) Wiring - Requires six 22 gauge conductors to Master Panel.
- 7) A-1900 and A-1901 - Disable switch - Master Panel. Option to disable individual zone switches at the Master Panel. Switch may be mounted on the Master Panel (A-1901) or at a remote location on single gang stainless steel plate (A-1900).
- (a) Wiring - Use 2 conductor cable from switch location to pins 1 and 3 on terminal (edge connector) as shown. Jumper from ping 1 to 3 must be removed. The disable feature can be wired to selected zones.

3 PART 3 - INSTALLATION

3.1 Installation:

- A. General: Install system according to NFPA 70, applicable codes, and manufacturer's printed instructions.
- B. System Wiring:
 - 1. All Door Monitoring system wiring shall be as recommended by the equipment manufacturer, and as shown on the Special Systems drawings provided with the system submittals.
 - 2. All wiring associated with the Door Monitoring System shall be color coded yellow. Color coding shall preferably be provided through the use of cabling with a yellow outer jacket. Where such wiring is not available, color coding may be provided by wrapping each cable with yellow electrical tape, suitable for use in air handling plenums, at intervals not to exceed 5'-0" on center, and for the last 6" of each cable run at each end.
 - 3. All wiring shall be run concealed from view. Cables may be run exposed above lay-in tile ceilings. Wiring shall be UL listed as suitable for use in air handling plenums.
 - 4. Wiring shall be fastened with approved nylon wire ties to the building structure. Cables shall not lay on or be attached to any temperature control tubing, mechanical piping or ductwork, electrical conduits or on the ceiling.
 - 5. Cables that penetrate or run within masonry walls and all runs where exposed in unfinished rooms or spaces shall be run in minimum 3/4" conduit or other raceway system as specified in Section 16050 - Basic Electrical Materials and Methods.
 - 6. All wiring to be minimum 22 gauge unless otherwise specified or directed by the manufacturer.
 - 7. All 120 volt wiring shall be run in conduit.
- C. The Door Monitor System Master Panel, door switches, interface modules and other equipment shall be installed generally where indicated on the drawings and as required by the equipment manufacturer.
- D. Provide multiple Door Monitor System Master Panels as required to provide monitoring of all exterior doors in the facility.
- E. Locate equipment so that it does not interfere with the designated functional uses of the area and where it is not easily subject to abuse or vandalism by the building occupants.
- F. Install door contacts flush in door frames approximately 4 inches from strike side. Provide conduit from contact location up into ceiling space. Provide one door contact for each door leaf. Do not install door contacts or equipment on any fire rated labeled doors.

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- G. Wiring Within Enclosures: Bundle, lace, and train the conductors to terminal points with no excess. Provide and use lacing bars and distribution spools.
- H. Number of Conductors: Shall be as recommended by system manufacturer for functions indicated.
- I. Splices, Taps, and Terminations: Make splices, taps, and terminations on numbered terminal strips in junction, pull and outlet boxes, terminal cabinets, and equipment enclosures.
- J. Tighten connections to comply with tightening torques specified in UL Standard 486A, or as recommended by the system manufacturer.
- K. Identification of Conductors and Cables: Color-code conductors and apply wire and cable marking tape to designate wires and cables so media are identified and coordinated with system wiring diagrams. Outer sheath of Door Monitor System wiring shall be yellow, or shall be marked with yellow plastic tape, approved for the purpose, at intervals not to exceed 5'-0" on center.
- L. Install power supplies and other auxiliary components at the system Master Panel except as otherwise directed by the system Manufacturer. Generally do not install such items in the vicinity of the devices they serve unless so directed by the system Manufacturer. Where plug-in type power supplies are employed, permanently fasten the device to its associated receptacle or outlet box so that it cannot be accidentally unplugged or work.

3.2 Grounding:

- A. Ground system components and conductor and cable shields to eliminate shock hazard and to minimize ground loops, common mode returns, noise pickup, cross talk, and other impairments.
- B. Comply with all requirements of Division 16 Section 16050 as related to grounding.

3.3 Identification:

- A. Provide nameplates and other identification as required in Section 16050, Basic Electrical Materials and Methods.

3.4 Field Quality Control:

- A. Manufacturer's Field Services: Provide services of a factory-authorized service representative to supervise the field assembly and connection of components, the actual installation of all equipment and final wiring connections and system pretesting, testing, adjustment, and programming.
- B. Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified.
- C. Pretesting: Align and adjust the system and perform pretesting of all components, wiring, and functions to verify conformance with specified requirements. Correct

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deficiencies by replacing malfunctioning or damaged items with new items. Retest until satisfactory performance and conditions are achieved.

- D. Testing: Provide at least 10 days notice of acceptance test performance schedule.
- E. Operational Tests: Perform operational system tests to verify conformance with specifications. Each system device shall be tested for proper operation. Test all modes of system operation and intrusion detection. Methodically test for false alarms in each zone of space intrusion detection devices by simulating activities outside indicated detection patterns.
- F. Retesting: Correct deficiencies and retest until the total system meets the requirements of the Specifications and complies with applicable standards.
- G. Prepare test and inspection reports.

3.5 Adjustment:

- A. Occupancy Adjustments: When requested within 1 year of date of substantial completion, provide on-site assistance in adjusting and reprogramming to suit actual occupied conditions. Provide up to 2 visits to the site for this purpose without additional cost.

3.6 Owner's Instructions:

- A. After adjusting the system, Contractor shall arrange a mutually convenient time for a test and demonstration of the system prior to final acceptance.
- B. Train Owner's operating personnel in the programming and operation of the system. Train Owner's maintenance personnel in the procedures and schedules involved in preventive maintenance and in programming, operating, adjusting, troubleshooting, and servicing of the system. Training shall be provided by the system's factory authorized supplier. Provide a minimum of four (4) hours of training. Provide a minimum of two (2) identical training sessions, to accommodate Owner's Maintenance and Operations personnel on different shifts.
- C. Coordinate a mutually agreeable time for training with the Owner, a minimum of seven (7) days in advance of the training session.

3.7 Examination of Premises:

- A. Once notified that the work in progress is ready for installation of the system components, visit the site and verify that the work is ready for the installation.
- B. Verify that all raceways and wiring have been properly installed. Verify wiring continuity.
- C. Verify substrate conditions, which have been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's instructions.

3.8 Field Quality Requirements

- A. Site Tests (Post Installation Testing): Comply with the following:
 - 1) Schedule Tests: Schedule test a minimum of 7 days in advance of performance of tests.
 - 2) Report: Submit a written record of all test results.
 - 3) Operational Test: Perform an operational system test to verify compliance of system with these specifications, and all manufacturer's recommendations.
 - 4) Retesting: Rectify deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify by the system test that the total system meets these specifications and complies with applicable standards. Report results in writing.

3.9 Cleaning

- A. Repair or replace damaged installed products.
- B. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance.
- C. Remove construction debris from project site and legally dispose of debris.

3.10 Protection

- A. Protect installed equipment, wiring and finish surfaces from damage during construction.

***** END OF SECTION *****

SECTION 16725

NURSE CALL SYSTEMS

1 PART 1 - GENERAL

1.1 Reference:

- A. All work under this Section shall be subject to Section 16010, "General Electrical Requirements" and any applicable conditions hereinbefore written for the entire work.

1.2 Scope:

- A. This section specifies the furnishing, installing, and testing of a complete networked Audio-Visual Nurse Call system to be installed at Little Sisters of the Poor, St. Martin's Home.
- B. The specific type/operation of system varies by Cottage. This specification is a comprehensive specification for all Cottages, including those to be renovated under this project, as well as for Cottages to be renovated under future phases of the work. The intent is to provide a complete, comprehensive scope of the system so that systems and equipment installed under this phase of construction will be fully compliant and compatible with work to be installed under future phases of the project. A general description of the Nurse Call System arrangement for each Cottage shall be as follows:
- 1) Cottage A – Immaculate Conception – Assisted Living/Skilled Nursing Swing Unit: Provide a complete, hard wired, networked, Audio-Visual Nurse Call system throughout. Provide for use of wireless pendant emergency call devices by all residents in this Cottage. Provide for interface of Nurse Call alarms and communications to wireless telephone handsets and alpha-numeric pagers by staff/caregivers.
 - 2) Cottage B – Our Lady of Fatima – Skilled Nursing Unit: Provide a complete, hard wired, networked, Audio-Visual Nurse Call system throughout. Provide for interface of Nurse Call alarms and communications to wireless telephone handsets and alpha-numeric pagers by staff/caregivers.
 - 3) Cottage C – Our Lady of Lourdes – Independent Living unit: Provide a hard wired, networked, Audio-Visual Nurse Call system for bath/toilet stations and Resident Check-In throughout. Provide for use of wireless pendant emergency call devices by all residents in this Cottage. Provide for interface of Nurse Call alarms and communications to wireless telephone handsets and alpha-numeric pagers by staff/caregivers.
 - 4) Cottage D – St. John of God – Independent Living unit: Provide a hard wired, networked, Audio-Visual Nurse Call system for bath/toilet stations and Resident Check-In throughout. Provide for use of wireless pendant emergency call devices by all residents in this Cottage. Provide for interface of Nurse Call alarms and communications to wireless telephone handsets and alpha-numeric pagers by staff/caregivers.

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5) Cottage E – St. Joseph – Skilled Nursing Unit: Provide a complete, hard wired, networked, Audio-Visual Nurse Call system throughout. Provide for interface of Nurse Call alarms and communications to wireless telephone handsets and alpha-numeric pagers by staff/caregivers.

- C. Provide all material, labor and incidentals necessary for the complete installation of multiple, interconnected, fully interfaced Nurse Call Systems throughout all Cottages renovated under this project.
- D. The systems outlined here shall include all necessary components, devices, equipment, wiring, interfaces, software, hardware, programming, etc., that provide the functions listed in this specification, whether specifically specified herein, indicated on the drawings, or required for a complete, fully functional, integrated, networked Nurse Call System. Any components, devices, equipment, wiring, interfaces, software, hardware, programming, etc. not specifically indicated shall be provided as if fully specified or indicated, at no additional cost. This shall include major items if necessary.
- E. All Nurse Call system and wiring shall be furnished and installed by the contractor in strict accordance with the system manufacturer's requirements and recommendations.
- F. Provide a raceway system and backboxes for installation of Nurse Call system components. Minimum size of conduit shall be $\frac{3}{4}$ inch, unless noted otherwise or required for wiring capacity. Extend conduit up from each device to above accessible ceiling in corridor or common area. Where devices are indicated to be installed in areas with drywall, plaster or otherwise inaccessible ceilings, provide conduit to accessible ceiling space. All raceways shall comply with all preceding specification requirements relative to raceways and fittings. Terminate all conduits with end bushings, and provide pull cord in each to facilitate pulling of wiring.
- G. Cables shall be supported and tied above ceilings, to obtain an installation neat in appearance. Cables shall be color coded with violet/purple outer sheath and tagged with identification labels.
- H. Furnish 120 volt circuit to power each of the equipment cabinets as indicated on the drawings, or as required from the Critical Branch of the facility Emergency Power System.
- I. Install wiring per manufacturer's representative's shop drawing submittal.
- J. Maintain record drawing of any wiring installation that deviates from shop drawing submittal.

1.3 Codes and Standards:

- A. Underwriter's Laboratories UL
 - 1) UL 1069, Standard for Hospital Signaling and Nurse Call Equipment; October 12, 2007 edition
- B. NFPA - National Fire Protection Association
 - 1) NFPA-70, National Electrical Code, 2008 Edition

- 2) NFPA-99, Standard for Health Care Facilities, 2005 Edition
- C. ADA – Americans with Disabilities Act Accessibility Guidelines (ADAAG)
- D. EIA – Electronic Industry Association
- E. NEMA – National Electrical Manufacturers Association – Installation Standards
- F. U.S. Dept. of Labor / Occupational Safety and Health Administration
- G. Code of Maryland Regulations (COMAR)
- H. The Joint Commission Long Term Care Accreditation Program

1.4 Quality Assurance:

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Compatibility: System shall be capable of integration with:
 - 1) Any brand of telephone system (wired or wireless)
 - 2) Any brand of alpha-numeric pagers
 - 3) Fire-Alarm system
 - 4) Existing RoamAlert System
- C. Electrical Components, Devices, and Accessories: Listed and labeled according to UL 1069 as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.5 Warranty:

- A. Warranty Period: Include the following warranty periods, from date of Substantial Completion of each phase of construction:
 - 1) Nurse Call System installation and components manufactured by system manufacturer: Five (5) years.
 - 2) Nurse Call System components not manufactured by system manufacturer (bed cords, etc.): One (1) year.
- B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace batteries that fail in materials or workmanship within specified warranty period. Special warranty for batteries applies to materials only, on a prorated basis for specified period.
 - 1) Nickel-Cadmium Batteries, Lithium Batteries, and Wet-Cell Batteries:

- (a) Full Warranty: Five (5) years.
- (b) Pro Rata: Fifteen (15) years.

1.6 Submittals

- A. Project submittals shall be provided in quantity identified in Division 1 or in the project Pre-Construction Meeting. Submittal quantity shall include sufficient copies for contractor's use and for inclusion in the project Operation and Maintenance Manuals. submittal sets. Each submittal set shall include the following:
 - 1) Product Data: For each type of product indicated.
 - (a) Shop Drawings: Detail the system including the following drawings as specified hereinbefore under Section 16010, paragraph "Special Systems Drawings:"
 - (1) Cabling Diagrams: Floor plans showing cabling interconnection of all components for this specific project. Include cable type for each interconnection.
 - (2) Wiring Diagrams: Power, signal, and control wiring.
 - (3) Station Installation Details: For built-in equipment; dimensioned and to scale.
 - (4) Equipment Cabinet Drawings: Dimensioned and to scale.
 - (b) Manufacturer Certificates: Signed by manufacturers certifying that nurse call equipment complies with requirements.
 - (c) Manufacturer's Warranty Statement.
 - (d) Field Tests Reports and Observations: Include record of final adjustments certified by Installer.
 - (e) Operation and Maintenance Data: For nurse call equipment to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
 - (1) Operating instructions.
 - (2) Troubleshooting guide.
 - (3) Wiring diagrams and terminal identification.
 - (4) Equipment parts list.
 - (5) Product data for types and sizes of wires and cables used.

1.7 Software Service Agreement:

- A. Technical Support: Beginning with Substantial Completion of the first phase, provide software support for two (2) years.
 - 1) Upgrade Service: Update software to latest version at Project Substantial completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.

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- 2) Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

1.8 Extra Materials:

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1) Fuses: One for every 10 of each type and rating, but no fewer than five (5) of each.
 - 2) Master-Station Privacy Handset: One for each Master Station installed.
 - 3) Bedside Station Cords: One for every 10 of each type, but no fewer than three (3) of each.
 - 4) Patient Pendants: One for every 10 of each type provided, but no fewer than five (5) of each.
 - 5) System program software backup, as installed, on CD-ROM.
 - 6) System program software, on original manufacturer's disks, complete with all required licenses.

2 PART 2 - PRODUCTS

2.1 System Manufacturers:

- A. Nurse Call System equipment described in this specification and indicated on the drawings shall be as manufactured by:
 - 1) Hard wired Nurse Call System: Jeron Electronic Systems, Inc., Provider 680
 - 2) Wireless Patient Pendants: Heritage MedCall, Inc.
 - 3) Telephone Handsets: EnGenius DuraFon
 - 4) Alpha-numeric Pagers: Scope

The above listed systems/manufacturers shall form the Basis of Design.

- B. Subject to compliance with all requirements specified herein, proposed substitutions will be considered for approval from:
 - 1) Hard wired Nurse Call System:
 - (a) West-Call, Novus System
 - (b) Rauland Borg Corporation, Responder 4000 Series
 - 2) Wireless Patient Pendants:
 - (a) West-Call
 - (b) Rauland
 - 3) Portable Telephone Handsets:

- (a) Ascom,
- (b) Vocera
- (c) Spectralink

Equipment from other manufacturers will not be considered.

2.2 System Requirements:

- A. Coordinate the features of materials and equipment to form an integrated system. Match components and interconnections, including interfaces to wireless pendants, alpha-numeric pagers and portable telephone handsets, for optimum performance of all specified functions.
- B. Expansion Capability: System shall be networkable through the interconnection of the Main Control Units to support up to 1024 patient beds and up to 48 Nurse Consoles.
- C. System, components, and cabling, and the selection, arrangement, and connection of materials and circuits, shall be protected against damage or diminished performance when subjected to ESD (electrostatic discharges) of up to 25,000 V in an environment with a relative humidity of 20 percent or less. Patient Stations shall be rated to ESD of 100,000 V in an environment with a relative humidity of 20 percent or less.
- D. The system shall employ multiplexed data transmission with Category 5e or Category 6 cabling with color coded external sheath and RJ-45 connections to interconnect Dome Lights/Zone Lights/Junction Modules to bus on Main Control Unit and for drops from Dome Lights/Junction Modules to intercom stations. All cable shall be listed and labeled for plenum installation.
- E. System shall provide continuous supervision of data and power between Main Control Unit and Nurse Consoles, Dome Lights/Zone Lights/Junction Modules, Intercom Stations, Duty Stations, and other peripheral stations. Any supervision failure shall alarm simultaneously at Nurse Console(s) (indicating the room number of the failure) and at an optional Electrical Supervision Station or at a pocket pager through the pocket page interface.
- F. All end-devices, including Nurse Consoles, Dome Lights, Zone Lights, Staff/Duty Stations, and Peripheral Stations:
 - 1) Shall be able to be hot-swapped without needing to power down the Main Control Unit.
 - 2) All employ plug-in terminations for simple service or replacement.
 - 3) Shall be easily cleaned and impervious to common healthcare facility cleaning agents.
- G. The system shall be user programmable for simple on-site changing of room numbers (architectural address), establishing or reconfiguring duty or zone areas, adding Nurse Consoles and Stations, and assigning Stations independently to Nurse Consoles, duty areas, zone light areas, or page groups. Program shall be retained in nonvolatile memory. There shall be no interruption of system operation (except for display at Nurse console used for programming) until programming is finished. System firmware shall be able to be upgraded using a connected PC, without needing to physically replace chips.

2.3 Hard Wired Nurse Call System Equipment And Functionality Specifications:

- A. Main Control Unit: Install on wall in the Communications Hub Room. Each Main Control Unit shall provide the following:
- 1) The microprocessor-controlled Main Control links bus stations and Nurse Consoles, manages data transmission and the use of the audio lines, and provides voice amplification and operating power.
 - 2) Interfaces with any combination of Nurse Consoles including Touchscreen Consoles, Satellite Consoles, and Direct Select Consoles.
 - 3) Audio Amplifier:
 - (a) The Main Control shall provide up to sixteen (16) Nurse Console audio entry connection points in a networked system.
 - (b) A four-channel audio amplifier shall allow four different Nurse Consoles to answer four different calls simultaneously.
 - (c) Balanced pair input/output; maximum 5W continuous, 10W peak; filtered for voice reproduction.
 - 4) Power Output:
 - (a) The power supply provides an output of 28VDC @ 100VA.
 - (b) Integrated battery backup to maintain full system operation for a minimum of 15 minutes to allow for the transition to facility's backup power.
 - 5) Controls:
 - (a) Main power: combination on/off switch and 2A circuit breaker.
 - (b) Battery power: combination on/off switch and 4A circuit breaker.
 - (c) Ten-position dipswitch for main control network settings.
 - (d) (4) Audio level potentiometers.
 - (e) (4) Port selector switches.
- B. Central Equipment Cabinet:
- 1) Install on wall in the Communications Hub Room. The Central Equipment Cabinet shall provide the following:
 - (a) The Central Equipment Cabinet shall house one Main Control or one Supplementary Power Supply as required for system operations as specified herein.
 - (b) Heavy gauge cabinet shall be built with welded steel construction.
 - (c) Hinged cover shall have one-piece piano hinge and tumbler lock with offset cam.
 - (d) The Central Equipment Cabinet shall be equipped with four threaded studs and nuts on back of enclosure to accept equipment sub-plate for various Nurse Call Systems.

C. Nurse Consoles:

- 1) Provide Nurse Consoles as shown on plans or as required. Nurse Consoles shall be as follows:
 - (a) Cottage A – Immaculate Conception – Assisted Living/Skilled Nursing Swing Unit: Provide Satellite Nurse Console at Nurses Station in this unit.
 - (b) Cottage B – Our Lady of Fatima – Skilled Nursing Unit: Provide touch screen type Nurse Console in Nurses Station.
 - (c) Cottage C – Our Lady of Lourdes – Independent Living unit: Provide Satellite Nurse Console at Nurses Station in Cottage B – Our Lady of Fatima.
 - (d) Cottage D – St. John of God – Independent Living unit: Provide Satellite Nurse Console at Nurses Station in Cottage B – Our Lady of Fatima.
 - (e) Cottage E – St. Joseph – Skilled Nursing Unit: Provide touch screen type Nurse Console in Nurses Station.

Where remote/satellite nurse call consoles are called for to be located at a Nurses Station in a Cottage to be renovated under a future phase of the work, install Nurse Console at location in the existing Cottage where directed during construction. Consoles shall be relocated to their final specified location as part of the renovation phase which includes that Cottage. All costs for relocating the Nurse Consoles shall be included in the cost of renovation of the Cottage to where the consoles are to be relocated.

- 2) All Consoles shall provide the following:
 - (a) Menu-driven operation using English prompts for all functions.
 - (b) Patient and Staff Calls:
 - (1) Thirty-one (31) call priority levels.
 - (2) Call Annunciation: a tone shall announce an incoming call and a display and an optional annunciator light (LED) shall identify the calling station and indicate the priority of the call. Incoming calls shall be displayed by room number, alpha or numeric bed designation and fully customizable English language call type.
 - (3) Ability to display a minimum of four (4) calls at a time with automatic sequencing of calls by priority and/or time of call so that oldest or highest priority call is always displayed first.
 - (4) Ability to respond to calls out of sequence without using numeric touchpad and without losing calls in system.

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- (5) Four (4) call status levels at Nurse Console to quickly identify highest priority call level: ROUTINE, URGENT, EMERGENCY, CODE.
 - (6) Programmable timer for unanswered calls with automatic upgrade, and display of outstanding calls. Verify timer settings with Owner's Representative.
- (c) Communications:
- (1) Choice of Nurse Console to Console/Station communication by handset or by button-activated talk/listen using console speaker/microphone.
 - (2) Hands Free Communication: Called station shall be capable of conversing hands free with Nurse Console.
 - (3) Station Selection: Nurse Console shall be capable of selectively communicating with other stations or groups of stations on its system.
 - (4) Handset Operation: Lifting handset on Nurse Console shall automatically disconnect speaker microphone and transfer conversation to the handset.
 - (5) Ability to monitor one or several user-selected rooms simultaneously.
- (d) Audio Paging:
- (1) Programmable page groups with visual display of group designator while paging.
 - (2) Ability to group page up to ten rooms simultaneously with visual display of selection.
 - (3) Ability to select and page up to ten different external public address systems (page zones) with visual display of selection.
 - (4) Automatic page to only those locations where staff have registered.
 - (5) Selective Public Address Paging: Nurse Console shall be capable of initiating a page to selected groups of stations or speakers simultaneously.
- (e) Service Requirements:
- (1) Ability to display beds with outstanding Nurse, Aide, or Stat Service Requirements.

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- (2) Programmable timer for unanswered Staff Service Requirements with automatic upgrade, and display of outstanding Staff Service Requirements.
 - (3) Ability to manually forward call-in tones to up to 10 rooms.
 - (4) Upon registering into the room, any outstanding Service Requirements matching the staff level or any outstanding patient calls from the Patient Station shall be automatically cleared.
- (f) Room Swing and Day/Night Transfer:
- (1) Ability for up to ten (10) pre-designated rooms, which normally call into a specific Nurse Console to be temporarily swung to another Nurse Console. Once a room has been swung, all calls originating from that room will only annunciate at the Nurse console that swung the room. The Nurse Console that swung the room shall be capable of returning the swung room to annunciate at the original Nurse Console.
 - (2) Console Capture of all calls from any Nurse Console to any other Nurse Console. Normal operation restored to the original Nurse Console when an attendant at the Nurse Console releases the Console Capture.
- 3) Touchscreen Nurse Console:
- (a) Each Touchscreen Nurse Console shall provide the following:
 - (1) Full-Color Nurse Unit Floor Plan: Room icons in a graphic representation of patient rooms in a Cottage. Labeled with room numbers and bed designators and may represent multiple Patient Stations. Calls are annunciated on the patient room icon.
 - (2) Call Placed Indicators: Indicator colors display status levels of calls. Routine-green, Urgent-yellow, Emergency-red, Fire Alarm smoke detector.
 - (3) Elapsed time of pending calls for each call icon for up to 99 minutes and 59 seconds until the call is canceled.
 - (4) Two-Line LCD Call Display: Displays a message for the highest, oldest call on the Console: room #, bed designator and call type.
 - (5) Keypad: Keys 0-9 shall be used to page a room station or bed. Keys A-D are used when there is a need to add alpha character suffixes, or to page the bed level. Example: 101A, 232C, etc.

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- (6) Enter touchpoint: Used to confirm entries.
- (7) Clear touchpoint: Allows the user to exit the current screen, or cancel a non-locking call.
- (8) Main Menu touchpoints: Used to select system option screens.
- (9) Quit touchpoint: Cancels audio connection or menu selection.
- (10) Hold touchpoint: Used to place current call on hold.
- (11) Tone Silence touchpoint: Mutes incoming call audible alert tone at associated Satellite Nurse Console. Any new call annunciating at the Nurse Console restarts call alert tone.
- (12) Talk touchpoint: Directional control of open voice panel microphone. Not used with handset.
- (13) Volume Down/Up: Used to adjust volume levels
- (14) Floor Plan Sub-maps: Up to 4 touchpoints used to display additional rooms owned by this Touchscreen Console.
- (15) Touchscreen Console Selector Keys: Used to select and display room call maps, which have been Room Captured to this Console.
- (16) Menu screens for Mobile Communications and Staff/Pager Setup are programmable to require entry of a fixed password for access to both.
- (17) Patient Information Display: while audio is connected to a Patient Station, the patient details field shall display the patient name, important patient information, doctor name, assigned nurse and aide, and the name of a nurse or aide present in the patient room. In rooms with multiple beds, bed selector keys shall permit review of other patient details.
- (18) The Touchscreen shall display the following default call priority and system messages: Audio Connected, Answered Call, Station Fail, Patient or Staff Normal, Patient Personal Attention, Cordout, Personal Attention Overtime, Cordout Overtime, Alarm, Bath, Patient Priority, Bath Overtime, Patient Priority Overtime, Aide Service Overtime, Nurse Service Overtime, Staff Emergency, Fire, Fire Alarm Smoke Detector, Busy, Main/Master Diagnostic, Trouble, Originate, Master Call.
- (19) Console Capture of up to 11 preprogrammed Console screens in the system. Nurse Console(s) names will display as icons on the touchscreen of the capturing Console. The room icons of the captured Console will display on the floor plan of the capturing Console when the Console is selected. The attendant

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will be able to activate or deactivate Console Capture without disruption to normal system operation.

- (20) Utilizes an Ethernet LAN connection to the Touchscreen Display Control Unit. The Ethernet connect shall be on a dedicated Nurse Call Ethernet LAN.
- (21) Hardware packaging including: 15.1-inch color LCD flat panel monitor with a touch sensitive screen, touchscreen control unit, entry keyboard, isolated UL1069 Listed interface, and Satellite Nurse Console (see Satellite Nurse Console section below for complete details).

4) Satellite Nurse Console

(a) Each Satellite Nurse Console shall provide the following:

- (1) Lightweight, high-impact telephone handset.
- (2) Built-in microphone and combined speaker/tone generator.
- (3) Four-line backlit LCD displays call information.
- (4) Spill proof membrane touchpad with:
 - (i) Menu Key: Allows the user to access menu functions.
 - (ii) Nurse Need Key: Requests for nurse service are made by pressing this key while connected with a Patient Station.
 - (iii) Aide Need Key: Requests for aide service are made by pressing this key while connected to a Patient Station.
 - (iv) Speed Menu Key: The speed menu allows a single key quick access to a single pre-programmed menu function.
 - (v) Numeric Keys (10): These keys are used to page a room station or bed.
 - (vi) Clear/Quit Key: Allows the user to exit the current screen, or cancel a non-locking call.
 - (vii) Tone Silence Key: Silences tones at this Nurse Console. If a new call is placed or if the call is timed out, the tone of the highest priority call will sound.
 - (viii) Scroll Key: Allows scrolling through lists on the four-line LCD screen.

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- (ix) + / -: Keys are used to increase or decrease the volume of audio at the Nurse Console.
 - (x) Alpha Entry Keys (4): These keys are used when there is a need to add alpha character suffixes, or to page the bed level. Example: 101A, 232C, 125B, etc.
 - (xi) Enter/Talk: This is used to confirm entries when programming. When an audio connection is established between the Nurse Console and a Patient Station, the Talk key is used for one-way paging.
- (5) Nurse Console shall display the following default call priority and system messages: Normal, Staff, Duty, Personal Attention, Master, Cordout, Alarm, Bath, Priority, Battery Low, Trouble, Master Fail, Power Fail, Main Fail, Staff Emergency, Fire, Code Blue, Code Pink, Originate, Failed, Aide Need, Nurse Need

5) Patient Bed Stations

- (a) Provide single Patient Bed Patient Stations as shown on plans. Placing a call from an associated Call Cord, Pillow Speaker or Feature Bed shall light a call-placed LED on the station and a specific color/section in the associated Dome Light and/or Zone Light while also annunciating at the assigned Nurse Console(s) and Duty Station(s). Each station shall be able to be set to one of four call-in/status levels. The available call-in/status levels shall be:
 - (1) Normal: Normal calls are non-locking and may be cleared remotely by answering at the Nurse Console. By default the white section of the associated Dome Light is illuminated solid.
 - (2) Personal Attention: higher priority than Normal calls, are Locking and must be canceled at the originating station. By default the white section of the associated Dome Light is illuminated flashing.
 - (3) Priority calls: higher-level call than Personal Attention and must be canceled at the originating station. By default the white section of the associated Dome Light is illuminated flashing.
 - (4) Privacy: stations cannot be monitored. Privacy is a room-level setting and is not bed-specific. By default the white section of the associated Dome Light is illuminated solid.
- (b) Removing a Call Cord or Pillow Speaker shall place a "Cord Out" emergency level call.
- (c) Calls shall be automatically upgraded in priority if not answered or cleared locally within a preprogrammed time. When a call is answered and intercom audio is initiated, the station sounds a pre-announce tone and the red Monitor LED lights to indicated the audio status. While audio is connected to the station, a Service Reminder shall be able to be set for

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Nurse (Green flashing Dome Light indication), Aide (Yellow flashing Dome Light indication), or Stat (Green and Yellow flashing Dome Light indication). Service Reminders shall automatically re-initiate an overtime call after a preset, user-definable time period if not cleared locally within a preprogrammed time.

- (d) Each bed station shall also include a Staff Assist button for staff use. Pushing the Staff Assist button shall light a call-placed LED on the station and a specific color/section in the associated Dome Light and/or Zone Light while also annunciating at the assigned Nurse Console(s) and Duty Station(s). By default, the station shall place a "Staff Emer" priority level call on the system, and issue an "all call" to all on-duty staff members on that Unit.
- (e) Each station shall provide the following:
 - (1) Continuous supervision for power and data.
 - (2) Ability to service exchange station "hot" without removing system power or powering down the local Main Control Unit.
 - (3) Momentary action Cancel button, monitor LED indicator, and call-placed LED indicator.
 - (4) High-efficiency 2 ¾ inch oval Speaker/microphones with Alnico magnets for clear voice communication.
 - (5) Blue LED to illuminate the station in low ambient light conditions.
 - (6) One DIN receptacle per bed for call cords or pillow speakers providing:
 - (i) Tilt release design to eliminate receptacle damage when the pillow speaker/call cord is pulled from any angle.
 - (ii) No dummy plug required. Holding the cancel button while removing a Call Cord or Pillow Speaker disables the "Cordout" call.
 - (iii) Ability to program the call priority on a per patient basis.
 - (7) RJ-45 field wiring receptacle for Cat-5e/6 wiring to associated Dome Light or Domeless Junction Module.
 - (8) Provide for Staff Assist button operation, either through operation of the patient cord or via a separate pushbutton on the face of the Patient Bed Station.

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- (9) Electrostatic Discharge protection in excess of 100 kV from associated call cords or pillow speakers.
 - (10) Unit shall mount in a standard UL recognized 2-gang or 3-gang electrical box.
- 6) Peripheral Station Interface Module
- (a) Provide Peripheral Station Interface Modules as required. Each Module shall provide the following:
 - (1) Enables non-audio Peripheral Stations to place calls from rooms without an associated Intercom Station.
 - (2) Continuous supervision for power and data.
 - (3) Ability to service exchange station "hot" without removing system power or powering down the local Main Control Unit.
 - (4) RJ-45 field wiring receptacle for Cat-5e/6 wiring to associated Dome Light or Domeless Junction Module.
 - (b) Unit shall mount in a standard UL recognized 2-gang electrical box.
- 7) Peripheral Stations
- (a) Provide as shown on plans or as required. Peripheral stations associated with Patient Station, Staff Station, Staff/Duty Station, or Peripheral Interface Module stations. Each Peripheral Station shall:
 - (1) Mount in a UL recognized 1-gang electrical box.
 - (2) Include a blue LED to illuminate the station in low ambient light conditions.
 - (b) Pushbutton Emergency Station:
 - (1) Pushing the call button shall light a call-placed LED on the station and a specific color/section in the associated Dome Light and/or Zone Light while also annunciating at the assigned Nurse Console(s) and Duty Station(s). By default, the station shall place a "Staff Emer" priority level call on the system. Calls are automatically upgraded in priority if not cleared locally within a preprogrammed time.
 - (2) The Pushbutton Emergency Station shall include:
 - (i) Momentary call button with customizable call priority label insert.
 - (ii) LED call placed indicator.

- (iii) Cancel button.
- (iv) Call from station shall only be able to be canceled locally.

(c) Pull-Cord Pushbutton Emergency Station:

- (1) Pulling the cord or pushing the call button shall light a call-placed LED on the station and a specific color/section in the associated Dome Light and/or Zone Light while also annunciating at the assigned Nurse Console(s) and Duty Station(s).
- (2) By default, the station shall place a "Bath" priority level call on the system. Calls shall be automatically upgraded in priority if not cleared locally within a preprogrammed time.
- (3) The Pull-Cord Pushbutton Emergency Station shall include:
 - (i) Six (6) foot, cut-to-length, PVC pull-cord with plastic cord guide and large easy to pull plastic "bell" attached.
 - (ii) Call button that works in conjunction with pull-cord.
 - (iii) LED call placed indicator.
 - (iv) Cancel button.
- (4) Call from a Pull-Cord Pushbutton Emergency Station shall only be able to be canceled locally.

(d) Pull-Cord Pushbutton Emergency Shower Station

- (1) Pulling the cord or pushing the call button shall light a call-placed LED on the station and a specific color/section in the associated Dome Light and/or Zone Light while also annunciating at the assigned Nurse Console(s) and Duty Station(s).
- (2) By default, the station shall place a "Bath" priority level call on the system. Calls shall be automatically upgraded in priority if not cleared locally within a preprogrammed time.
- (3) The station shall include:
 - (i) Six (6) foot, cut-to-length, PVC pull-cord with plastic cord guide and large easy to pull plastic "bell" attached.
 - (ii) Call button that works in conjunction with pull-cord.
 - (iii) LED call placed indicator.
 - (iv) Cancel button.

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- (v) Wall gasket and waterproof design allowing direct application of water spray from a shower stall or similar type installation.
- (4) Call from station shall only be able to be canceled locally.
- (e) Pushbutton Staff Assist Station:
 - (1) The Staff Assist station shall include a single pushbutton for Staff Use to request assistance.
 - (2) Pushing the call button shall light a call-placed LED on the station and a specific color/section in the associated Dome Light and/or Zone Light while also annunciating at the assigned Nurse Console(s) and Duty Station(s). By default, the station shall place a "Staff Emer" priority level call on the system, and issue an "all call" to all on-duty staff members on that Unit. Calls are automatically upgraded in priority if not cleared locally within a preprogrammed time.
 - (3) The Staff Assist Station shall include:
 - (i) Momentary call button with customizable call priority label insert.
 - (ii) LED call placed indicator.
 - (iii) Cancel button.
 - (iv) Call from station shall only be able to be canceled locally.
- (f) Resident Check-In Station:
 - (1) The Resident Check-In Station shall include a single pushbutton for resident use, in each Independent Living Cottage, for use by the Resident to check-in and verify that they are present and do not require assistance.
 - (2) Pushing the call button shall light a call-placed LED on the station and shall send a signal to the Nurse Call console to indicate that the resident has "checked in" for the day and is functional and not in need of assistance.
 - (3) The Nurse Call system shall monitor all Resident Check-In stations in each Independent Living Cottage, for resident check in between preset times each day (e.g. 6:00 AM – 10:00 AM). If a Resident has not checked in by the prescribed time, the system shall alert the Nursing Staff that the resident has not checked in and may need assistance.
 - (4) The Staff Assist Station shall include:
 - (i) Momentary call button with customizable call priority label insert.
 - (ii) LED call placed indicator.
 - (iii) Call from station shall be cleared from the Nurse Call Console.

(g) Auxiliary Alarm Input Station:

- (1) Provide Auxiliary Alarm Input Station on wall below each Patient Bed Station.
- (2) Auxiliary Alarm Input Station shall provide two (2) 1/4 inch jacks for the connection of external patient monitoring devices. Each jack shall provide:
 - (i) Individually programmable call priority level per jack.
 - (ii) Configurable for latching or non-latching inputs.
 - (iii) Customizable call priority label insert and associated LED call placed indicator per jack.
 - (iv) Cancel pushbutton.
- (3) Dummy plugs shall not be required for not in use jacks.

8) Dome Lights

- (a) Provide Dome Lights at each Patient/Resident Room and at each room with a Nurse Call System call initiating device.
- (b) Coordinate exact mounting location and arrangement with details on Architectural drawings.
- (c) Dome lights shall be LED type to provide virtually maintenance free operation with no incandescent lamps to replace.
- (d) Advanced Dome Light shall provide:
 - (4) A translucent lens and four sections with opaque partitions separating the sections.
 - (5) LED indicators capable of producing a minimum of the following eight colors: white, red, yellow, orange, green, blue, magenta and pink and to be displayed with five light patterns: steady, slow flash, fast flash, sequence slow, and sequence fast.
 - (6) Four RJ-45 connections for Cat-5e or Cat-6 cables for wiring to associated bus stations, dome lights, zone lights, or Domeless junction modules.
- (e) In the unexpected event of communications loss with the nurse call Main Control Unit, Dome Lights shall enter a local room failsafe mode and continue to indicate calls in the hallway via the LED indicators.
- (f) Dome Light housing shall be resistant to all common healthcare facility cleaning agents.

- (g) Dome lights shall be LED type to provide virtually maintenance free operation with no incandescent lamps to replace.
 - (h) Dome Lights shall light the following default colors for staff presence and call placed indication:
 - (1) Solid White: Routine, Staff, and Duty calls
 - (2) Flashing White: Priority and Personal Attention
 - (3) Flashing Red: Bath, Staff Emergency, Emergency
 - (4) Sequencing White, Green, Yellow, and Red: Smoke Detector activation
 - (5) Flashing Green: Nurse Service Reminder
 - (6) Flashing Yellow: Aide Service Reminder
 - (7) Flashing Green and Yellow: Stat Service Reminder
- 9) Domeless Junction Modules
- (a) Provide as required to serve Nurse Call devices in rooms/areas where dome lights are not required, or where additional connections are required. Each Module shall provide the following:
 - (1) Four (4) RJ-45 connections for Cat-5 or better cables for wiring to associated bus stations, dome lights, zone lights, or additional Domeless Junction Modules.
 - (2) Unit shall mount in a standard UL recognized 1-gang or 2-gang electrical box.
- 10) Zone Lights
- (a) Provide Zone Lights as shown on plans or as required to annunciate rooms where dome lights are not direct line-of-sight visible from the Nurses Station.
 - (b) Advanced Zone Light shall provide:
 - (3) Programmable into sixteen (16) total Zone areas.
 - (4) A translucent lens and four sections with opaque partitions separating the sections.
 - (5) LED indicators capable of producing a minimum of the following eight colors: white, red, yellow, orange, green, blue, magenta and pink and to be displayed with five light patterns: steady, slow flash, fast flash, sequence slow, and sequence fast.

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- (6) Two RJ-45 connections for Cat-5e or Cat-6 cables for wiring to associated dome lights, zone lights, or Domeless junction modules.
 - (b) Zone lights shall be LED type to provide virtually maintenance free operation with no incandescent lamps to replace.
 - (c) Zone lights shall be resistant to all common healthcare facility cleaning agents.
 - (d) Zone Lights shall light the following default colors for call placed indication:
 - (1) Solid White: Routine, Staff, and Duty calls
 - (2) Flashing White: Priority and Personal Attention
 - (3) Flashing Red: Bath, Staff Emergency, Emergency
 - (4) Sequencing White, Green, Yellow, and Red: Smoke detector activation
 - (5) Flashing Green: Nurse Service Reminder
 - (6) Flashing Yellow: Aide Service Reminder
 - (7) Flashing Green and Yellow: Stat Service Reminder
 - (e) Zone lights shall mount in a standard UL recognized 1-gang or 2-gang electrical box.
- 11) Call Cords: Provide Standard and Specialty Call Cords as required:
- (a) Standard Call Cords:
 - (1) Provide one (1) Standard call Cord for each Patient Bed Station provided, plus spare cords as specified above.
 - (2) 10 foot vinyl jacketed cord.
 - (3) White thermoplastic pendant with momentary contact nurse call pushbutton.
 - (4) 8-pin DIN connector.
 - (5) Metal bed clip.
 - (6) Strain relief at both ends.
 - (b) Specialty Geriatric Call Cord:

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- (1) Provide one (1) Geriatric Call Cord for every ten (10) Patient Bed Stations provided per Cottage, with a minimum of two (2) per Cottage.
- (2) The Specialty Geriatric Call Cord shall consist of:
 - (i) Bulb and Cord: 6 foot gray non-toxic tubing with matching molded air bulb.
 - (ii) 8-pin DIN connector.
 - (iii) Metal bed clip.

(c) Specialty Breath Activated Call Cord:

- (1) Provide one (1) Specialty Breath Activated Call Cord for every ten (10) Patient Bed Stations provided per Cottage, with a minimum of two (2) per Cottage.
- (2) The Specialty Geriatric Call Cord shall consist of:
 - (i) Conduit: Plastic covered, 3' heavy-duty flexible metal conduit.
 - (ii) Straw: 2" x 5/16" diameter clear vinyl straw (12 provided).
 - (iii) Cord: 9' x 5/16" diameter grey plastic tubing.
 - (iv) Connector: 1/4" phone-type plug with 1/4"-to-8-pin DIN adaptor.

D. Reporting Software and Hardware Package:

- 1) Provide a complete Reporting Software and Hardware Package, which shall provide the following features for all Nurse Call systems installed under this project:
- 2) Support computer archiving and analysis of patient call activity and staff response for up to eighty (80) Main Control Units to a single logging PC.
- 3) Multiple report generation options including Summarized Call Statistics, Hourly Call Statistics, Detailed Patient Activity, Summary Patient Activity, and System-Wide Activity.
- 4) Remote report generation capability from any networked PC work station on the facility's LAN.
- 5) Provide a computer workstation, located in the Communications Hub Room, for use in generating, viewing and printing Nurse Call System reports.
- 6) Ability to export data to Crystal Reports for enhanced analysis.

- 7) Provide a computer workstation for configuration of the Nurse Call system and generation, viewing and printing of Nurse Call System Reports. Locate computer workstation in Communications Hub Room:
- (a) PC Hardware and Software – The personal computer workstation (s) shall provide the following minimum levels of performance/features:
 - (a) Case: Mini-Tower configuration
 - (b) CPU: Intel Core 2 Quad, operating at 2.83 GHz with 6 Mb Level 2 cache
 - (c) System memory: 4 GB
 - (d) 16X DVD +/-RW optical drive
 - (e) Hard drive: 500 GB serial ATA, 7200 RPM
 - (f) Video card with 512 MB video memory
 - (g) Integrated 10/100/1000 Ethernet Interface
 - (h) 101 Key USB keyboard
 - (i) USB optical mouse, 2 button with scroll wheel
 - (j) Input/output Ports: 7 USB 2.0
 - (k) Integrated audio with speakers
 - (l) Operating System: Microsoft Windows 7 Professional, 64 bit
 - (m) Single 17" minimum flat panel TFT/active matrix LCD display, 1280 x 1024 non-interlaced resolution minimum; .28 or better dot pitch and 72 Hz. minimum vertical refresh rate or max resolution, 65 million colors.
 - (n) Productivity Software:
 - (i) Microsoft Office Professional (Word, Excel, Outlook, PowerPoint, Access)
 - (ii) Adobe Acrobat Professional
 - (iii) Crystal Reports, full compatible and configured for Nurse Call System Reports package
 - (iv) Roxio Easy CD/DVD Creator
 - (v) Symantec Norton Internet Security, with 12 month subscription
 - (o) All software shall be the latest edition of the software specified above, complete with all available service packs, patches and updates. Provide software registration cards to the Owner for all included software.
 - (p) Complete computer workstation software package, including any hardware or software keys. Include the original installation disks and licenses for all included software, device drivers, and peripherals.
 - (q) Provide all required cables and connectivity for connection to both the nurse Call System, and to the facility staff Local Area Network.

E. Pocket Page Interface

- 1) Provide a Pocket Page Interface for interface between all nurse call systems and staff Alpha-Numeric Pagers throughout the facility:
 - (a) Using industry standard TAP protocol to transmit informational messages and patient call information to the facility's pocket page encoder/transmitter.
 - (b) Supporting three programmable operating modes. Regardless of the pocket page mode, all call on the nurse call system will continue to announce at respective Duty Station(s) and Nurse Console(s):
 - (a) Manual Mode – from a Nurse Console initiate a pocket page message to any staff member's pocket pager.
 - (b) Automatic – Always route patient calls from patients to their assigned caregiver's pocket pager.
 - (c) Semi-Automatic – Nurse Console attendant selectively initiates pocket page notification to assign caregivers by setting a service requirement. Attendant may include informational "tag" message detailing patient's needs.
 - (c) Patients without an assigned caregiver shall automatically display on a preprogrammed pocket pager to ensure no patient call is missed.
 - (d) Supporting system supervision error notification to a technician's pocket pager.

F. Facility-Wide Wireless Telephone Interface: Provide a Wireless Phone Interface:

- 1) System shall provide the capability to interface with a voice enabled communications server using third party software and additional hardware and software for wireless phones. The following features shall be provided:
 - (a) Wireless telephones ring and display the room number, bed designator, and English language call type on its LCD screen.
 - (b) Wireless telephones shall require only a single key press to connect the caregiver with the calling patient through the nurse call Patient Station in the room.
 - (c) Wireless telephones shall have the capability to originate calls into rooms (Patient Stations, Staff Stations), Nurse Consoles, caller ID telephones, or to the public network through interface to the existing house Nortel telephone switch/PBX.
 - (d) Wireless telephones shall have capability to set (nurse need or aide need) service reminders.
 - (e) Wireless telephones shall have capability to send radio pocket page transmissions with tag messages.

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- (f) Patient calls shall be selectively assigned to individual wireless telephones.
- (g) Wireless telephones, when in communication with a nurse call Patient Station, shall be notified of any incoming calls from any other nurse call Patient Stations assigned to that handset. Patient Station calls which go unanswered at their assigned wireless telephone be automatically transferred to another preprogrammed handset after a preset time period.
- (h) It shall be possible to program code calls to ring at a predefined group of phones. Systems that do not allow multiple phones to ring for code calls will not be acceptable.

G. Caller-ID Phone Interface: Provide a Caller-ID Phone Interface:

- 1) The system shall provide the capability to interface with the facility's existing Nortel Norstar wired PBX (Private Branch Exchange) telephone system through a dedicated Telephone Interface Terminal or Caller ID Telephone Interface. The following features shall be provided:
 - (a) Notification of a call placed from an assigned room will be capable of being answered from anywhere in the facility by using any PBX standard DTMF telephone extension. Notification shall include display of room number and call type on Caller ID compatible PBX systems.
 - (b) Once audio is connected to the nurse call system from the PBX telephone, the attendant shall have capability to answer the highest priority call from rooms assigned to the Nurse Console.
 - (c) Once audio is connected to the nurse call system from the PBX telephone, the attendant shall have capability to originate calls into rooms.
 - (d) Once audio is connected to the nurse call system from the PBX telephone, the attendant shall have capability to set (nurse need or aide need) service reminders.
 - (e) Once audio is connected to the nurse call system from the PBX telephone, the attendant shall have capability to send Radio Pocket Page transmissions with tag messages.

2.4 Wireless Nurse Call System Equipment And Functionality Specifications:

A. General:

- 1) Provide all labor, equipment and materials necessary for the installation of a complete wireless emergency call system, as an adjunct to the hard wired system, for use and monitoring of Resident Emergency Call Pendants, for residents in the following areas:
 - (a) Cottage A – Immaculate Conception – Assisted Living/Skilled Nursing Swing Unit

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- (b) Cottage D – St. John of God – Independent Living Unit
 - (c) Cottage E – St. Joseph – Skilled Nursing Unit
- 2) The Wireless Nurse Call System shall be fully interfaced to the Hard Wired System so that all calls for assistance, alarms, trouble indications, etc. are transmitted to the hard wired system. Provide all required interfaces, wiring, programming, etc., as required for fully functional interface between Wireless and Hard Wired systems.
- 3) The installed system shall meet the following minimum requirements:
- (a) Operate in the 902 – 928 MHz. frequency band and comply with all applicable FCC regulations.
 - (b) Transmit all alarms utilizing frequency-hopping spread-spectrum technology, which shall send redundant messages across a minimum bandwidth of 10 MHz for maximum effectiveness and reliability.
 - (c) All equipment in the system shall be fully supervised. Every device in the system shall transmit a periodic supervisory message containing the device ID and its status including battery condition. Every device shall transmit its status multiple times daily to ensure total system integrity.
 - (d) The system shall be totally wireless utilizing radio frequencies (RF) for all communication between alarm devices, all repeaters and the receiver connected to the controlling computer.
 - (e) The system shall support remotely powered pull-cord transmitters to remove the requirement for battery replacement. A suitable 12VDC power supply shall be provided to supply power to these devices.
 - (f) All repeaters shall contain battery backup to provide uninterrupted integrity of the wireless infrastructure.
 - (g) The system shall be capable of receiving transmissions from wireless devices and transmitting information over the same wireless infrastructure to portable information displays.
 - (h) The system shall be capable of supporting up to 8000 devices with full supervision.

B. Products:

- 1) All products provided shall be new and the standard product of a single reputable manufacturer.
- 2) Master Computer:
 - (a) The Master Computer shall be the main control and annunciation point for the wireless emergency call system.

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- (b) The Master Computer shall be a Dell or equivalent PC with Intel processor, operating on a Microsoft Windows operating system. The system shall have the option of touch panel operation and wall mounted display. Locate the Master Computer in the Communications Hub Room, adjacent to the Nurse Call Reporting Computer.
- (c) Sentry Freedom software shall be installed to communicate with, store, and display all system activity from the Network Coordinator.
- (d) The computer shall provide for network interface via LAN and/or telephone modem connection.
- (e) A database shall be maintained on this computer or networked computer for retrieval of all system activity.
- (f) AC power to the Master Computer shall be provided through a suitable uninterruptible surge suppressed power supply. Provide minimum
- (g) The master computer shall provide the following minimum levels of performance/features:
 - (a) Case: Mini-Tower configuration
 - (b) CPU: Intel Core 2 Quad, operating at 2.83 GHz with 6 Mb Level 2 cache
 - (c) System memory: 4 GB
 - (d) 16X DVD +/-RW optical drive
 - (e) Hard drive: 500 GB serial ATA, 7200 RPM, with internal redundant drive, configured as directed by Emergency Call system manufacturer
 - (f) Video card with 512 MB video memory
 - (g) Integrated 10/100/1000 Ethernet Interface
 - (h) 101 Key USB keyboard
 - (i) USB optical mouse, 2 button with scroll wheel
 - (j) Input/output Ports: 7 USB 2.0
2 RS232 Serial
 - (k) Integrated audio with speakers
 - (l) Modem, internal. Provide RJ-11 jack wired to provide telephone line access from POTS line, ahead of facility telephone system PBX.
 - (m) Single 17" minimum flat panel TFT/active matrix LCD display, 1280 x 1024 non-interlaced resolution minimum; .28 or better dot pitch and 72 Hz. minimum vertical refresh rate or max resolution, 65 million colors.
 - (n) Software:
 - (i) Operating System: Microsoft Windows 7 Professional, 64 bit, or as compatible with the Emergency Call software
 - (ii) Symantec Norton Internet Security, with 12 month subscription
 - (iii) Emergency Call Software: Heritage Model HM-FR2-SW1 or HM-FR2-SW2
 - (o) All software shall be the latest edition of the software specified above, complete with all available service packs, patches and

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- updates. Provide software registration cards to the Owner for all included software.
- (p) Complete computer workstation software package, including any hardware or software keys. Include the original installation disks and licenses for all included software, device drivers, and peripherals.
 - (q) Provide all required cables and connectivity for connection to both the nurse Call System, and to the facility staff Local Area Network.
- (h) Master Computer Operation:
- (a) The computer and software shall be capable of sounding, displaying and logging a unique alarm when an emergency call is placed.
 - (b) The display shall have the capability of listing the room number, registered occupant's name, alarm time, type of call, location and contact information.
 - (c) The system shall be capable of monitoring and displaying check in devices to provide daily reporting of resident activity.
 - (d) The computer shall maintain supervision over the entire wireless system including infrastructure and transmission devices. Any low battery or device failures shall be logged and annunciated on the screen.
 - (e) The system shall have the ability to forward calls to Personal Communication Assistant portable devices (pagers) over the wireless infrastructure.
 - (f) The system shall have the ability to extend calls to telephones, wide area pagers, email addresses, and voice over two-way radio utilizing LAN, telephone and serial communication.
 - (g) The software shall maintain a database of all system activity and provide means of report generation for specific time periods, types of calls, rooms, and devices and printing or saving reports to specific files.
 - (h) The software shall provide four levels of operation and administration based on unique passwords.
 - (i) The software shall provide for displaying alarm information from other building systems via RS-232 serial interface. These systems may include, and not limited to, nurse call systems and wander management systems.
 - (j) The software shall be capable of creating backup and restore disks in the event the master computer fails.
 - (k) Software and hardware shall be available to allow remote enrollment of transmitters and creating an import file for ease of adding large numbers of devices to an existing system without disruption.
- (i) Network Controller: The Network Controller shall connect to the Master Computer and is the interface to the wireless network. The controller shall be a two-way radio device capable of receiving and transmitting information to the wireless network.

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- (a) The controller shall receive and convert radio transmissions from registered wireless devices to serial data for receipt by the Master Computer
 - (b) The controller shall receive serial data from the Master Computer and convert it for radio transmission to the wireless network and registered devices.
 - (c) The controller shall be provided with an interconnect cable and power supply. The power supply shall receive its power from the same uninterruptible surge suppressed power supply as the Master Computer.
 - (d) The Network Controller shall be Heritage Model HM-6040.
- 3) High-Power Repeaters: The High-Power Repeaters shall provide range extension and location information from wireless transmitters registered to the system.
- (a) Perform a signal strength survey of the existing facility to determine quantity and location of High Power Repeaters as required to provide full coverage of entire building and grounds. Interior areas shall include 100% coverage of the Basement/Lower Level, First and Second floors. Exterior areas to be covered shall include all courtyards, walkways, driveways, parking lots, recreational areas, garages and the wooded grotto are to the west of the main building. Provide sufficient
 - (b) The repeater shall be provided power by means of an AC adapter with output suitable for class 2 wiring to the repeater. Provide duplex receptacle at each repeater location, connected to the building emergency power system Critical Branch.
 - (c) The repeater shall contain a lithium-ion battery for battery backup and be of sufficient capacity to provide 24 hours of normal operation.
 - (d) All repeaters located in exterior areas shall be provided with suitable weatherproof enclosures to fully protect the device in an outdoor mounting arrangement. Provide duplex receptacle, with weatherproof in use cover, at each repeater location, connected to the building emergency power system Critical Branch.
 - (e) The High-Power Repeaters shall be Heritage Model HM-5000.
- 4) Wireless Transmitters – Battery Powered:
- (a) General:
 - (a) All wireless transmitters shall be provided with batteries.
 - (b) Replacement batteries shall be commercially available from standard retail electronics stores.
 - (c) All devices shall be available with 3 minute or 60 minute check in times. The check in times shall be dictated by the maximum number of devices in the completed system.
 - (b) Wireless Pendant Transmitters:
 - (a) Wireless Pendant Transmitters shall be worn by residents, and shall be used to summon assistance anywhere in the building or on the site.
 - (b) Wireless Pendant Transmitters shall be water resistant in normal use, including bathing. It shall be able to withstand contact with

- water and be able to be worn in the shower without damage or malfunction.
- (c) Wireless Pendant Transmitters shall be fully supervised and transmit low battery warnings.
 - (d) Wireless Pendant Transmitters shall use a single call button requiring a minimum one-second press to activate a call. The delay shall be for false alarm prevention.
 - (e) Transmitter shall include a visible LED to indicate transmission
 - (f) Trans Wireless Pendant Transmitters shall have a reset button on the rear of the case, which may be utilized as a staff activated call clear.
 - (g) The transmitter shall not exceed 2.2" x 1.9" x 0.72" and a weight of 1.4 ounces.
 - (h) Each Wireless Pendant Transmitter shall be furnished with both a neck cord, with break-away link and belt clip. Transmitter shall have available an optional wristband.
 - (i) The Wireless Pendant Transmitters shall be Heritage Model HM-1223S. Provide transmitter quantities as follows:
 - (i) Cottage A: 20
 - (ii) Cottage C: 30
 - (iii) Cottage D: 30

2.5 Portable Telephone Handsets

- A. Provide Portable Telephone Handsets for each Cottage/Nursing Unit for use both in receiving and reacting to nurse call system calls, as well as for placing and receiving of internal or external calls via the existing facility telephone system. The Portable Telephone Handsets shall be fully compatible with both the existing facility Nortel Norstar Telephone System, and with the proposed Nurse Call system.
- B. Provide the following quantity of Portable Telephone Handsets for each Cottage:
 - 1) Cottage A – Immaculate Conception – Assisted Living/Skilled Nursing Swing Unit: 4
 - 2) Cottage B – Our Lady of Fatima – Skilled Nursing Unit: 4
 - 3) Cottage C – Our Lady of Lourdes – Independent Living Unit: 1
 - 4) Cottage D – St. John of God – Independent Living Unit: 1
 - 5) Cottage E – St. Joseph – Skilled Nursing Unit: 4
- C. Portable Telephone Handsets shall provide the following features:
 - 1) Designed for rugged industrial use. Handsets shall be suitable for cleaning/infection control with all standard health care facility cleaning agents.
 - 2) Function as both internal and external telephone, two-way radio and Nurse Call System caregiver device.
 - 3) Two-way radio function shall provide full-duplex intercom or half duplex broadcast capabilities
 - 4) Speakerphone
 - 5) 4-Line alphanumeric liquid crystal display

- 6) 2.5mm headset port
- D. Each Portable Telephone Handset shall include:
- 1) Li-Ion Battery Packs – One (1) installed in the handset plus two (2) spare per handset
 - 2) Both Low Profile Handset Antenna and Optimal Performance Handset Antenna
 - 3) Belt Clip
 - 4) Protective carrying case
- E. The portable handsets shall be connected to the facility telephone system via a four (4) line base unit. The base unit shall provide the following features/capabilities:
- 1) 12 floors in-building penetration
 - 2) 250,000 sq. ft. of facility coverage
 - 3) 3,000 acres of property, open land coverage
 - 4) Multi-Line (4-ports / line per base unit)
 - 5) The base unit shall support up to 90 telephone handsets
 - 6) Works behind any analog port (PBX, VOIP, PSTN, FXS or POTS)
 - 7) Expandable to (8) bases for (32) line/ports
 - 8) Speakerphone
- F. Provide all required adapters, interfaces, hardware, connections, programming, etc., as required for fully operational connection to both the existing facility Nortel Norstar telephone system, as well as to the proposed Nurse Call system.
- G. Provide at each Nurse's Station a custom built battery charging station with chargers for all Portable Telephone Handsets assigned to that Nurse's Station, plus 25% spare batteries (minimum two (2)). The charging station shall provide concealment, internal to the station, for all cords/power adapters associated with the chargers, and shall provide internal power strips for connection of the power adapters, with a single cord and plug connection, with six (6) foot cord for connection to a local emergency power system critical branch receptacle. Provide ventilation holes and a positive ventilation fan in side of charging station to minimize heat build-up from power adapters. The charging station shall be suitable for either wall or desk mounting, and shall be finished in plastic laminate to match finish other surfaces in the Nurse's Station. Plastic laminate finish shall be as selected by the Architect. Exact location shall be as directed by Architect in field. Submit drawings of the proposed charging station and samples of plastic laminate finish for approval prior to fabrication.

2.6 Alpha-Numeric Pagers:

- A. Provide Alpha-Numeric Pagers for each Cottage/Nursing Unit for use both in receiving nurse call system calls. The Alpha-Numeric Pagers shall be fully compatible with the proposed Nurse Call system.
- B. Alpha-Numeric Pagers shall be Scope Geo 40AZ. The pages shall provide a two (2) line display, with 20 characters per line. The pagers shall provide the following features:
 - 1) Bright 20 character x 2 line display
 - 2) 6 addresses (selectable)
 - 3) Frequency programmable (synthesized)
 - 4) Lockable alert modes
 - 5) Pulsed vibrate modes
 - 6) Over the air switch off
 - 7) Urgent call alert mode
 - 8) Anti-tamper modes. Almost all functions can be 'locked' or disabled.
 - 9) Address and frequency 'hand' programmable
- C. Provide belt clip/holster for each pager.
- D. Provide protective rubber boot with lens for each pager.
- E. Paging System Broadcast Unit:
 - 1) Paging System Broadcast Unit shall be Scope Connexions 2, or approved equal.
 - 2) The system shall use UHF POCSAG signaling format ensures excellent propagation even in difficult environments.
 - 3) The system shall have a range of up to a mile with basic antenna. Provide a signal strength survey of the facility, before and after installation, to ensure 100% coverage of the buildings and grounds. Provide external antennas or amplifiers if necessary to provide full coverage.
 - 4) The system shall accept up to 9,999 pagers without expansion
 - 5) Provide with all required hardware, software, cables, etc. for fully functional interface to the Nurse Call system.
- F. Provide the following quantity of Alpha-Numeric Pagers for each Cottage:
 - 1) Cottage A – Immaculate Conception – Assisted Living/Skilled Nursing Swing Unit: 4
 - 2) Cottage B – Our Lady of Fatima – Skilled Nursing Unit: 8
 - 3) Cottage C – Our Lady of Lourdes – Independent Living Unit: 8
 - 4) Cottage D – St. John of God – Independent Living Unit: 8
 - 5) Cottage E – St. Joseph – Skilled Nursing Unit: 8
- G. Provide all required adapters, interfaces, hardware, connections, programming, etc., as required for fully operational connection to both the existing facility Nortel Norstar

telephone system, as well as to the proposed Nurse Call system.

- H. Provide at each Nurse's Station a custom built battery charging station with chargers for all Alpha Numeric Pagers assigned to that Nurse's Station, plus 25% spare (minimum two (2)). The charging station shall provide concealment, internal to the station, for all cords/power adapters associated with the chargers, and shall provide internal power strips for connection of the power adapters, with a single cord and plug connection, with six (6) foot cord for connection to a local emergency power system critical branch receptacle. Provide ventilation holes and a positive ventilation fan in side of charging station to minimize heat build-up from power adapters. The charging station shall be suitable for either wall or desk mounting, and shall be finished in plastic laminate to match finish other surfaces in the Nurse's Station. Plastic laminate finish shall be as selected by the Architect. Exact location shall be as directed by Architect in field. Submit drawings of the proposed charging station and samples of plastic laminate finish for approval prior to fabrication.

3 PART 3 – INSTALLATION

3.1 Installation:

A. Wiring Method:

- 1) Install cables in raceways except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used.
- 2) All Nurse Call System wiring shall be UL-listed for use in air handling plenums, including plenum ceilings.
- 3) Conceal cable and raceway except in unfinished spaces.
- 4) All wiring associated with the Nurse Call System shall be color coded violet/purple. Color coding shall preferably be provided through the use of cabling with a violet/purple outer jacket. Where such wiring is not available, color coding may be provided by wrapping each cable with violet/purple electrical tape, suitable for use in air handling plenums, at intervals not to exceed 5'-0" on center, and for the last 6" of each cable run at each end.
- 5) Install cables without damaging conductors, shield, or jacket.
- 6) Do not bend cables, in handling or in installing, to smaller radii than minimums recommended by manufacturer.
- 7) Pull cables without exceeding cable manufacturer's recommended pulling tensions.
 - (a) Pull cables simultaneously if more than one is being installed in same raceway.
 - (b) Use pulling compound or lubricant as necessary. Use compounds that will not damage conductors, insulation or exterior cable sheath.
 - (c) Use pulling means, including fish tape, cable, rope, and basket-weave wire or cable grips that will not damage media or raceway.

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- 8) Install exposed raceways and cables parallel and perpendicular to surfaces or exposed structural members, and follow surface contours. Secure and support cables by straps, staples, or similar fittings designed and installed so as not to damage cables. Secure cable at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, or fittings.
- 9) Wiring within Enclosures: Provide adequate length of conductors.
- 10) Separation of Wires: Separate speaker-microphone, line-level, speaker-level, and power wiring runs. Run in separate raceways or, if exposed or in same enclosure, provide 12-inch minimum separation between conductors to speaker microphones and adjacent parallel power and telephone wiring. Provide separation as recommended by equipment manufacturer for other conductors.
- 11) Splices, Taps, and Terminations: Make splices, taps, and terminations on numbered terminal strips in junction, pull, and outlet boxes, terminal cabinets, and equipment enclosures. Install terminal cabinets where there are splices, taps, or terminations for eight or more conductors.
- 12) Impedance and Level Matching: Carefully match input and output impedances and signal levels at signal interfaces. Provide matching networks if required.
- 13) Identification of Conductors and Cables: Retain color-coding of conductors and apply wire and cable marking tape to designate wires and cables so all media are identified in coordination with system wiring diagrams. Label stations, controls, and indications using approved consistent nomenclature.
 - (a) Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
 - (b) Label exposed cables at intervals not exceeding 15 feet.
 - (c) Prepare cable administration drawings to show building floor plans with cable administration point labeling. Identify labeling convention and show labels for terminal hardware and positions, cables, stations and devices and equipment grounding conductors.
 - (d) Category-5 or better wire termination will be connectorized according to ANSI Standard T568A using LED Dome Lights or Corridor Junctions to rooms and bus on main control.

3.2 Grounding:

- A. Ground cable shields and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other signal impairments.
- B. Signal Ground Terminal: Locate at main equipment cabinet. Isolate from power system and equipment grounding except at connection to Telecommunications Grounding Busbar at Communications Hub Room.
- C. Grounding Provisions: Comply with requirements in Division 16 Section "Grounding and Bonding."

3.3 Field Quality Control:

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- A. **Manufacturer's Field Service:** Provide the services of a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
- B. **Test Procedure:** Comply with the following:
- 1) **Schedule tests** a minimum of seven days in advance of performance of tests.
 - 2) **Report:** Submit a written record of test results.
 - 3) **Operational Test:** Perform an operational system test, and demonstrate proper operations, adjustment, and sensitivity of each station. Perform tests that include originating station-to-station and all-call messages and pages at each nurse call station. Verify proper routing, volume levels, and freedom from noise and distortion. Test each available message path from each station on the system. Meet the following criteria:
 - (a) **Speaker Output:** 90 dB plus or minus 3 dB, 300 to 3000 Hz, reference level threshold of audibility 0 dB at 0.02 millipascals of sound pressure.
 - (b) **Gain from patient's bedside station to nurse station,** with distortion less than 65 dB (plus or minus 3 dB, 300 to 3000 Hz).
 - (c) **Signal-to-Noise Ratio:** Hum and noise level at least 45 dB below full output.
 - 4) **Test Procedure:**
 - (a) **Frequency Response:** Determine frequency response of two transmission paths by transmitting and recording audio tones.
 - (b) **Signal-to-Noise Ratio:** Measure the ratio of signal to noise of the complete system at normal gain settings, using the following procedure: Disconnect a speaker microphone and replace it in the circuit with a signal generator using a 1000-Hz signal. Measure the ratio of signal to noise and repeat the test for four speaker microphones.
 - (c) **Distortion Test:** Measure distortion at normal gain settings and rated power. Feed signals at frequencies of 300, 400, 1000, and 3000 Hz into each nurse call equipment amplifier, and measure the distortion in the amplifier output.
- C. **Retesting:** Rectify deficiencies indicated by tests and completely retest work affected by such deficiencies at Contractor's expense. Verify by the system test that the total system meets these Specifications and complies with applicable standards. Report results in writing.
- D. **Inspection:** Verify that units and controls are properly labeled and interconnecting wires and terminals are identified.
- E. **Occupancy Adjustments:** When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting sound levels and controls to suit actual occupied conditions. Provide up to three visits to Project during other-than-normal operating hours for this purpose.

3.4 Training:

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- A. Train Owner's Nursing Staff in the programming and full operation of the system. Training shall be provided by the system's factory authorized supplier. Provide a minimum of four (4) hours of training. Provide a minimum of two (2) identical training sessions, to accommodate Nursing personnel on different shifts.
- B. Train Owner's maintenance personnel in the procedures and schedules involved in preventive maintenance and in programming, operating, adjusting, troubleshooting, and servicing of the system. Training shall be provided by the system's factory authorized supplier. Provide a minimum of four (4) hours of training. Provide a minimum of two (2) identical training sessions, to accommodate Owner's Maintenance and Operations on different shifts.
- C. Coordinate a mutually agreeable time for training with the Owner, a minimum of seven (7) days in advance of the training session.

***** END OF SECTION *****

SECTION 16730

ACCESS CONTROL SYSTEM

1 **PART 1 – GENERAL**

1.1 **Related Documents:**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections and Section 16010 General Electrical Requirements apply to this Section.

1.2 **Definitions and Acronyms:**

- A. ABA Track: Magnetic stripe that is encoded on track 2, at 75-bpi density in binary-coded decimal format; for example, 5-bit, 16-character set.
- B. AGC: Automatic gain control.
- C. B/W: Black and white.
- D. CCD: Charge-coupled device.
- E. CCTV: Closed-circuit television.
- F. Central Station: A PC with software designated as the main controlling PC of the security access system. Where this term is presented with initial capital letters, this definition applies.
- G. Controller: An intelligent peripheral control unit that uses a computer for controlling its operation. Where this term is presented with an initial capital letter, this definition applies.
- H. CPU: Central processing unit.
- I. Credential: Data assigned to an entity and used to identify that entity.
- J. dpi: Dots per inch.
- K. DTS: Digital Termination Service: A microwave-based, line-of-sight communications provided directly to the end user.
- L. File Server: A PC in a network that stores the programs and data files shared by users.
- M. GFI: Ground fault interrupter.
- N. Identifier: A credential card, keypad personal identification number or code, biometric characteristic, or other unique identification entered as data into the entry-control database for the purpose of identifying an individual. Where this term is presented with an initial capital letter, this definition applies.
- O. I/O: Input/Output.
- P. LAN: Local area network.
- Q. LCD: Liquid-crystal display.
- R. LED: Light-emitting diode.
- S. Location: A Location on the network having a PC-to-Controller communications link, with additional Controllers at the Location connected to the PC-to-Controller link with RS-485 communications loop. Where this term is presented with an initial capital letter, this definition applies.
- T. MPEG: Moving picture experts group.
- U. NTSC: National Television System Committee.
- V. PC: Personal computer. This acronym applies to the Central Station, workstations, and file servers.
- W. PCI Bus: Peripheral component interconnect; a peripheral bus providing a high-speed data path between the CPU and peripheral devices (such as monitor, disk drive, or network).
- X. PDF: (Portable Document Format.) The file format used by the Acrobat document

- exchange system software from Adobe.
- Y. PIR: Passive infrared.
 - Z. Protected or Protection Zone: A space or area for which an intrusion must be detected and uniquely identified, the sensor or group of sensors assigned to perform the detection, and any interface equipment between sensors and communication link to central-station control unit.
 - AA. RFI: Radio-frequency interference RF: Radio frequency.
 - BB. ROM: Read-only memory. ROM data are maintained through losses of power.
 - CC. RS-232: An TIA/EIA standard for asynchronous serial data communications between terminal devices. This standard defines a 25-pin connector and certain signal characteristics for interfacing computer equipment.
 - DD. RS-485: An TIA/EIA standard for multipoint communications.
 - EE. Standard Intruder: A person who weighs 100 lb. (45 kg) or less and whose height is 60 inches (1525 mm) or less; dressed in a long-sleeved shirt, slacks, and shoes.
 - FF. Standard-Intruder Movement: Any movement, such as walking, running, crawling, rolling, or jumping, of a "standard intruder" in a protected zone.
 - GG. TCP/IP: Transport control protocol/Internet protocol incorporated into Microsoft Windows.
 - HH. TWAIN: (Technology without an Interesting Name.) A programming interface that lets a graphics application, such as an image editing program or desktop publishing program, activate a scanner, frame grabber, or other image-capturing device.
 - II. UPS: Uninterruptible power supply.
 - JJ. WAN: Wide area network.
 - KK. WAV: The digital audio format used in Microsoft Windows.
 - LL. Wiegand: Patented magnetic principle that uses specially treated wires embedded in the credential card.
 - MM. Windows: Operating system by Microsoft Corporation.
 - NN. Workstation: A PC with software that is configured for specific limited security system functions.
 - OO. WYSIWYG: (What You See Is What You Get.) Text and graphics appear on the screen the same as they will print.

1.3 System Description:

- A. The Access Control System shall include, but is not necessarily limited to:
 - 1. Head-end Hardware and Software
 - 2. Field Panels
 - 3. Cards, Fobs and Readers
 - 4. Electric Locks
 - 5. Electric Strikes
 - 6. Request-to-Exit Devices
 - 7. Raceways, Pathways and Wiring

1.4 Related Sections:

- A. Architectural Section - Door Hardware
- B. 16721 – Fire Alarm System
- C. Door Monitoring System
- D. Existing Roam Alert System
- E. Section 16741 " Data, Voice, and Video (RF) Structured Cabling and Outlet System."

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1.5 Submittals:

- A. General: Submit the following according to Division 1 Specification Sections and Section 16010, "General Electrical Requirements."
- B. Product Data and Shop Drawings: Submit these items, and the Certifications specified below, as a complete package. Submittal will not be reviewed if it is incomplete.
 - 1. A complete schedule of equipment and materials that are to be furnished for the work. Manufacturer's specifications or cut sheets for each major component.
 - 2. Complete drawings of equipment cabinets, racks and special assemblies. Each drawing shall show all equipment with its manufacturer and model number.
 - 3. Complete drawings detailing installation locations of equipment, cable quantities and types with terminal block or patch panel locations.
- C. Provide complete Special System Drawings as specified in Section 16010, showing the location of all devices, equipment, interfaces and wiring. Update drawings to reflect as-built conditions, including final outlet and jack designations/addresses. Include copies of as-built drawings as a part of the project Operating and Maintenance Manuals.
- D. Provide Operation and Maintenance Manuals, as specified in Division 1 and Section 16010, for work specified in this Section. Include complete service information, including schematics, prints of the Special System Drawings, interconnecting diagrams for this particular project, and parts lists to permit quick and efficient maintenance and repair of the equipment by a qualified technician. Provide a separate binder with copies of all system test reports.

1.6 Performance Requirements

- A. System Overview:
 - 1. The contractor shall provide and install a new integrated security management system that shall provide a simple and easy-to-use graphical user interface. The system shall provide local operational control of all access points and alarm sensors.
 - 2. The system shall carry the UL mark, and shall meet the requirements of UL294.
 - 3. The manufacturer of the proposed system shall have been producing access control products for at least 20 years and shall be ISO 9000 and 9001 certified. The manufacturer shall be a Microsoft Certified Partner. System shall meet Microsoft requirements for "Designed for Microsoft Windows 2003 Server" and "Designed for Windows XP".
 - 4. The manufacturer shall supply, immediately upon request, a VPAT statement showing support for Section 508.
 - 5. The manufacturer of the proposed system shall require resellers to pass a formal training program prior to being certified as authorized to sell and install the system. Such certification shall require annual re-qualification. The system integrator proposing the system shall be in possession of such a certification.

6. The Security Management System (SMS) client and server software shall be used in conjunction with intelligent controllers to provide a distributed access control and alarms monitoring system. In the event of a communications failure between the host server and the field controllers, the controllers shall continue to make local access control decisions and save all transactions in memory until communications are restored. At that time the controller shall upload all stored transactions to the server.
7. The SMS shall seamlessly integrate the functions of access control, alarms monitoring and response, digital video imaging and badge design/creation, and visitor management. All SMS components shall run in an integrated application environment as part of a single application.
8. Language packages in over 15 languages shall be available without incurring additional costs.

B. Required Access Control Hardware Features:

1. The SMS hardware shall be comprised of modular components that connect over standard interfaces to one another. There shall be a database storage and processing module (DBU), and once data has been downloaded to the DBU it shall locally make access control decisions. Access granted or denied decisions shall be made in under 0.5 seconds.
2. The DBU shall store firmware in non-volatile flash memory to allow for convenient updates through the head-end software application. The DBU shall store the cardholder and configuration database information in battery-backed memory so that loss of primary power will not cause the loss of the database.
3. The DBU shall support configurations that include: 16 card readers, 96 monitored input points, or 32 auxiliary output points.
4. There shall be an intelligent controller option to provide control of 8 readers/doors from a single circuit board (communications, memory, CPU, and reader/door functions integrated) with an available 8-reader/door add-on to provide a 16-door controller from two circuit boards. The 8-door controller shall provide an integrated on-board RS-232 interface, and shall have provisions for modular expandable memory.
5. There shall be an option for hardware made with a lead-free manufacturing process to meet RoHS requirements.

6. Communication Schemes:

(a) Hardwired Communications

- (1) The field panels shall be located convenient to the access and monitor points that they control, and shall be interconnected in a chain configuration to a serial port of a convenient client PC on the system.
- (2) The system shall support a minimum of 31 intelligent field panels (nodes) daisy-chained together such that they communicate back

to a single serial communications port at the host.

- (b) Bi-Directional Communications - A chain of field panels shall be wired in a loop configuration, by the addition of a cable from the last controller and connecting it into a second port on the PC. When this configuration is installed, should a break in the cable occur, the PC shall be able to communicate with the nodes after the break, via the secondary port._
- (c) Dial-Up Communications - Remote sites with field panels shall also have the ability to be centrally administered and monitored using low cost dial-up connections via autodial/auto-answer modems with each site storing all access activity for up-loading during periodic calls to update the central history log. Should an alarm occur, the remote site shall immediately call and report the incident.
- (d) Secondary Dial-In Alarms - Installations involving large quantities of remote dial-up sites shall have the ability to be configured with a secondary port, which is dedicated to receiving any alarms from the remote sites. This feature shall ensure that alarms can still be received even if the primary line is busy, for example, if card administration updates are occupying this telephone line._

7. Network Communications

- (a) The first field panel in a chain of panels shall have the ability to communicate with its monitoring client PC over the local or wide area network. This shall be achieved by the addition of a network interface option module and provide a cost effective alternative configuration to a direct connection via a client PC's serial port. The network interface shall support both "10 base T" and "100 base TX" (10/100) communications speeds. The network interface shall support encryption utilizing either TwoFish or AES algorithms.
- (b) An optional modem and telephone line shall be configured to provide an alternative path for the reporting of alarms. The fallback to dial-up alarms reporting shall be automatic in the event of detecting a network communications failure.

8. Efficient Memory Management:

- (a) Controllers shall be capable of supporting cardholder populations of at least 200,000, or be configured to a learning mode that allows the cards most frequently used to have their access rights stored locally in the panel's memory.
- (b) When a card is presented which is not resident in the local panel, a verification request shall be made to the central database, if the card is valid the details shall be downloaded. If the card memory is full, the card with the oldest transaction date shall be deleted to make space for the card requested. This shall allow automatic management of cardholders, based upon frequent users having "instant" response and infrequent users learned when required.

9. Elevator Control:

- (a) The system shall have the ability to provide elevator access control by (1) using a card reader to activate the elevator call button, (2) using a card reader in the cab to activate the correct floor selection button, or (3) a combination of both of these functions. The system shall have special field panels specifically designed to handle inputs and outputs used to interface with the elevator controls.
 - (b) The panels specifically designed for elevator control shall support either a single elevator cab for up to 64 floors, or up to 4 elevator cabs for up to 16 floors each.
 - (c) Each cardholder shall then have floor permissions assigned as part of the normal access rights. The system shall provide outputs to the elevator controls to uniquely verify which floors are authorized for each cardholder. The system shall be capable of tracking which floor was enabled/selected by that person.
10. Database Synchronization:
- (a) To ensure synchronization of the distributed controllers' databases with a region's main database an internal checking process shall be provided within each controller. In the event of corruption of a controller's local database then it shall be able to detect this condition and automatically request the relevant data to be downloaded from its local server. This action shall not require Operator intervention.
 - (b) The system shall continue to provide access control functionality during this re-synchronization process.
11. Door lock release relays shall be minimally rated for 3 A @ 30 VDC.
12. Readers supporting various technologies shall provide data from card presentations, key fob presentation or biometric authentications through a door control unit (DCU) that includes the electrical interface to the reader as well as inputs for door sensors and form C relays for outputs.
13. The DCU shall support Wiegand communications to the reader. In order to provide higher levels of security, the DCU shall support bi-directional, supervised, and encrypted communications to the reader. Door controllers that do not support encryption and supervision of reader communications are not considered equal.
14. The controller shall support a direct serial connection to the Edge Network Video Server (ENVSTM) for alarm transmission.
15. The system shall support an option to store cardholder biometric information (e.g. fingerprint or hand geometry templates) at the panel (as part of the cardholder record). Storage of the template data at the reader shall be unacceptable. An acceptable alternative is to store individual templates on secure smart cards.
16. The SMS hardware shall support all of the following options for supervision of the monitored input points:

- (a) 2-state supervision – in which only secured and alarm state are indicated.
- (b) 3-state supervision – in which the input state can be secure, alarm or open circuit.
- (c) 4-state supervision – supports secure, alarm, short circuit and open circuit states.
- (d) 6-state supervision – supports secure, alarm, short or open circuit for the sensor in addition to tamper alarm and tamper short circuit states.

C. High Availability and Disaster Recovery:

- 1. To provide greater client software availability, software shall be installed so that in the event of a database server failure, client machines will quickly and without operator intervention, automatically connect to a standby server machine.
- 2. This configuration shall utilize the industry standard Microsoft clustering solution and allow for an installation with a large number of client machines, the ability to continue to operate without interruption, while the cause of the main server failure is investigated.
- 3. The SMS product shall be capable of supporting options for 99.99% and 99.999% availability.
- 4. The SMS product shall support a disaster recovery solution using off-site database replication.

D. Bandwidth Utilization:

- 1. The proposal shall include documented manufacturer's evidence of network bandwidth utilization including plots and supporting data, covering all aspects of normal system operation. Proposal submissions without supporting documentation will not be considered or evaluated.

E. Encryption

- 1. Encryption falls into two distinct areas, firstly between clients and their Server, secondly between client and local area network panels (LAN Nodes). LAN node links shall support TwoFish and AES encryption between the supervising client PC and its LAN Chains.
- 2. For client to server connections, the SMS shall support a solution using industry standard network cards, such as the Intel Pro 100s, which support IPsec and 3DES encryption.
- 3. Web-based (thin client) SMS clients shall use 128-bit SSL encryption.

F. Required Standard Software Features:

The following software features shall be part of the standard product offering without requiring additional purchase or licensing:

- (a) The installation of the server and client software shall utilize a "wizard" interface to guide users through the appropriate installation steps.

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- (b) The SMS shall start up as part of the Operating System. The SMS shall run as a service in the OS, and there shall be no requirement to run an application after the operating system is ready.
- (c) The SMS shall support a Graphical User Interface that minimizes training needs for even inexperienced users. The software shall include on line help displays to eliminate operator reference manuals.
- (d) The SMS software shall be run using standard x86-based hardware, and the operating system shall be Microsoft Windows as follows:
 - (1) SMS server shall run on Windows 2000 Server, Windows 2003 Server or later Microsoft Server Software.
 - (2) SMS clients shall run on Windows 2000 Workstation or Windows XP Professional.
 - (3) System shall meet Microsoft requirements for "Designed for Microsoft Windows 2003 Server" and "Designed for Windows XP".
- (e) The server shall use Microsoft SQL Server 2000® database server. The only acceptable alternative is to use Microsoft Desktop Engine (MSDE). The system shall allow other authorized applications to gain access to the system's database should wider integration of the system at the site become a requirement.
- (f) The system shall use Microsoft Message Queue (MSMQ) for handling transactions between server and clients as well as between server and field hardware. Use of first-in-first-out (FIFO) buffers shall not be acceptable.
- (g) It shall be possible to select any function, within a given Operators permission, independent of the currently displayed screen. Functions will be accessed via tool bar Icons, which will include Help prompts that will appear when the mouse pointer dwells on the selection button. It shall also be possible to link any standard Windows application to a custom toolbar icon.
- (h) A print screen command icon shall be provided, subject to an individual Operator's permission, for all screens and will allow the currently displayed information and screen presentation to be printed.
- (i) The system shall support an unrestricted number of time codes. Furthermore, the system shall support a minimum of 10 intervals per time code.
- (j) The SMS shall support an unrestricted number of time intervals. A time interval is a defined span of time such as "08:00 to 17:00" as "Business Hours". Time intervals shall be permitted to span midnight, such as "20:00 to 05:00" as "Third Shift".
- (k) The system shall be scalable to a multiple-server implementation where each region (either geographical or logical) has a server capable of making local decisions and configuration changes. The Global head-end server responsible for managing the entire enterprise including all regional servers shall support a minimum of 999 regional servers.
- (l) Operator Permissions:
 - (1) System operators shall be associated with a log in Name and Password. A system option will determine whether strong operator passwords will be used. The minimum definition of a strong password shall be a password that contains at least one upper case character, one lower case character, one numeral and one

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punctuation mark, with a minimum password length of six characters. Additionally the password cannot contain any full word of the operator's username.

- (2) The option to use a Secure Biometric or Smart card for system logon shall be provided. When used, this option will force the operator to present their Name, Password and Biometric or Smart card.
- (3) Operators shall be assigned to permission profiles. This will determine the functions that will be available to that operator when logged-on to the system. Each operator is required to only see the functions for which s/he has access. The system shall support an option to hide Personal Identification Numbers of cardholders when an operator is viewing a record.
- (4) Card record data entry shall be divided into operator permission areas, allowing separate permission categories to be assigned for the viewing of personal data, ID badge printing and access right management.
- (5) The SMS shall support an unrestricted number of operators and operator permission profiles.
- (6) For all operators, a means of re-arranging their Icon tool bar shall be provided to allow the most frequently used Icons to be repositioned by the operator.
- (7) The system shall store operator preferences based on logon information. This feature shall allow an operator to work with their preferred configuration independent of which workstation they occupy.

(m) Video Imaging and ID Badge Printing:

- (1) The system shall incorporate video imaging as a fully integrated function to customize access control cards by printing an identity badge directly onto the card. The badge design and image capture capabilities shall combine with the latest technology card printers to allow the production of an ID badge pass for each card holder at the time of registration.
- (2) For each cardholder both a facial image and a signature shall be able to be captured, or imported, and stored as part of the card record. These images shall be captured from a standard CCTV camera connected to the computer via a Video Card supporting DirectX 8 (or later) or MCI format, or imported if available as a bit map or JPEG file. The system shall use data compression techniques to ensure efficient use of the available hard disk space to maximize the number of images that can be stored on the hard disk.
- (3) Alternatively a signature may be imported from a signature capture terminal connected to the system via an RS 232 com port of the client PC local to where the card is being issued.
- (4) A comprehensive integrated badge design facility shall also be provided, allowing an unrestricted number of custom badge layouts to be defined then saved with a suitable description as a

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reference. This shall make full use of the card record details such as name, card number, inactive date as well as allowing personal data to be included in the badge design. Company logos shall be imported as bit maps or JPEG images to provide a personalized corporate appearance to the card.

- (5) All elements incorporated into the design shall be able to be rotated.
 - (6) Each badge design shall contain either a single sided design or a double-sided design. Each side of the card shall also be designated as being blank, or magnetic stripe side, or smart chip side, to ensure the designer is aware of the available space where printing may be incorporated for each card combination. The badge designer function shall be capable of supporting portrait, landscape, standard and custom-sized card designs.
 - (7) When creating a new card record a badge preview screen shall also be included that displays the specific card's details on the selected badge design to allow confirmation prior to requesting the badge to be printed.
 - (8) Each new cardholder record shall have the option to be flagged for future printing. Cards flagged in this manner shall be easily recalled at a later stage and processed for output to the printer in a single action. Selecting multiple cards for bulk printing shall also allow each card to be printed either with its specific badge design, as defined within each card's record, or alternatively printed with a selected common badge design. Encoding of magnetic stripe cards shall also be included as part of the bulk printing process.
 - (9) The SMS shall support any manufacturer's ID badge printer with a Microsoft Windows 2000 or Windows XP (depending on the workstation configuration) compatible printer driver.
 - (10) The SMS shall provide the option to encode a magstripe card during the print cycle shall also be incorporated. Applications that require on-site encoding can combine both actions in a single process.
 - (11) Each badge design shall include a default printer, validity period, and access rights.
- (n) Video Verification:
- (1) The Video Imaging option shall also provide a monitoring screen that will automatically display the stored image for a card when used at a reader. This screen shall operate in conjunction with a live video input from a CCTV camera viewing the selected access point, allowing the operator to verify that each card offered is in fact being used by the person to whom it was issued.
 - (2) This screen shall also be frozen and printed to provide a hard copy

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evidence of any abuse observed by the operator. For high security access points, the system shall be configured to not grant access until the operator has verified the stored and live images are the same person, with the door release being controlled by the system operator.

- (3) Video verification shall include the ability to monitor at least 4 portals on the same screen (for application with turnstiles, for example). This feature shall also provide the operator with a means of granting access to the individual with a single mouse click.

(o) Report Generation:

- (1) Extensive history reporting shall be a standard integrated feature; and shall include the ability to review all system alarms, access control activity, and operator actions. These reports shall be made available for review via the operator's display screen, or to a printer, or to another disk media. Extensive sort parameters shall include by any of the "Personal Details" fields or Titles, for example by "Department", and only Names commencing with "SM*".
- (2) The system shall support generation of reports detailing the system operation. The following reports shall be available in the software:
 - (i) Cards on site
 - (ii) Hours on site
 - (iii) Cardholders with access to each door
 - (iv) Access rights of each cardholder
 - (v) System Configuration
 - (vi) Scheduled and Conditional Commands defined
 - (vii) System operator transaction history
- (3) It shall be possible to replay video clips associated with events by directly interacting with the report as published to the computer screen.
- (4) The system shall demonstrate the ability to export data, for example reports, to other standard office word processing packages such as Microsoft Word®.
- (5) The system shall provide system management reporting, including detailed listings for all the operator actions and the current cardholder database for output to the display screen, printer or disk media.
- (6) The system shall have the ability to save frequently used report configurations and associate them with a "Title". Such predefined reports shall be available from a list to simplify the report selection. It shall be possible to request these reports to run immediately or schedule them to occur at a specified date and time.

- (7) Scheduled reports shall additionally have the option to be automatically repeated by specifying the number of days and reporting period to be included, for example a weekly report of Alarms to run at 10:30 am each Monday and including the previous 7 days of Alarms.
- (8) The system shall allow custom reporting options by providing an interface to a commercially available 'off the shelf' reporting product, such as Crystal Reports. The interface shall present all database fields in a structured format, which does not require detailed knowledge of the database design and table relationships.
- (9) History Reporting:
 - (i) Extensive reporting shall be included to provide the ability to review all system alarms, access control activity and operator actions. These reports shall be available for review on the operator's display, to a printer, or to a file.
 - (ii) Extensive sort parameters shall include any of the personal details fields of information such as by department, job title, vehicle registration, contractor company name or any other reference appropriate for each site.
 - (iii) Frequently run report configurations shall be saved allowing them to be selected and run on demand, or scheduled to run automatically as required. When scheduled to run automatically this shall have the ability to be repeated.
 - (iv) Total Hours Spent On-Site – This report shall provide a detailed audit of the arrival and departure times for cardholders and calculates the total time spent on site for the chosen reporting period. This report shall be filtered by any of the personal data fields of information associated with each cardholder.
 - (v) Cards On-Site Reporting - This report shall provide a list of cardholders currently on the site. This may be for all persons within the site or just who, for a particular department or a particular contractor company, is currently present. The report may also be run to cover just a part of the site, for example, cardholders is in a particular building or room.
- (p) The SMS server shall communicate to all clients (operator workstations and field hardware) through WIN32 services. The SMS server shall not require that an application be run for proper system operation.
- (q) Clients:
 - (1) The system shall support an unrestricted number of clients to suit growing enterprise requirements. The system shall provide the

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means for multiple operators to simultaneously administer the system from convenient locations connected via a local area network (LAN) or across a wide area network (WAN).

- (2) Systems that operate on the MSDE database server that restrict the number of clients shall be upgradeable to a fully unrestricted version of the software without the need for a database conversion.
 - (3) Clients shall not use mapped drives for server connections.
 - (4) Clients shall not use UDP messaging.
 - (5) System shall support a minimum of two client pc monitors. The system shall additionally store the last position and size of all open dialog boxes and screens upon exiting the application on a per operator basis. The next time the operator logs into the application, the screen positions shall be restored. Such operation shall be independent of which workstation the operator uses.
- (r) Addition of Cardholders to the System Database:
- (1) The system shall provide a means of assigning access control rights to each cardholder. Access control rights determine which access points are accessible to the cardholder based on date and time of day. The system shall support an unrestricted number of access rights.
 - (2) The software shall also provide an ALTERNATE set of Access rights to a cardholder on a temporary basis. The change may be initiated at any time by an authorized operator, or automatically between specified dates. This shall provide the facility of automatically changing a card's rights between a specified date range, after which the card will revert to its normal Doors and Times. Alternate access rights shall be able to be configured for multiple date ranges.
 - (3) Each cardholder shall either be associated with standard door timings, for door release, door open and door pre-held or be given extended timings for disabled persons or someone who has to push a cart.
 - (4) Cardholders who have not used a reader for some time shall be readily listed to allow their card's status to be reviewed. An additional feature shall allow cardholders to be automatically set inactive and therefore access denied should the card have not been presented at any reader on the system for a defined number of days.
 - (5) Cardholders shall be assigned an expiration date, and more specifically an expiry time, after which a card shall automatically become inactive and therefore be rejected at all readers on the

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system. To further simplify card administration, the system shall have the ability to be configured to automatically purge expired cardholder records after a configurable number of days from the date of expiration.

- (6) The system shall allow for the definition of Access control rights to be associated with a badge design. Each user that selects that badge design shall be provided with the associated access control rights that can further be customized for the specific cardholder.
- (7) The system shall allow access control rights to be defined for a cardholder on a reader basis. A time code will be associated with each reader as it is assigned to the cardholder's access control rights.
- (8) The system shall allow access control rights to be defined for a cardholder on a reader group basis. Reader groups are groups of readers. A time code will be associated with each reader group as it is assigned to the cardholder's access control rights.
- (9) The system shall allow access control rights to be defined for a cardholder on an access code basis. An access code is a group of access control rights.
- (10) The system shall have a note field associated with each cardholder record. The note field shall be free form text and shall support a minimum of 256 characters. The note field shall further support the ability to attach a file (of any type or size) to the cardholder record.
- (11) When viewing a cardholder record the last twenty-five (25) valid door access transactions shall be displayed to help locate a cardholder.
- (12) A driver's license scanner shall be supported to simplify data entry of cardholder information. The scanner support shall include, at a minimum, the ability to automatically read, through optical character recognition, the most common fields from valid driver's licenses issued by all 50 states; and populate these fields into the appropriate user-defined personal data fields in the cardholder record.
- (13) m. The system shall support a field for assigning an approving official to the cardholder record that defines the individual who authorized the assignment of a credential. Approving officials shall have an associated validity period and image of their signature. As an option, the assignment of an approving official shall be mandatory.
- (14) The SMS shall allow the user to enroll biometric data as part of the cardholder enrollment process. The number of verifications to determine applicability of the enrolled biometric data shall be configurable.

(s) Cardholder Details:

- (1) Cardholder information shall include first and last name, card number, PIN code and valid period to provide automatic expiration. Each cardholder record shall also incorporate at least 50 user-defined personal data fields, independent of user-defined fields for visitor management.
- (2) Data entry shall be simplified by remembering previous entries of personal data and allowing selection from a pick list to minimize repetitive typing when creating each cardholder's record. The cardholder database and the history log shall also be sorted by any of the additional fields of information making them a powerful tool for filtering data.
- (3) Personal data fields shall support free entry text, picking an entry from a previously configured list, or picking an entry from an updatable list. Each of these entries shall further be categorized as a date, a time, general input, or customized input. Each category shall support the masking of input data to assure data integrity. For instance, a date mask might look like "mm/dd/yyyy" to indicate that the date input should be a two-digit month followed by a two-digit day followed by a four-digit year all separated by the slash character. The mask shall be required for customized input.
- (4) Personal data fields shall have the option of being configured as mandatory.

(t) Locator – This feature shall provide a quick method of locating cardholders by displaying the last 25 valid history events along with the time, date and access point used. This information shall be available for an individual or group of persons by name, card number or by personal data.

(u) Card Watch Feature – Any cardholder shall be easily tracked as they move around a large site by selecting card watch. As the person uses their access control card, the system shall have the ability to automatically notify the operator of the person's presence at each location.

(v) Key Card Mode:

- (1) Key card mode authority shall be assigned to special cardholders, such as site key holders, and can be enabled on a per reader basis. This shall allow a person when vacating an area or building to change the reader's mode of operation from normal access control to Key Card Out operation.
- (2) When in this condition only persons with key card privileges shall gain access through the door, all non-key card users are rejected regardless of their card's current access rights.
- (3) This special feature shall be activated/deactivated by the key cardholder, using a card swipe followed by a special code entered

via the reader's keypad.

- (w) Serial Device Interface The software shall allow the definition of ASCII commands to be sent out over a computer serial port (physical or virtual) or through the RS-232 interface of the DBU. These serial commands shall be available through the user interface as well as in the conditional logic described herein.
- (x) Automatic Holiday Override:
 - (1) The software shall be programmed by the operator to recognize special or holiday dates, which in turn can be linked to operational changes in how the site is to be managed on these specific days. This feature shall notify a system operator of individual holiday dates up to seven days prior provides a useful check on the date's current validity. Multiple types of holiday dates shall also be provided so that partial days or early closing requirements on specific dates can be accommodated.
 - (2) The SMS shall provide a calendar function to enable scheduling of events up to five (5) years into the future.
 - (3) The SMS shall provide the ability to schedule one-time events for up to five (5) years into the future.
- (y) System Partitioning:
 - (1) The access point readers, monitor points, and auxiliary outputs shall be managed on a partition basis by simply defining which devices are to be included in a partition.
 - (2) The SMS shall support an unrestricted number of partitions.
 - (3) Multiple private or public entities shall be able to share the system with database segregation for card records and ownership of readers, monitor point inputs and switching outputs dependent upon the operators assigned permissions. Each company partition shall allow for autonomous system administration, allowing partitioned card administration, reports, and alarms.
 - (4) Operator permissions shall be created and assigned globally or by the owning company. When created and assigned globally an Operator's password shall be associated with one or more companies.
 - (5) Alarm reporting shall be routed to a client located at the company owning the monitor point or reader and can be automatically redirected to a different PC at pre-programmed times and selective days of the week.
 - (6) Common areas, such as the main entrance, shall have the ability to be shared so that all parties may access these doors, even when different card customer/site codes have been configured.

(z) Alarm Management:

- (1) Alarm handling shall be efficiently managed with up to 99 priority levels and user definable instruction messages to ensure the operator monitoring the site takes appropriate responses. The facility shall have the ability to customize audible alerts for each type of alarm is provided using standard or custom generated multimedia wave files. Each alarm type shall also be presented in a user-defined color.
- (2) To provide additional information when reviewing alarm signals, the operator shall either enter custom comments or simply select from a predefined pick list to provide a time-stamped record of all the actions taken throughout the incident. Predefined manual commands shall be uniquely assigned for each alarm, and readily activated by the operator via a command button provided on the alarm acknowledgement screen. Additionally automatic conditional commands shall be configured to automatically operate in response to any given alarm condition.
- (3) The SMS shall be optionally configured to require operator comments when acknowledging alarms.
- (4) The SMS shall support the ability to selectively choose alarms to acknowledge and/or clear.
- (5) Each alarm shall be configurable to have a specified color and sound.
- (6) Each alarm shall be capable of linking video from digital video recorders (if applicable) for incident playback.
- (7) The Alarm Monitor screen shall provide an indication that cardholder information is available for a specific alarm. A "Card" button shall be available that when pressed will display the cardholder badge image.
- (8) Alarm monitor screen shall support the display of alarm statistics, shall provide up to ten alarm filters to be displayed in different tabs on the alarm screen, and shall provide the ability to sort based on each different column.
- (9) Each alarm shall be time-stamped in the local time zone (not the server time zone), and the system shall support the additional display of labels associated with different geographical time zones such as PST, EST, GMT, etc. The labels for time zones shall be customizable.
- (10) The system shall permit the routing and display of real time activity at any standard client machine. Activity shall be shown in a dedicated activity window that is updated automatically when new transactions occur. This option shall not be limited to routing

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transactions to one location and shall support the simultaneous routing and display of real time activity at multiple locations.

- (11) Alarms shall be capable of being routed to specific client machines by time of day or day of week.
- (12) Unacknowledged alarms shall be capable of being routed to alternate client (or Email – see Software Options below) based on age and priority of alarm.
- (13) The display of reader door alarms shall be automatically enabled or disabled by the use of timed commands, either by reader or by a group of readers.
- (14) The system shall support a generic ASCII input capability that allows the system administrator to define specific ASCII input strings as alarms to be displayed in the alarm monitoring window as well as on the graphical map interface if so configured.

(aa) Graphical Site Maps

- (1) To further enhance the presentation to the operator, the system shall have the ability to import and use graphical maps. Maps shall be linked together using a tiered tree structure. To speed the location of an incident, each map level shall contain a clearly visible indicator as to which sub map the operator should select next to find the device that is in alarm.
- (2) Maps shall also have the ability to be configured to appear automatically on presentation of a new alarm, providing the operator with prompt visual indication that an alarm has occurred.
- (3) The status of readers, doors, monitor points and auxiliary outputs shall be requested from any map by simply selecting the icon representing the device and its current state will be displayed.
- (4) The icons on the graphic map shall dynamically indicate the status of the device they represent. For example, a door icon shall change to show the door open when the door position sensor indicates such, and shall change to the original icon when the door is again secure. Additionally, monitor points shall also change to show their current state.
- (5) Should the operator wish to change the current setting, simply pressing the right mouse button shall cause the appropriate command options list to appear for selection.
- (6) Having selected a command, confirmation shall be provided by reflecting the change in status on the display.
- (7) Maps shall be created using standard office tools such as Paint® or drawing packages such as AutoCAD®. It shall be possible to import drawings in the following formats: JPEG, Bitmap, Windows

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metafile or DXF.

- (8) Icons representing access points, monitoring points, switching outputs, alarm inputs, CCTV cameras or intercom call stations shall be placed on any map at the required location in a drag and drop manner.
- (9) It shall be possible to define on the map the location of readers, access doors, alarm monitored points, output switching relays, CCTV cameras, Digital Video Recorder Cameras, Intercom call stations and alarm panel devices. The map display shall allow the operator to switch the video display of any defined CCTV camera to any defined CCTV monitor. The map display shall allow the display of stored and live Digital Video Clips.
- (10) It shall also be possible to change the status of readers, reader groups, floor groups, alarm monitored points or output switching relays and confirm the successful execution of such commands from the map display. This functionality shall be capable of being restricted per device based on operator permission.
- (11) The map display shall include the option to display a group of similar devices as a single icon. Once devices are grouped it shall be possible to change their status. For example, it shall be possible to unlock all entrance doors by executing a single command from the map display.

(bb) Manual and Automatic Commands:

- (1) Operators shall be provided with a wide choice of manual commands embracing the control of readers, monitor points, output switching relays and door locking devices. Also the operator shall have the ability to check the status of single, or multiple devices. This shall ensure the operator is always able to check the operational status of the system and make any adjustments as requirements change. When graphical maps are utilized, status requests shall be simply initiated by "clicking" on the device icon within the map. This functionality shall be capable of being restricted per device based on operator permission.
- (2) Automatic commands shall be included and may operate on a timed or event basis.
- (3) Scheduled commands shall easily be defined linking complimentary commands to occur at the start and stop times of any chosen time code.
- (4) Event triggered commands shall provide an extremely powerful means of creating IF/THEN/WHEN associations encompassing a wide selection of IF conditions to the automatic execution of THEN commands subject to a WHEN time code being active. A minimum of 10 THEN actions shall be available per trigger command.

- (5) Devices shall be managed on a partition basis by grouping readers, monitor points and auxiliary outputs. This feature shall allow multiple devices to be actioned by a single command when using manual, timed and conditional commands. This functionality shall be capable of being restricted per device based on operator permission.
- (6) The SMS shall support an unrestricted number of automatic (scheduled and trigger) and manual commands. These commands shall be capable of spanning across multiple field controllers.

(cc) Card Initiated Commands

- (1) The software shall allow authorized cardholders to initiate powerful trigger commands manually from selected reader locations when certain models of readers are used in conjunction with the field panels.
- (2) Up to 99 predefined commands shall be invoked by an authorized card allowing, for example, a patrolling guard to switch on outputs, disable monitor points, lock doors, providing remote management of the system during a patrol of the site.
- (3) The system shall only permit assigned users to enter command codes at keypad readers. Such assigned users shall not be restricted as to when or where they can enter a command code – such restrictions may be placed on the commands themselves.

(dd) User Code Mode

- (1) The SMS shall support the ability to put a keypad-equipped reader into User Code Mode. This feature shall allow a cardholder to gain access by entering a valid card's number at a reader keypad, therefore not requiring the holder to carry a card.
- (2) User code mode shall be enabled on a per reader basis.
- (3) This mode shall support card number only, or card number and its assigned PIN code.

(ee) Visitor Management:

- (1) Visitor Management shall be incorporated as a standard feature of software. Operators shall be able to pre-enroll visitors using a Web (thin) or Standard (thick) client. The thin client shall connect to the server via Microsoft™ Terminal Services and Microsoft™ Internet Explorer to permit any operator with visitor permissions assigned the ability to pre-enroll visitors without the need to install client software on their local machine.
- (2) Visitor Management shall be fully integrated with other key areas

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of the system, such as access, alarms management, muster and Video ID Badging. Visitor records shall have 50 personal data fields with user definable data titles independent from the personal data fields defined for cardholders. All visitor transactions and movements shall be recorded and may be reported on and filtered, using the extensive reporting capabilities of the software. Visitors may exist without being assigned a card number if access control is not required.

- (3) Data entry shall be simplified by remembering previous entries of personal data and allowing selection from a pick list to minimize repetitive typing when creating each visitor's record. The cardholder database and the history log shall also be sorted by any of the additional fields of information making them a powerful tool for filtering data.
 - (4) Personal data fields shall support free entry text, picking an entry from a previously configured list, or picking an entry from an updatable list. Each of these entries shall further be categorized as a date, a time, general input, or customized input. Each category shall support the masking of input data to assure data integrity. For instance, a date mask might look like "mm/dd/yyyy" to indicate that the date input should be a two-digit month followed by a two-digit day followed by a four-digit year all separated by the slash character. The mask shall be required for customized input.
 - (5) Personal data fields shall have the option of being configured as mandatory.
 - (6) Visitor time of arrival and time of departure shall be tracked by the system. This feature shall be available even if a visitor is not issued a card or card number in the system.
 - (7) The system shall support a driver's license scanner including optical character recognition to ease data entry.
 - (8) The SMS shall support capture of a business card image.
 - (9) The SMS shall support the inclusion of a custom message for each visitor record.
- (ff) Area Occupancy Monitor:
- (1) The system shall include the ability to monitor the occupancy of an area.
 - (2) Occupancy thresholds shall be configured for the maximum and minimum values, and associated with automatic conditional commands. These shall be used for applications such as to disable the entry readers when all the garage spaces are occupied and switch a garage full indicator sign on.

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- (3) Complementary commands shall also be provided to enable the entry readers and turn off the indicator as a vehicle leaves the garage. Similarly when the garage is empty, the lights could be automatically turned off.
- (gg) Device Configuration:
- (1) The system shall support a notes field to be associated with each device configured on the system. The notes field shall be free-form text, and shall support a minimum of 256 characters. The notes field may be used for detailed device descriptions or for maintenance history. The notes field shall also allow files to be associated.
 - (2) The system shall provide a hierarchical tree view of the system configuration supporting expansion and collapse of any and all branches.
- (hh) Windows Daylight Saving Auto Adjustment:
- (1) The system shall support Windows TimeSrv or Windows Time Management.
- (ii) History Archive and System Back Up:
- (1) The system shall allow on line archiving of history logs, along with database back up of system configuration and cardholder details. To further ease the burden of remembering to back up your system's database, this function shall be able to be automated to occur without intervention at a pre-set time.
 - (2) The system backup and history archive shall be to a magnetic tape drive at the database machine, or the system may be configured with a destination drive and path located on a different PC accessible to the Database machine via the network.
- (jj) Support for Smart Cards and Biometrics:
- (1) a. The system shall have the integrated capability to capture at least two forms of biometrics – preferably fingerprint and hand geometry.
 - (2) Any proposed fingerprint solution shall support the enrollment and use of at least two fingerprints, which shall allow the cardholder to present either finger to gain entry.
 - (3) On a timed or manual basis the system shall be configurable to allow entry using the smart card only, smart card plus fingerprint or smart card plus two fingerprints, thereby raising or lowering the level of security as required.
 - (4) The system shall allow the assignment of a fingerprint for normal entry and a different fingerprint for duress entry. The cardholder

shall have the ability to trigger a silent duress alarm by presenting the duress fingerprint. This provides the cardholder with a safe way to indicate a duress condition, without alerting anyone locally that the alarm has been triggered.

- (5) An option to recall the fingerprint acceptance threshold from the smart card to override the threshold stored at the reader shall be provided. By recalling the threshold from the smart card, overall site security is not compromised by a poor quality fingerprint, which would normally require a low acceptance threshold to be set at the reader.

- (kk) The manufacturer of the SMS shall make available documentation on Server Hardening, which shall, at a minimum, detail the TCP/IP ports that are utilized by the system to allow other ports to be closed.

- (ll) Anti-Passback
 - (1) The system shall support both "hard" anti-passback and "soft" anti-passback alarm reporting modes.
 - (i) If the cardholder has access rights at a reader, but creates an anti-passback alarm, if the reader configured as hard anti-passback sends an anti-passback alarm and denies access to the door/portal.
 - (ii) Soft anti-passback sends an anti-passback alarm, but still allows access through the door/portal.
 - (2) The system shall support timed anti-passback. The principle of timed anti-passback is simple: once a card has been used at a timed anti-passback reader, the card causes an anti-passback violation if it is used again at the same or another timed anti-passback reader within a predefined period of time. The exception to this rule is when the anti-passback reader has been defined to be for an exit route. In this case, the card can be used at any time without causing an alarm or event. This allows for situations where a person enters an anti-passback-protected area, then wishes to exit the area immediately, perhaps, for example, because he or she forgotten something.
 - (3) The use of an exit anti-passback reader also causes the time delay for reuse of the card to be zeroed, so in the example, the person can re-enter the anti-passback-protected area immediately, without having to wait. The delay can also be zeroed from the Card Holders screen or by means of an anti-passback command. Sending a command may be useful if, for example, people have passed through an exit during a fire drill and the delay is long.
 - (4) The system shall support zonal anti-passback. In the case of zonal anti-passback, the building needs to be partitioned into zones. For example, zone 1 may be the main lobby, zone 2 the computer room, etc. For each reader that is defined as a zonal

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anti-passback reader, you can specify which zone of the building the card is going from and which zone it is going to. For example, the reader may allow a card to go from zone 1 (e.g. main lobby) to zone 2 (e.g. computer room).

- (5) The system remembers which zone each card is in and updates this information whenever the card is used at a zonal anti-passback reader. An anti-passback alarm or event is generated if the reader's from zone does not match the card's currently-recorded zone. For example, an alarm or event is generated if the from zone of the reader is zone 3, but the card is currently recorded as being in zone 1. If a card's currently-recorded zone and the actual zone get out of step, either because of some violation of the system (e.g. a person has previously climbed over a turnstile) or for a legitimate reason (e.g. a person has passed through a fire exit during a fire drill), some means is obviously required to bring the two back into step. This can be accomplished from the Card Holders screen or by means of an anti-passback command. Both methods put the card(s) into a "neutral zone", so that the next transaction at an anti-passback reader is always accepted without violation, and the reader's to zone becomes the card's new zone.

(mm) Elevator Control:

- (1) Each cardholder shall have floor permissions assigned as part of the normal access rights. The system shall provide outputs to the elevator controls to uniquely verify which floors are authorized for each cardholder. The system shall be capable of tracking which floor was enabled/selected by that person.

G. Required Available Software Options (to be included in the system software):

1. Data Import:

- (a) The system shall provide an option to import cardholder details, including facial images and signatures from an external source where these exist. This option may be used to speed initial commissioning of the security management system's database, or in some cases, to allow synchronization with other employee management systems. It shall be possible to manually start or schedule the import of cardholder details. It shall also be possible to start the data import process from an external application, thus providing the means for real time import of cardholder data.
- (b) The interface requirements shall be fully defined and support either a comma delimited ASCII text file or a Microsoft SQL® database import mechanism. Fully detailed supporting documentation shall be provided to enable a third party to design and implement this facility without needing reference to the system's manufacturer.
- (c) Imported data shall reside in an intermediary table within the database until an integrity check can be applied to the data. Only after satisfying this test

will data be included in the SMS data tables.

2. Data Export:

- (a) The system shall provide an option to export any or all of the cardholder details, including facial and signature images, to an external interface. This option may be used to pass common data to other employee-related systems or databases.
- (b) The export interface requirements shall be fully detailed in the form of supporting documentation to enable a third party to design and implement this facility without needing reference to the system's manufacturer.

3. Smart Card or Key Fob Encoding

- (a) The system shall provide the ability to encode contactless smart cards or key fobs with access control information. The system shall support encoding either Mifare or DESfire.
- (b) The software shall support the Philips Pegoda and the OmniKey CardMan 5121 contactless card readers for the encoding and reading of Mifare and Mifare DESFire cards.
- (c) The system shall be capable of capturing fingerprint biometrics and storing them on a contactless smart card, which will then be read and used to verify the cardholder during an access control transaction.
- (d) Any proposed fingerprint solution shall support the enrollment and use of at least two fingerprints, which shall allow the cardholder to present either finger to gain entry.
- (e) An option to store the fingerprint acceptance threshold in the smart card or at the reader shall be provided. By storing the threshold in the smart card, overall site security is not compromised by a poor quality fingerprint, which would normally require a low acceptance threshold to be set at the reader.

4. Magnetic Stripe Card Encoder

- (a) A magnetic stripe card encoder shall be included. This shall allow magnetic stripe cards to be encoded by the user on site. The existing cards shall have the access control data added onto either track 1 or track 2 of such cards.
- (b) The system shall encode the high security encrypted Micromax format, or be used to encode custom formats to suit specialized requirements. When a custom format is defined, this shall also be used by the system to allow card verification for the access control function, should spare tracks not be available specifically for the access control requirement.

5. Guard Tour

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- (a) This feature shall allow Guard Tour patrol sequences to be created consisting of a number of designated clocking points, which the patrolling guard has to visit.
 - (b) A guard tour sequence shall define the order in which the clocking points are to be visited and also how long the guard should take to move between each clocking point location. A window of tolerance shall be included to add a +/- value to these timings.
 - (c) The system operator shall initiate the required guard tour patrol and declares the guard who is to undertake the tour of the premises. The system shall then automatically monitor the guards progress around the patrol tour, reporting alarms if the clocking points are either out of sequence, or the guard arrives too early, or becomes overdue. The operator shall be notified as each point is clocked to allow the guard's progress around the site to be monitored. A patrol tour shall be able to be suspended, if required, and will automatically resume when the next point is then clocked.
 - (d) Guard tour patrols shall be configurable on a per company basis when multiple companies are required on a site. Management reports shall be created from the history log to confirm when each guard tour was carried out, including any deviations or incidents during the tour.
6. Intercom Integration (to be included for Future implementation):
- (a) The system shall support a serial or other high-level connection to an intercom system. The intercom system shall be accessed by users through a call station; typically sited outside the building at doors, parking barriers, etc.
 - (b) Visitors or other personnel generally ask permission to gain entry at the intercom call stations. These are known as call requests. The SMS shall allow call requests to be answered and managed by using a dedicated screen within the SMS application - the View/Intercom Control screen. The screen shall list all outstanding call requests, and allow the operator to communicate with the callers using simple screen buttons. The screen shall contain a Command button that is associated with commands programmed for use with the intercom. Typically, the command is used to open a door or barrier for the caller.
 - (c) It shall also be possible to answer a call request by using the Connect button in the Acknowledge Alarms screen (if the call request is set up as an alarm)and from maps in the View/Maps screen.
 - (d) Various alarm and/or event messages shall be associated with the use of the intercom interface. These shall be included in transaction reports generated by the SMS.
7. Thin Client Access:
- (a) The system shall provide for an option of thin client access to the security management system. The thin client interface shall utilize Microsoft

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Terminal Services to provide the same look and feel of the thick client to minimize training time and expense. The thin client shall be capable of the same functionality of a thick client with the exception of functionality that requires access to ports on the thin client computer – Microsoft Terminal Services does not sufficiently support such access.

- (b) The system shall provide for an option of thin client access specifically for the visitor management system. The thin client interface shall utilize Microsoft Terminal Services to provide the same look and feel of the thick client to minimize training time and expense. The thin client shall be restricted to Visitor Management functions.

1.7 Quality Assurance:

- A. The Access Control System shall be designed, provided, integrated and installed by a Security Vendor capable of full integration of all required system features, functions and operations.
- B. The security system vendor shall be a factory-authorized dealer of the specific system proposed for this project, locally staffed with trained and certified technicians, such as ARK Systems, Inc.
- C. Provide, for evaluation by the Owner and Engineer, a written technical review package of the proposed system. Provide product cut sheets, system description and functionality, and a preliminary riser diagram indicating the system architecture. Prior to approval, the Owner and tenant reserve the right to request oral presentations of the proposed security system solution.
- D. Comply with NFPA 70, "National Electrical Code."
- E. Listing and Labeling: Provide system and components that are listed and labeled for their indicated use and location on the Project.
- F. Comply with UL Standard 1076, "Proprietary Burglar Alarm Units and Systems."
- G. Equipment shall be Underwriters' Laboratory listed.
- H. Nationally Recognized Testing Laboratory (NRTL) Listing: System components of types and ratings for which NRTL listing or labeling service is established and components shall be listed and labeled.
- I. Single-Source Responsibility: Obtain system components from a single source (the prime system manufacturer) that assumes responsibility for system components and for their compatibility.
- J. Comply with recommendations in Security Industry Association (SIA)/ANSI Standard CP-01.
- K. Comply with EIA/TIA-606, "Administration Standard for the Telecommunications Infrastructure of Commercial Buildings."
- L. Qualifications Of Contractor:

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1. Access Control Sub-Contractor shall be an installation and service Access Control Sub-Contractor regularly engaged in the sale, installation, maintenance and service of access control systems.
2. Access Control Sub-Contractor shall have five years' experience with the installation, start-up and programming of systems of a similar size and complexity to the one proposed.
3. Access Control Sub-Contractor shall be a factory authorized dealer of the system proposed for at least two years.

M. Supervision of Work:

1. Access Control Sub-Contractor shall employ a competent Foreman to be in responsible charge of the Work. Foreman shall be on the project site daily during the execution of the Work.
2. Access Control Sub-Contractor's Foreman shall be a regular employee, principle, or officer of Access Control Sub-Contractor, who is thoroughly experienced in projects of a similar size and type. Access Control Sub-Contractor shall not use contract employees or other Sub-Contractors as Foremen.

N. Qualifications of Technicians:

1. All electronic systems Work shall be performed by electronic technicians thoroughly trained in the installation and service of specialty low-voltage electronic systems.
2. Journeyman electrical contractors may be used to install conduit, raceways, wiring, and the like, provided that final termination, hook-up, programming, and testing is performed by a qualified electronic technician, and that all such Work is supervised by the Access Control Sub-Contractor's Foreman.
3. All incidental Work, such as cutting and patching, lock hardware installation, painting, carpentry, and the like, shall be accomplished by skilled craftsmen regularly engaged in such type of work. All such Work shall comply with the highest standards applicable to that respective industry or craft.

O. Supervision And Construction Procedures:

1. The Access Control Sub-Contractor shall supervise and direct the Work, using his best skill and attention. Access Control Sub-Contractor is solely responsible for all construction means, methods, and techniques.
2. The Access Control Sub-Contractor shall employ a competent foreman who shall be in attendance at the project site during the progress of the Work. The foreman shall represent the Access Control Sub-Contractor and all communications given to the foreman shall be as binding as if given to the Access Control Sub-Contractor.

P. Regulatory Requirements:

1. All Work is to conform to all building, fire, and electrical codes and ordinances applicable in the Owner. In case of conflict between the Drawings/Specifications

and codes, the codes shall govern. Notify Engineer of any such conflicts.

Q. Interface with Other Systems:

1. Fire Alarm:

(a) An evacuation signal from the fire alarm system shall cause the following Access Control System operations:

- (1) Exterior Doors: Exterior doors shall remain locked (fail secure); however egress through the doors shall remain possible via panic pushbars on the exterior doors.
- (2) Doors Between Main Corridor and Cottage: These doors shall unlock (fail safe).
- (3) Doors to Medicine Rooms: These doors shall remain locked (fail secure). Access to these rooms shall be possible via mechanical key in lockset.

2. Roam Alert (existing system relocated):

- (a) A patient/resident, wearing Roam Alert, within the vicinity of a door equipped with a Roam Alert, shall cause the door's Roam Alert electric lock to be activated, and the door kept from opening.
- (b) Swiping of a valid Access Control System card shall override the Roam Alert, and allow free passage through the door for the standard period of time allowed for that door.

1.8 Project Conditions:

A. Environmental Limitations: Do not deliver or install equipment, cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.9 Coordination:

A. Coordinate layout and installation of Access Control System equipment, devices and wiring with all other project trades.

1.10 Software Service Agreement:

A. Technical Support: Beginning with Substantial Completion of the first phase, provide software support for all software provided under this contract for a period of two years.

B. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two (2) years from date of Substantial Completion of first phase of project. Upgrading software shall include computer or server operating systems. Upgrade shall include new or revised licenses for use of software. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

1.11 System Startup:

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- A. Power shall only be applied to the system after re-checking for proper grounding of the system and measuring all loops for lack of shorts, grounds, and open circuits.

1.12 Commissioning:

- A. After all Work is completed, and prior to requesting the Acceptance test, Contractor shall conduct a final inspection, and pre-test all equipment and system features.
- B. Correct any deficiencies discovered as the result of the inspection and pre-test.
- C. Submit a request for the Acceptance test in writing to the Owner's Representative, no less than fourteen days prior to the requested test date. The request for Acceptance test shall be accompanied by a certification from Contractor that all Work is complete and has been pre-tested, and that all corrections have been made.
- D. During Acceptance test, demonstrate all equipment and system features to Owner. Contractor shall remove covers, open wiring connections, operate equipment, and perform other reasonable work as requested by Owner.
- E. Any portions of the Work found to be deficient or not in compliance with the Project Drawing and Specifications will be rejected. The Engineer or Owner's Representative will prepare a list of any such deficiencies observed during the Acceptance test. Contractor shall promptly correct all deficiencies. Upon correction of deficiencies, submit a request in writing to Owner's Representative for another Acceptance Test.

1.13 Warranty:

- A. Conform to all project warranty requirements as herein specified in Division 1 and Section 16010, "General Electrical Requirements."
- B. Warrant that all Work furnished (material and labor) under this Contract will be of good quality, free from faults and defects, and in conformance with the Project Drawings and Specifications.
- C. Provide a parts and labor guarantee on all Work. Guarantee shall be for a period of two (2) years from date of Acceptance for each phase, except where any specific guarantees from a supplier or equipment manufacturer extends for a longer time.
- D. Guarantee shall cover all costs associated with troubleshooting, repair, and replacement of defective Work, including costs of labor, transportation, lodging, materials, and equipment.
- E. Promptly respond to Owner's requests for service during the guarantee period. Contractor shall provide repair service as soon as reasonably possible upon request from Owner, but in no case shall service response exceed 8 hours from time of request.

2 PART 2 PRODUCTS

2.1 Manufacturers:

- A. Access Control System equipment described in this specification and indicated on the drawings shall be the Amag Technology Symmetry Business Version, which shall form the basis of design.
- B. The system shall be designed, provided, integrated and installed under the direct supervision of a system Integrator, who shall be responsible for all system design and integration.
- C. Subject to compliance with all requirements specified herein, proposed substitutions will be considered for approval from manufacturers and system integrators which can meet all of the specified requirements.

2.2 General:

- A. All products shall be new and unused, and shall be of manufacturer's current and standard production.
- B. Where two or more equipment items of the same kind are provided, all shall be identical and provided by the same manufacturer.
- C. Drawings and Specifications indicate major system components, and may not show every component, connector, module, or accessory that may be required to support the operation specified. Contractor shall provide all components needed for complete and satisfactory operation.
- D. Product Availability:
 - 1. Determine product availability and delivery time, and include such considerations into the project schedule to ensure completion within the overall project schedule time frame.

2.3 Wire And Cable

- A. General: Provide all wire and cable required to install systems as indicated. Wire and cable shall be sized to provide minimum voltage drop and minimum resistance to the devices being supplied.
- B. All cables shall be specifically designed for their intended use (direct burial, aerial, etc.).
- C. Comply with equipment manufacturers recommendations for wire and cable size and type.
- D. Comply with all applicable codes and ordinances.

2.4 Lightning Protection:

- A. Provide suitable lightning protection for all processors/controllers.
- B. All lightning protection equipment shall be UL listed.

2.5 Access Control System - System Specifications:

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- A. Head-end Hardware and Software shall be AMAG Technology Business Edition or approved equivalent, with the following optional modules/features:
1. Intercom Integration
 2. Guard Tour
 3. Magnetic Stripe and Key Fob Encoding
 4. Data Import
 5. Data Export
 6. Contactless Smartcard Programming
- B. Field Panels
1. Provide AMAG Technology model multiNODE 2 Series Controllers, as required:
 - (a) MDU-2 Controller
 - (b) MDU-4 Controller
 - (c) 2-DC Expansion Module
 - (d) LAN Comms Module
 - (e) 360 Elevator NODE Controller
 - (f) Input/Output Module
 - (g) RS232 Module
 2. Provide AMAG Technology model multiNODE 2100 Series Controllers, as required:
 - (a) M2100 DBU board (20K, 50K, 100K, 200K cardholders)
 - (b) M2100 4DCU board
 - (c) M2100 4DCR board
 - (d) M2100 2DCR board
 - (e) M2100 power supply
 - (f) MN RS232 module
 - (g) MN NIC-3
 - (h) MN Input/Output module
 - (i) MN RS-485 reader interface module
 - (j) Wiegand interface module

2.6 Door Contact Switches:

- A. Door Contact Switches for hinged type doors shall be shall be Sentrol #1078C-W, or equivalent device suitable for concealed installation in the door type and material in which the device is to be installed. Provide one door contact for each leaf of double doors. Provide door contacts for each door indicated on the drawings. Verify door material, and provide contacts compatible with wood, steel, aluminum or other door materials. Provide one interface module for each door or each set of double doors.
- B. Door Contact Switches for overhead type doors shall be shall be balanced, triple biased, supervised type. Overhead door contact switches shall be approved by the Defense Intelligence Agency. Switch shall have a gap distance of 0.7 to 2.0 inches. Unit shall have a 3' stainless steel armored jacket to protect wiring. Door Contact Switches for overhead doors shall be Sentrol #2720 high security overhead door magnetic contacts.
- C. Door Contact Switches for hinged type doors and roof hatches shall contain three independent Form C biased reed contacts wired in SPDT configuration. The unit shall

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contain a supervised loop with a magnetic tamper feature. A pry tamper connection shall be provided for the 24-hour loop. The unit shall be anodized aluminum with a 3-foot stainless steel armored cable. Door Contact Switches for hinged type doors, roof hatches and similar features shall be GE Interlogix high security surface mount, 2700 series.

2.7 Door Hardware:

- A. Proximity Type Card Readers: Standard card readers shall be Proximity Type Card Readers. Typical read range shall be 5". Unit shall read HID Prox II format cards, or key fobs. Audible feedback shall provide positive confirmation of card read. Wiring for the reader shall be supervised from the controller. Visual feedback shall be provided via LED for card accepted, card rejected. Unit shall contain a door pre-held warning buzzer. Dimensions shall be 3.8" wide by 4.9" high by 1.8" deep. Proximity Type Card Readers shall be Amag Technology model . S853 card reader (Contact, Contactless, Key Fob and LCD), in color as selected by the Architect.
- B. Magnetic Locks shall be comprised of a lock housing, an electromagnetic coil and an armature. Holding force shall be minimum of 1200 pounds. Operating voltages shall be selectable in the field (12VDC/AC or 24VDC/AC). The magnetic lock shall include a built-in circuit board attached to the access cover to provide a convenient, plug-in, concealed area for wiring. Unit shall be equipped with an adjustable mounting bracket to facilitate installation. Unit shall have no residual magnetism, and the door shall release without delay when the lock is de-energized. Provide magnetic lock in configuration, and with accessories as required to suit each door installation. Magnetic locks shall be DynaLock Corporation Series 2000 with all required power supplies, accessories, etc. as required.
- C. Electric Strikes shall be dual voltage (12/24 DC). The strike shall have the ability to change from fail safe to fail secure in the field. Unit shall be rated for continuous duty; the steel keeper shall withstand over 1300 pounds of force. The strike shall come equipped with three faceplates to handle any frame type. Electric Strikes shall be UL 1034 listed and meet ANSI/BHMA 156.5 Grade 1. Electric strikes shall be Von Duprin Series 5100 electric strike in configuration, and with accessories as required to suit each door installation.
- D. Door Contacts used for status shall be steel door contacts shall be 1" diameter. SPDT. Form C. 30V AC/DC maximum. Door status contacts shall be GE Interlogix door contact 1076 series, or approved equal, to suit the specific door arrangement. Provide color to best match door and frame on which contact is being installed.
- E. Request to Exit Pushbuttons shall be narrow style with Push to Exit lettering on a green button. 1.75" wide by 4.5" high. UL listed. Provide Securitron model EEB3N or approved equal. Provide weatherproof accessories for stations used for exterior gate or in normally wet interior locations.
- F. Request to Exit Motion Detectors shall be specially designed for Request-to Exit applications. Unit shall contain built-in timers, door monitor with sound alert, pointable coverage, sequential logic input and selectable relay trigger mode. UL 294 listed. Request to Exit Motion Detectors shall be Detection Systems model DS-160 or DS-161 (grey or black enclosure) as selected by architect for each door, or approved equal.
- G. Access Control System Door Power Supplies shall have eight (8) independently controlled fuse protected outputs. Class 2 rated power limited. Fuses rated for 3.5A. Red LED's shall indicate outputs are triggered. Fire alarm disconnect shall be individually selectable for any

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or all of the eight outputs. Provide integral battery backup. Access Control System Door Power supplies shall be Altronix or approved equal. Mount on wall above accessible ceiling, on Secure side of protected door opening. Provide power from Facility Emergency Power System, Critical branch panelboard.

2.8 Computer Workstations:

- A. Provide standard Intel/Microsoft Windows based personal computer workstations for the following applications, in the following locations:
1. Database Computer – Communications Hub Room
 2. Badging Workstation –Office, as designated in Cottage F (Administration) by the Owner's Representative
- B. Computer Workstations:
1. Provide computer workstations and servers for:
 - a. Access Control System Server
 - b. Badging Workstation
 2. Each computer workstation/server shall provide the following minimum hardware configuration:
 - a. Mini-Tower Case Configuration
 - b. Processor – Intel® Core™ 2 Duo E6700 (2.83GHz, 1066 MHz, front side bus)
 - c. System Memory – 8.0 GB, in 2 DIMM slots (2 additional slots available)
 - d. Hard Drive: 500 GB Serial ATA (provide second 500 GB Serial ATA hard drive for Database Computer)
 - e. Optical Drive – 16X DVD+/-RW SATA
 - f. Video Card – 256MB on card video memory, dual monitor DVI and VGA output
 - g. Ethernet network card - 10/100/1000 MHz
 - h. Integrated Intel Sound on motherboard
 - i. Speakers (right and left channel with volume control)
 - j. 19 in 1 Media Card Reader
 - k. Minimum nine (9) high speed USB ports (2 on front, 6 on rear and 1 internal)
 - l. Operating System: Windows 7 Professional with all Service Packs installed
 - m. USB keyboard with multi-media features
 - n. Optical mouse
 - o. Monitor – 22" wide screen/flat panel, minimum resolution: 1680 x 1050 at 60 Hz; Minimum Image Contrast Ratio: 1,000:1; Maximum Response Time: 5 ms
 - p. Microsoft Office 2010 Professional (Word, Excel, Outlook, PowerPoint, Access)
 - q. Microsoft Visio Professional 2010
 - r. Adobe Acrobat Professional (latest edition).

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- s. Provide additional industry standard software as required for full functionality of all hardware (e.g. CD/DVD burning software).
 - t. Provide all required cables, interfaces, cable management, etc.
 - u. Plug-in desktop UPS, APC or approved equal, with sufficient battery capacity to operate computer and monitor (not printers) for 30 minutes.
 - v. Provide plug-in strip with on-off switch, minimum six (6) NEMA 5-15R receptacles and integral TVSS protection for each workstation. Provide additional plug-in strips as required to support all peripheral devices at each computer workstation.
 - w. Personal computer workstations shall be Dell Optiplex or approved equal.
3. Badging Workstation: In addition to the computer workstation hardware and software as specified above, provide the following additional items at the Badging Workstation:
- a. Provide a card printer with dual card input hoppers that can hold up to 200 cards. Printer shall have the ability to print edge to edge on cards 10 mil to 50 mil thick in color or monochrome. Unit shall have an LCD display, a tape-based cleaning system, a window to view remaining card supply, and a card hopper lock. The printer shall have 4MB of RAM with the ability to print 133 color cards or over 500 monochrome cards per hour. Card printer shall be Fargo DTC500 series or approved equal.
 - b. Provide manual punch for punching hole/slot in card for attaching clip.
 - c. In addition to the basic operating system and office suite software specified above, the badging client workstation shall contain all software and hardware necessary to create ID badges on the proximity cards.
 - d. Provide a handheld digital camera with minimum 12.0-mega-pixel super HAD CCD with 5X optical and 2x digital zoom; 2.7" LCD monitor; 64 MB internal memory without supplemental memory card. Provide Kodak Easyshare M590, or approved equal. Provide tripod for mounting, and USB cable for connection to PC.
 - e. Provide color laser printer, printing speed minimum 8 pages per minute at 600 x 600 dpi resolution; 272 MB internal memory; monthly printing duty cycle up to 20,000 pages; 250-sheet input tray and single-sheet priority feed slot; USB interface with cable. Provide HP model Color Laserjet 1600 or approved equal.
 - f. Provide and program 250 access cards for use on the system, including cards, plastic card protector pouch and clip-on retractable badge holder. The card shall contain proximity access card and photo identification. Cards shall have an external number for easy identification and control. Card shall accept a horizontal or vertical punch.
 - g. Provide magnetic stripe encoder for encoding cards.
 - h. Provide key fob encoder for encoding key fobs.
 - i. Provide system Card Reader on wall adjacent to Badging workstation for testing cards and key fobs.

- j. Provide and program 250 access cards for use on the system, including cards, plastic card protector pouch and clip-on retractable badge holder. The card shall contain proximity access card and photo identification. Cards shall have an external number for easy identification and control. Card shall accept a horizontal or vertical punch.
- k. Provide and program 100 key fobs for use on the system. Key fobs shall include 1" diameter dual ring key ring and chain to attach fob to key ring.

3 PART 3 – EXECUTION

3.1 Preparation:

- A. Obtain detailed project planning forms from manufacturer of security system; develop custom forms to suit project. Fill in all data available from project plans and specifications and publish as project planning documents for review and approval throughout the system design and installation process.
 - 1. Record setup data for control station and workstations.
 - 2. For each Location, record setup of Controller features and access requirements.
 - 3. Propose start and stop times for time zones and holidays, and match up access levels for doors.
 - 4. Set up groups, facility codes, linking, and list inputs and outputs for each Controller.
 - 5. Assign action message names and compose messages.
 - 6. Set up alarms. Establish interlocks between alarms, intruder detection, and Digital Video Surveillance features.
 - 7. Prepare and install alarm graphic maps.
 - 8. Develop user-defined fields.
 - 9. Develop screen layout formats.
 - 10. Discuss badge layout options; design badges.
 - 11. Complete system diagnostics and operation verification.
 - 12. Prepare a specific plan for system testing, startup, commissioning and demonstration.
 - 13. Develop acceptance test concept and, on approval, develop specifics of the test.
 - 14. Develop cable and asset management system details; input data from construction documents. Include system schematics and Technical Drawings in Microsoft Visio format.

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- B. In meetings with Engineer and Owner's Representative, present Project planning documents and review, adjust, and prepare final setup documents. Use final documents to set up system software.

3.2 Examination of Premises:

- A. Prior to the start of installation, examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of Security System components or equipment.
- B. Examine pathway elements intended for cables. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation.
- C. Examine roughing-in for LAN and control cable conduit systems to PCs, Controllers, card readers, and other cable-connected devices to verify actual locations of conduit and back boxes before device installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 Wiring Installation:

- A. Wiring Method:
 - 1. Install wiring in raceways except in accessible indoor ceiling spaces and in interior hollow gypsum board partitions where plenum rated or metallic sheathed cable may be used.
 - 2. Conceal raceways and wiring except in unfinished spaces and as indicated. Control and data transmission wiring shall not share conduit with other building wiring systems.
 - 3. All power wiring shall be run in conduit, or as type MC cable where permitted as described in Section 16050, "Basic Electrical Materials and Methods." Minimum conduit size shall be $\frac{3}{4}$ ".
- B. Comply with NECA 1, "Good Workmanship in Electrical Contracting."
- C. Comply with EIA/TIA-569, "Commercial Building Standard for Telecommunications Pathways and Spaces."

3.4 Wires and Cables:

- A. Install the appropriate cable from the CPU to readers, door contacts, request-to-exit devices, electric locks or electric strikes at each door and/or gate, and to all other system components.
- B. Conductors: Provide size and type as recommended by system manufacturer.
- C. 120 volt and higher power wiring: Install according to Section 16050 "Basic Electrical Materials and Methods," unless otherwise indicated or directed by the system manufacturer.

- D. Control and Signal Transmission Conductors: Install unshielded, twisted-pair cable, unless otherwise indicated or if manufacturer recommends shielded cable, according to Division 16 Section 16741 " Data, Voice, and Video (RF) Structured Cabling and Outlet System."
- E. Computer and Data-Processing Cables: Install according to Section 16741 " Data, Voice, and Video (RF) Structured Cabling and Outlet System."
- F. Television Signal Transmission Cables: Install according to Section 16741 " Data, Voice, and Video (RF) Structured Cabling and Outlet System."
- G. Fiberoptic Cabling: Install according to Section 16741 " Data, Voice, and Video (RF) Structured Cabling and Outlet System."

3.5 Cable Installation:

- A. Design, layout, size, and plan new wire and cable runs as required.
- B. All wire and cable from the processors to all devices at each door shall be "home-run" unless otherwise specified.
- C. All wire and cable passing thru metalwork shall be sleeved by an approved grommet or bushing.
- D. Install Access Control System cables using techniques, practices, and methods that are consistent with Category 6 rating of components and that ensure Category 6 performance of completed and linked signal paths, end to end.
- E. Install cables without damaging conductors, shield, or jacket.
- F. Boxes and enclosures containing security system components or cabling, and which are easily accessible to employees or to the public, shall be provided with a lock. Boxes above ceiling level in occupied areas of the building shall not be considered to be accessible. Junction boxes and small device enclosures below ceiling level and easily accessible to employees or the public shall be covered with a suitable cover plate and secured with tamperproof screws.
- G. Install end-of-line resistors, where required, at the field device location and not at the Controller or panel location.
- H. Cable application requirements are minimum requirements and shall be exceeded if recommended or required by manufacturer of system hardware.
- I. RS-232 Cabling: Install at a maximum distance of 50 feet.
- J. RS-485 Cabling: Install at a maximum distance of 4000 feet.
- K. Card Readers:
 - 1. Install number of conductor pairs recommended by manufacturer for the functions specified, indicated or required.

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2. Unless manufacturer recommends larger conductors, install No. 22 AWG wire if maximum distance from Controller to the reader is 250 feet, and install No. 20 AWG wire if maximum distance is 500 feet.
 3. For greater distances, install "extender" or "repeater" modules recommended by manufacturer of the Controller.
 4. Install minimum No. 18 AWG shielded cable to readers and keypads that draw 50 mA or more.
 5. Install minimum No. 16 AWG cable from Controller to electrically powered locks. Do not exceed 250 feet.
 6. Install minimum No. 18 AWG AC power wire from transformer to Controller, with a maximum distance of 25 feet.
- L. Wiring within Enclosures:
1. Bundle, lace, and train conductors to terminal points. Use lacing bars and distribution spools.
 2. Separate power-limited and non-power-limited conductors as recommended in writing by manufacturer.
 3. Install conductors parallel with or at right angles to sides and back of enclosure. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with intrusion system to terminal blocks.
 4. Mark each terminal according to system wiring diagrams.
 5. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.
- M. Splices, Taps, and Terminations: For power and control wiring, use numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- N. Install power supplies and other auxiliary components for detection devices at controllers, unless otherwise indicated or required by manufacturer. Do not install such items near devices they serve.
- O. Identify components with engraved, laminated-plastic or metal nameplate for central-station control unit and each terminal cabinet, mounted with corrosion-resistant screws or epoxy adhesive. Nameplates and label products are specified in Section 16010, "General Electrical Requirements," paragraph "Identification."

3.6 Power to Security Equipment:

- A. Power all equipment from 120 VAC circuit dedicated for security use, except as noted. Mark all panel circuit breakers with labels worded "Security Equipment - Do Not Operate", or equivalent.

- B. All plug-in transformers shall be located at the security control panels. Secure all low-voltage plug-in transformers to outlet with screw or strap. Clearly label all transformers to identify purpose and use.

3.7 Fire Rated Doors and Frames

- A. Do nothing to modify a UL. rated door or frame that would in any way affect or void the UL. label or fire rating.

3.8 Grounding:

- A. Ground system equipment racks, enclosures, components and conductor and cable shields to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.
- B. Comply with the following Industry Standards:
 - 1. IEEE 1100, "Power and Grounding Sensitive Electronic Equipment."
 - 2. ANSI/TIA/EIA-607, "Commercial Building Grounding and Bonding Requirements for Telecommunications"
- C. Bond shields and drain conductors to ground at only one point in each circuit.
- D. System Ground:
 - 1. Ground all system equipment to Telecommunications Grounding Busbar in Communications Hub Room, or nearest Cottage Communications Closet.

3.9 Field Quality Control:

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation and to supervise pre-testing, testing, and adjusting of equipment. Report results in writing.
- B. Inspection: Verify that units and controls are properly installed, connected, and labeled, and that interconnecting wires and terminals are identified.
- C. Pre-testing: After installation, align, adjust and balance system and pretest components, wiring, and functions to verify that they comply with requirements in the Contract Documents.
 - 1. Correct deficiencies observed in pre-testing. Replace malfunctioning or damaged items with new ones and retest until satisfactory performance and conditions are achieved. Prepare forms for systematic recording of acceptance test results.
 - 2. Report of Pre-testing: After pre-testing is complete, provide a letter certifying that installation is complete and fully operable; include names and titles of witnesses to preliminary tests.
- D. Test Schedule: Schedule tests after pretesting has been successfully completed and system has been in normal functional operation for at least 14 days. Provide a minimum of 10 days' notice of test schedule.

- E. Perform the following field tests and inspections and prepare reports:
1. Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified.
 2. Operational Tests: Schedule tests after pre-testing has been successfully completed. Test all modes of system operation and intrusion detection at each detection device. Test for detection of intrusion and for false alarms in each protected zone. Test for false alarms by simulating activities outside indicated detection patterns.
 3. Electrical Tests: Comply with NFPA 72, Section A-7. Minimum required tests are as follows:
 - a. Verify the absence of unwanted voltages between circuit conductors and ground.
 - b. Test all conductors for short circuits using an insulation-testing device.
 - c. With each circuit pair, short circuit at the far end of circuit and measure circuit resistance with an ohmmeter. Record circuit resistance of each circuit on Record Drawings.
 - d. Verify that each controller is in normal condition as detailed in manufacturer's operation and maintenance manual.
 - e. Test signal and data transmission circuits complying with requirements in Section 16741, "Data and Voice Structured Cabling and Outlet System" for proper signal transmission under open-circuit conditions. One connection each should be opened at not less than 10 percent of initiating and indicating devices. Observe proper signal transmission according to class of wiring used.
 - f. Verify that transient surge-protection devices are installed according to manufacturer's written instructions.
 - g. Test each initiating and indicating device for alarm operation and proper response at central-station control unit.
 - h. Test both primary and secondary power. Verify, by test, that UPS is capable of operating the system for period and in manner specified.
 4. LAN Cable Procedures: Inspect for physical damage and test each conductor signal path for continuity and shorts. Use Class 2, bidirectional, Category 6 tester. Test for faulty connectors, splices, and terminations. Test according to TIA/EIA-568-1, "Commercial Building Telecommunications Cabling Standards - Part 1 General Requirements." Link performance for UTP cables must comply with minimum criteria in TIA/EIA-568-B.
 5. Test each circuit and component of each system. Tests shall include, but are not limited to, measurements of power supply output under maximum load, signal loop resistance, and leakage to ground where applicable. System components with battery backup shall be operated on battery power for a period of not less than 10 percent of the calculated battery operating time. Provide special equipment and software if testing requires special or dedicated equipment.
 6. Operational Test: Perform operational system tests to verify that system complies with Specifications. Include all modes of system operation. Test equipment for proper operation in all functional modes.

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7. Operational Test: After installation of cables and connectors, demonstrate product capability and compliance with requirements. Test each signal path for end-to-end performance from each end of all pairs installed. Remove temporary connections when tests have been satisfactorily completed.
- F. Remove and replace malfunctioning devices and circuits and retest as specified above.
- G. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.
- H. Report of Tests and Inspections: Prepare a written record of tests, inspections, and detailed test results in the form of a test log.
- I. Tag all equipment, stations, and other components for which tests have been satisfactorily completed.
- J. Certification Agency: Owner will provide the services of a qualified testing and inspecting agency to certify the systems in accordance with listed Government standards.

3.10 Identification:

- A. In addition to requirements in this Article, comply with applicable requirements in Section 16010 "General Electrical Requirements" paragraph, " Identification" and with TIA/EIA-606.
- B. Label each terminal strip and screw terminal in each cabinet, rack, or panel.
 1. All wiring conductors connected to terminal strips shall be individually numbered, and each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with the name and number of the particular device as shown.
 2. Each wire connected to building-mounted devices is not required to be numbered at the device if the color of the wire is consistent with the associated wire connected and numbered within the panel or cabinet.

3.11 System Software

- A. Develop, install, and test software and databases for the complete and proper operation of systems involved. Assign software license to Owner. Provide original copy of physical media program and all programming, on CD-ROM or similar media, to Owner as part of system documentation.

3.12 Access Control System Startup Service:

- A. Engage a factory-authorized service representative to supervise and assist with startup service. Complete installation and startup checks according to approved procedures that were developed in " Preparation" Article and with manufacturer's written instructions.
- B. Enroll and prepare badges and access cards for Owner's operators, management, and security personnel.

3.13 Protection:

- A. Maintain strict security during the installation of equipment and software. Rooms housing the control station, and workstations that have been powered up shall be locked and secured, with an activated burglar alarm and access-control system reporting to a Central Station complying with UL 1610, "Central-Station Burglar-Alarm Units," during periods when a qualified operator in the employ of Contractor is not present.

3.14 Cleaning:

- A. Clean installed items using methods and materials recommended in writing by manufacturer.
- B. Clean Digital Video Surveillance system components, including camera-housing windows, lenses, and monitor screens.

3.15 Initial Programming and Configuration

- A. Contractor shall provide initial programming and configuration of the security management system. Programming shall include defining hardware, doors, monitor points, clearance codes, time codes, door groups, alarm groups, operating sequences, camera call-ups, and the like. Input of all program data shall be by Contractor. Contractor shall consult with Engineer and Owner's Representative to determine operating parameters.
- B. Contractor shall develop and input system graphics, such as maps and standby screens. Use the project floor plan drawings as the basis for the creation of maps. Development of maps shall include the creation of icons for all doors, monitor points, and tamper circuits.
- C. Work with the Owner's Representative and designated System Operator to input the cardholder data for each access card.
- D. Contractor shall maintain hard copy worksheets which fully document the system program and configuration. Worksheets shall be kept up to date on a daily basis by Contractor until final Acceptance by Owner. Worksheets shall be subject to inspection and approval by Owner. Provide final copies to Owner prior to Project Close-out.
- E. Maintain a complete, up-to-date backup of the system configuration and cardholder database on CR-ROM or DVD. Backup shall be maintained throughout programming period until final Acceptance by Owner, with back-ups created at a minimum, on a daily basis. Provide all required optical disk media. Submit back-up disks to Owner upon Final Acceptance.
- F. Approximately sixty (60) days after start-up of system, Contractor shall return to project to provide follow-up assistance with system configuration as requested by Owner. Contractor shall include an allowance of forty (40) hours of labor for follow-up assistance in his Base Bid price.

3.16 Software Engineering Support:

- A. Provide the services of a software engineer to assist the Owner in coordinating the interfaces between the security management system and the staff databases and a paging system or other remote notification system.

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- B. Software engineer shall be employed by the manufacturer of the security management system and shall be thoroughly knowledgeable of the security management system applications.
- C. Software engineer shall be on-site and available to meet with Owner's representatives for a period of not less than two consecutive days. On-site visit shall be scheduled at the convenience of the Owner.

3.17 Training:

A. General:

1. Recording:

- a. All Instruction, Demonstration and Training sessions shall be recorded using Digital Video Disk (DVD) based audio/video recording equipment.
- b. Each session shall be recorded on a separate disk. Label and index disks to indicate session date, content and system being demonstrated.
- c. Provide three (3) copies of each disk, in standard DVD jewel cases.
- d. Refer to Specification Section 16010, "General Electrical Requirements" for additional information and requirements.

2. Provide the services of a Factory Authorized Representative to provide complete operator training on the Security Management System. Training shall consist of thirty-two hours of classroom instruction for up to ten people selected by Owner, plus two (2) hours of individual hands-on training for each of up to ten people selected by Owner. Hands-on training shall include the opportunity for each person to operate the system, and to practice each operation that an operator would be expected to perform.

3. Training shall cover all operating features of the system, including the following:

- a. System set-up and cardholder database configuration.
- b. Access control features.
- c. Alarm monitoring features.
- d. Report generation and searches.
- e. Card/key fob management.
- f. Disk backup procedures
- g. Routine maintenance and adjustment procedures.

4. Training sessions shall be held at Owner's facility, and shall be scheduled at the convenience of Owner. Contractor shall provide written training outline and agenda for each training session prior to scheduling.

5. General format of training sessions shall be as follows:

Day 1: Afternoon Session: Control Center Training
Day 2: All Day: System Administrator Training
Day 3: All Day: System Administrator Training

Day 4: All Day: System Administrator Training
Day 5: Morning Session: Control Center Training

6. Provide written training materials for ten (10) people, plus CD-ROM with all training materials in Adobe Acrobat .PDF format.

B. Operator Training:

1. Provide complete operator training on the Security Management System. Two types of operator training shall be provided:
 - a. System Administrator Training: One week comprehensive training course for system managers and maintenance personnel. Provide two (2) separate on-site training sessions.
 - b. Area Manager Training: One day session on basic operation. A minimum of five (5) separate on-site training sessions shall be conducted. Training sessions will be held approximately three weeks apart.
2. Training sessions shall include the opportunity for each person to operate the system, and to practice each operation that an operator would be expected to perform.
3. Contractor shall provide written training materials for each of ten (10) people at each training session.
4. Training sessions are to be held at Owner's facility, and are to be scheduled at the convenience of Owner. Some training sessions may be required to be held during evening hours and on weekends to accommodate users whose schedule does not permit attendance during regular hours.
5. Contractor shall provide written training outline and agenda for each training session prior to scheduling.

C. Technician Training

1. Contractor shall provide complete technician training on the security management system. Technician training shall enable Owner's in-house technicians to make basic repairs, additions, and modifications to the system.
2. A minimum of two (2) separate technician training sessions shall be conducted. The exact schedule for training sessions shall be determined by the Owner.
3. Each technician training session shall consist of three (3) consecutive days of classroom instruction for ten people selected by Owner.
4. Contractor shall provide a fully operational mock-up for use during training sessions. Mock-up shall include Intelligent Controller, card reader, request-to exit detector, monitor switches and other such devices necessary to fully demonstrate system operation and repair. All mock-up equipment shall be provided by Contractor and left at Owner's facility for the duration of the training period. University-owned equipment shall not be used in the mock-up.
5. Contractor shall provide written training materials for ten (10) people at each

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technician training session, plus copies of all training materials on CD-ROM in Adobe Acrobat .PDF format.

6. Technician training shall cover the installation, configuration, and repair of the security management system. Topics to be covered shall include, but shall not be limited to, the following:
 - a. Overview of security management system hardware and software.
 - b. Intelligent Controller installation and repair.
 - c. Card reader installation and repair.
 - d. Installation and repair of detection devices: contact switches, REX detectors, motion detectors, and other such devices.
 - e. Isolating hardware/software problems.
 - f. Diagnosis of communications related problems.
 - g. Routine maintenance and repair.
7. Technician training sessions are to be held at Owner's facility, and are to be scheduled at the convenience of Owner.
8. Contractor shall provide written training outline and agenda for each technician training session prior to scheduling.

3.18 Maintenance:

- A. Provide full procedures for all database back-ups.
- B. Provide full procedures for server/workstation hard drive maintenance, such as defrag, etc.
- C. Provide full procedures for maintaining physical and software firewalls.
- D. Provide full procedures for upgrading software.
- E. Provide full procedures for testing battery condition on all field panels for adequate back-up time.
- F. Provide full procedures for any other tasks that must be performed to ensure the warranty remains intact.

END OF SECTION

BICSI	Building Industry Consulting Service International
Cross-Connect:	A facility enabling the termination of cable elements and their interconnection or cross-connection
EIA/TIA	Electronics Industry Alliance/Telephone Industry Association
EMI	Electromagnetic interference
Gb/s	Giga-Bits per second
IDC	Insulation Displacement Connector
IDF	Intermediate Distribution Frame
IEEE	Institute of Electrical and Electronics Engineers
LAN	Local Area Network
Mb/s	Mega-Bits per second
MPOP	Minimum Point of Presence
NDC	Network Data Center
NEC	National Electrical Code (NFPA-70)
NFPA	National Fire Prevention Association
NRTL	Nationally Recognized Testing Laboratory
OTDR	Optical Time Domain Reflectometer
RCDD	Registered Communications Distribution Designer
STP	Shielded Twisted Pair
TDR	Time Domain Reflectometer
TGB	Telecommunications Grounding Busbar
TMGB	Telecommunications Main Grounding Busbar
UL	Underwriters Laboratories
UTP	Unshielded Twisted Pair

1.4 System Description:

- A. System includes provision of combination voice, data and Video (RF) Distribution multi-jack outlets at locations indicated on the drawings, with horizontal cables from each jack to the appropriate termination location as indicated in the "Schedule of Telecommunications Outlets" on the drawings. It shall also include extension of copper and fiberoptic trunk cables from each IDF Room to the Main Telephone Equipment and Main Data Network rooms, as indicated on the drawings.

1.5 Submittals:

- A. General: Submit the following according to Division 1 Specification Sections and Section 16010, "Basic Electrical Requirements."
- B. Product Data and Shop Drawings: Submit these items, and the Certifications specified below, as a complete package. Submittal will not be reviewed if it is incomplete.
1. A complete schedule of equipment and materials that are to be furnished for the work. Manufacturer's specifications or cut sheets for each major component.
 2. Complete drawings of equipment racks and special assemblies. Each drawing shall show all equipment with its manufacturer and model number.
 3. Complete drawings detailing installation locations of equipment, cable quantities and types with terminal block or patch panel locations.

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4. 24" long samples of each type cable and fiberoptic cable proposed for use on the project, bearing all relevant markings.
- C. Provide complete Special System Drawings as specified in Section 16010, showing the location of all the outlets, trunk cable routes, and other components installed. Indicate outlet and jack designations/addresses at each outlet. Update drawings to reflect as-built conditions, including final outlet and jack designations/addresses. Include copies of as-built drawings as a part of the project Operating and Maintenance Manuals.
- D. Provide Operation and Maintenance Manuals, as specified in Division 1 and Section 16010, for work specified in this Section. Include complete service information, including schematics, prints of the Special System Drawings, interconnecting diagrams for this particular project, and parts lists to permit quick and efficient maintenance and repair of the equipment by a qualified technician. Provide a separate binder with copies of all system test reports.

1.6 Quality Assurance:

A. Installer Qualifications:

1. The installing contractor shall submit proof of having installed at least ten (10) similar Data And Voice Structured Cabling And Outlet Systems. These systems shall have been in service for a minimum of five (5) years. These systems must have been within a fifty (50) mile radius of the project location. Included with this proof shall be the customer name, customer contact and telephone number, and, if applicable, the architect and electrical engineer on the project. The Architect and Owner retain the right to reject any installing contractor who, in their sole judgment, has not met the above criteria OR has received a less than favorable reference from any of the submitted references OR from any other customer for which the installing contractor has performed similar installations, whether or not such customer has been listed on the submittal.
2. In order to assure full compliance with all industry standards and methods, the installing contractor shall have on its regular staff a BICSI Registered Communication Distribution Designer (RCDD). Proof of such registration shall be included with the original submittal.
3. In order to assure full compliance with all codes and regulations, the installing contractor must have on its regular staff a Master Electrician licensed within the jurisdiction in which the installation occurs. Proof of such licensing must be included with the original submittal.
4. The Contractor shall make application for all necessary permits, licenses and inspections as required by the Authority Having Jurisdiction, and shall pay all fees and charges appurtenant thereto.
5. The installing contractor must be certified by the manufacturer of the Cabling System being proposed for installation. Proof of such certification must be included with the original submittal.

- B. Manufacturer Qualifications: Materials proposed for use on this project shall be provided by a manufacturer experienced in manufacturing components listed and

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labeled under the appropriate EIA/TIA-standards and who comply with these Specifications.

- C. Comply with NFPA 70, "National Electrical Code."
- D. Comply with the latest editions of following industry standards:
 - 1. TIA 455 Series Standard Test Procedures for Fiber Optic Fibers, Cables, Transducers, Connecting and Terminating Devices
 - 2. TIA 472 Series General Specifications for Fiberoptic Cables
 - 3. TIA 492 Series Generic Specification for Optical Waveguide Fibers
 - 4. TIA-526-7, OFSTP-7 Measurement Of Optical Power Loss Of Installed Single-Mode Fiber Cable Plant
 - 5. TIA-526-14 Optical Power Loss Measurements Of Installed Multimode Fiber Cable Plant
 - 6. TIA-568-C.0 Generic Telecommunications Cabling for Customer Premises
 - 7. TIA-568-C.1 Commercial Building Telecommunications Cabling Standards - Part 1 General Requirements
 - 8. TIA-568-C.2 Balanced Twisted-Pair Telecommunications Cabling and Components Standards
 - 9. TIA-568-C.3 Optical Fiber Cabling Components Standard
 - 10. TIA-569 Commercial Building Standard for Telecommunications Pathways and Spaces
 - 11. TIA-570 Residential Telecommunications Infrastructure Standard
 - 12. TIA-598 Optical Fiber Cable Color Coding
 - 13. TIA-606 Administration Standard for the Commercial Telecommunications Infrastructure
 - 14. TIA J-STD-607 Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications
 - 15. TIA-758 Customer-Owned Outside Plant Telecommunications Infrastructure Standard
 - 16. TIA-942 Telecommunications Infrastructure Standard For Data Centers
 - 17. TIA-1179 Healthcare Facility Telecommunications Infrastructure Standard
 - 18. TIA TSB-140 Additional Guidelines for Field-Testing Length, Loss and Polarity of Optical Fiber Cabling Systems
 - 19. IEEE 802.3 Ethernet: Defines media and distance requirements for Ethernet based LAN. Includes all applicable sub-letters.
 - 20. UL 910 Test Method of Fire and Smoke Characteristics of Electrical and Optical Cables Used in Air Handling Spaces.
 - 21. UL 1666 Standard Flame Test for Flame Propagation Height of Electrical and Optical Cable Installed Vertically in Shafts
- E. Comply with all applicable Building Industry Consulting Service International (BICSI) standards and requirements.

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- F. Nationally Recognized Testing Laboratory (NRTL) Listing: System components of types and ratings for which NRTL listing or labeling service is established and components shall be listed and labeled.

1.7 Performance Requirements

- A. General Performance: The entire cabling and outlet system installed under this project shall comply with transmission standards in TIA/EIA-568-C.x, when tested according to test procedures of those standards.

1.8 Delivery, Storage, And Handling:

- A. According to BICSI ITSIM, cables should be tested upon receipt. Test cables upon receipt at Project site.
- B. Test optical fiber cable while on reels. Use an Optical Time Domain Reflectometer to verify the cable length and locate cable defects, splices, and connector, including the loss value of each. Retain test data and include the record in maintenance data.
- C. Test each pair of UTP cable for open and short circuits.

1.9 Project Conditions:

- A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.10 Coordination:

- A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.

1.11 Warranty:

- A. Conform to all project warranty requirements as herein specified in Division 1 and Section 16010, Electrical General Requirements
- B. Special Warranty Requirements:
 - 1. The proposed Systems shall be covered by a two part certification program provided by a single manufacturer and that manufacturer's certified installer. Manufacturer shall administer a follow-on program through the installer to provide support and service to the system owner/user.
 - 2. The first part is an assurance program which provides that the certified system will support the applications for which it is designed, during the 15 year warranty of the certified system.
 - 3. The second portion of the certification is a fifteen-year warranty provided by the manufacturers and the installer on all products within the system (cords, telecommunications outlet/connectors, cables, cross-connects, patch panels, etc.).

4. In the event that the certified system ceases to support the certified application(s), whether at the time of cut-over, during normal use or when upgrading, the manufacturer and vendor shall commit to promptly implement corrective action.

2 PART 2 - PRODUCTS

2.1 Telephone Service:

- A. Telephone service shall be extended to the building by the local telephone company. Satellite television signal shall be provided to the facility by the Owner's selected satellite television provider.
- B. Provide concrete encased underground ductbank for incoming telephone service into the building. Conform to all utility company requirements. Mandrel each duct, and provide 3/16 @ nylon pull cord in duct for use by Verizon.
- C. Terminate ductbank inside building at plywood backboard. Provide four (4) foot wide dedicated width for incoming telephone service. Provide four (4) foot wide dedicated width for incoming cable television service.
- D. All costs for telephone service shall be paid by the Owner.
- E. Coordinate backbone cabling with the protectors and demarcation points provided by the telephone and satellite television utility/service provider.

2.2 Grounding:

- A. Provide communications grounding system in accordance with all recommendations contained in EIA/TIA 607 Commercial Building Grounding and Bonding Requirements for Telecommunications.
- B. Provide Telecommunications Main Grounding Busbar (TMGB) at incoming telephone service consisting of a 4' long x 2" high x 1/4" thick tin plated copper ground bus, with lugs for termination of #6 equipment grounding conductors at 3" on center along ground bus.
- C. Provide Telecommunications Grounding Busbar (TGB) at each IDF Room or communications equipment location consisting of a 4' long x 2" high x 1/4" thick tin plated copper ground bus, with lugs for termination of #6 equipment grounding conductors at 3" on center along ground bus. Provide additional lugs for connection of Telecommunications Bonding Backbone conductors. Provide (1) #4/0 bare copper ground wire from each Telecommunications Grounding Busbar to the closest building structural steel or steel reinforcing bar, and bond with exothermic weld connection.
- D. Provide a Telecommunications Grounding Grid, consisting of a minimum of three (3) 3/4" diameter x 10' long copper clad steel ground rods. Interconnect ground rods with #4/0 bare copper ground wire direct buried below grade. Extend 1 #4/0 bare copper ground wire, direct buried below grade, between Telecommunications Ground Rod Array and building electric service ground rods. The Telecommunications Grounding System shall be so constructed that the resistance between the equipment and the

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ground shall not exceed 0.5 ohms. Additional ground rods shall be provided as required to obtain this resistance value.

- E. Provide Telecommunications Bonding Backbone conductors between all Telecommunications Grounding Busbars and the Telecommunications Main Grounding Busbar, in accordance with EIA/TIA 607. Telecommunications Bonding Backbone conductors shall be insulated copper, #4/0 AWG minimum. All horizontal runs within the building shall be installed in electrical metallic tubing (EMT). Provide EMT sleeves for vertical extensions through floors. Bond all conduit and conduit sleeves to the telecommunications grounding system in accordance with NEC requirements.
- F. Provide labels as indicated in EIA/TIA 607 on all Telecommunications Bonding Conductor. Labels shall be permanent preprinted or computer generated on self stick plastic labels.

2.3 Voice/Data Outlets and Wiring:

- A. Manufacturers: Subject to compliance with requirements, provide products by Ortronics, Inc., which shall form the basis of design. Subject to compliance with all contract requirements substitutions may be considered from one of the following:
 - 1. Chatsworth Products, Inc.
 - 2. Hubbell Premise Wiring
 - 3. Molex Premise Networks; a division of Molex, Inc.
 - 4. Nordex/CDT; a subsidiary of Cable Design Technologies.
 - 5. Panduit Corp.
 - 6. The Siemon Co.
- B. Workstation Outlets General: Multiple jack/connector assembly mounted in a single gang faceplate.
 - 1. Faceplate: High-impact modular white or ivory ABS plastic, except as specified otherwise below.
 - 2. Mounting: Semi-flush, except as otherwise indicated. All unused mounting spaces shall be equipped with a blank insert.
 - 3. Legend: Label jacks, "Voice" or "Data" as appropriate to use. Provide facilities for insertion of machine printed jack identification label behind clear plastic cover for each jack position.
- C. Typical workstation outlets shall consist of a multiple port information outlet with modular wiring jacks as indicated in the Schedule of Telecommunications Outlets on the drawings.
- D. Wall mounted telephone outlets shall be provided with a single, flush mounted RJ-45 modular wiring jack mounted in a stainless steel wall plate with wall telephone instrument mounting lugs.
- E. Neatly wrap all unterminated pairs at fax, modem, pay phone and similar outlets around the outer cable sheath for future use.

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- F. Termination of station cables at voice and data jacks shall be in accordance with EIA/TIA 568A, Designation T568B for Category 6 cable as directed by the Owner's data network manager.
- G. Voice and Data cable(s) between each IDF Room and the Main Data Network Room shall be as indicated in the Telecommunications Trunk Wiring Schedule on the drawings.

2.4 Twisted Pair Cables, Connectors, and Terminal Equipment:

- A. Unshielded Twisted Pair (UTP) Cable Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Belden CDT Inc.; Electronics Division.
 - 2. Berk-Tek; a Nexans company.
 - 3. CommScope, Inc.
 - 4. Draka USA.
 - 5. Genesis Cable Products; Honeywell International, Inc.
 - 6. KRONE Incorporated.
 - 7. Mohawk; a division of Belden CDT.
 - 8. Nordex/CDT; a subsidiary of Cable Design Technologies.
 - 9. Superior Essex Inc.
 - 10. SYSTIMAX Solutions; a CommScope, Inc. brand.
 - 11. 3M.
 - 12. Tyco Electronics/AMP Netconnect; Tyco International Ltd.
- B. Unshielded Twisted Pair (UTP) Cable: Comply with EIA/TIA-568A, TSB 36. Multi-pair, solid copper No. 24 AWG, color-coded, thermoplastic-insulated conductors in an outer jacket listed for use in air-handling plenum spaces. Color of outer jacket sheath shall be on a per system/use basis, as specified hereinafter.
- C. UTP Cable Connecting Hardware: Comply with EIA/TIA-568A, TSB 40. Insulation displacement connector (IDC) type, using modules designed for use with punch-down caps or tools.
 - 1. IDC Terminal Block Modules: Integral with connector bodies, including plugs and jacks where indicated.
 - 2. IDC Connecting Hardware: Consistent throughout Project.
- D. Jacks and Jack Assemblies for UTP Cable: Modular, color-coded, RJ-45 receptacle units with integral IDC-type terminals. Use jacks for data or voice service.

2.5 Fiberoptic Cables Connectors, and Terminal Equipment:

- A. Fiberoptic Cable Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Berk-Tek; a Nexans company.
 - 2. CommScope, Inc.
 - 3. Corning Cable Systems.
 - 4. General Cable Technologies Corporation.
 - 5. Mohawk; a division of Belden CDT.
 - 6. Nordex/CDT; a subsidiary of Cable Design Technologies.

7. Optical Connectivity Solutions Division; Emerson Network Power.
8. Superior Essex Inc.
9. SYSTIMAX Solutions; a CommScope, Inc. brand.
10. 3M.
11. Tyco Electronics/AMP Netconnect; Tyco International Ltd.

B. Multi-mode fiberoptic cable shall provide the following features and performance specifications:

1. All fibers shall be 900 micron tight buffer for maximum protection and ease of installation.
2. General purpose 10 gigabit grade multi-mode cable with glass size of 62.5/125 microns.
3. Available in multi-strand cables.
4. Loaded minimum bend radius of 6.0 inches and an unloaded minimum bend radius of 3.3 inches.
5. The maximum attenuation in dB per kilometer at 850 nm shall be 3.0 dB and at 1300 nm it shall be 1.0 dB.
6. The minimum bandwidth at 850 nm shall be 200 MHZ and at 1300 nm it shall be 500 MHZ.
7. Maximum short term load (installation) shall be 300 lbs. and a long term maximum load of 100 lbs. For 6F and larger.

C. Single-mode fiberoptic cable shall provide the following features and performance specifications:

1. General purpose single-mode cable with glass size of 8.3-8.4/125 microns.
2. Available in multi-strand cables.
3. Loaded minimum bend radius of 6.0 inches and an unloaded minimum bend radius of 3.0 inches.
4. The maximum attenuation in dB per kilometer at 1310 nm shall be 0.5dB and at 1550 nm it shall be 0.5 dB.

D. All tight buffer fiberoptic cables shall be riser or plenum rated for indoor and outdoor use, as appropriate to the specific installation condition for that cable. The material used to tight buffer each fiber to 900 microns shall be a color coded. Fiberoptic cables of 12 strands or less shall be color coded by individual solid colors. Fiberoptic cables of greater than 12 strands shall be color coded by an industry standard method. The outer jacket shall be extruded directly over the strength member layer without tape or other materials between. Outer jackets of cables for indoor use shall be color coded as follows: orange for multi-mode fiber, yellow for single-mode fiber, gray or black for hybrid cables containing both single and multi-mode fibers. Cables for use outdoors shall be black in color, and shall be ultra-violet and fungus resistant. All fiberoptic cables shall meet or exceed all EIA/TIA standards for impact, crush and flex resistance.

- E. Fiberoptic cables shall be suitable for operation between -20°C and +80°C.
- F. Cables for direct burial shall have a riser or plenum rated core (finished cable on the inside), with an exterior steel armor and a polyethylene outer jacket. Remove outer armor jacket immediately after entrance into building.
- G. Provide fiberoptic distribution rack mounted at each end of each fiberoptic cable. Provide strain relief for fiberoptic cable. Terminate each fiber strand with connectors as indicated below at each end. Verify connector types with Owner's Representative prior to purchase.

2.6 Optical Fiber Cable Hardware

- A. Manufacturers: Subject to compliance with requirements, provide products by Corning Cable Systems, which shall form the basis of design. Subject to compliance with all contract requirements proposed substitutions may be considered from one of the following:
 - 1. ADC.
 - 2. American Technology Systems Industries, Inc.
 - 3. Berk-Tek; a Nexans company.
 - 4. Dynacom Corporation.
 - 5. Hubbell Premise Wiring.
 - 6. Molex Premise Networks; a division of Molex, Inc.
 - 7. Nordex/CDT; a subsidiary of Cable Design Technologies.
 - 8. Optical Connectivity Solutions Division; Emerson Network Power.
 - 9. The Siemon Co.
- B. Cross-Connects and Patch Panels: Modular panels housing multiple-numbered, duplex cable connectors.
- C. Number of Connectors per Field: One (1) for each fiber of cable or cables assigned to field, plus spares and blank positions adequate to suit specified expansion criteria.
- D. Patch Cords: Factory-made, dual-fiber cables in 36-inch (900-mm) lengths.
- E. Cable Connecting Hardware:
- F. Comply with Optical Fiber Connector Intermateability Standards (FOCIS) specifications of TIA/EIA-604-2, TIA/EIA-604-3-A, and TIA/EIA-604-12. Comply with TIA/EIA-568-C.3.
- G. Quick-connect, simplex and duplex, Type SC connectors. Insertion loss shall be not more than 0.75 dB.

2.7 Data Patch Panels:

- A. All horizontal data cables shall be terminated in Category 6 patch panels. Provide separate patch panels for horizontal data, and data riser cabling. Patch Panels shall be modular panel mounting multiple, numbered jack units with connectors of the IDC type at each jack to provide permanent termination of conductor pair groups of installed cables. Patch Panels shall be 48 port, Category 6, Ortronics or approved equal.

1. Number of Jacks per Field: 1 for each 4-pair UTP cable, plus spares and spare positions equivalent to 10% of the installed cables.
2. Mounting: Mount in floor mounted EIA equipment racks, with vertical and horizontal cable management brackets installed on front and rear of each rack.

2.8 Data Equipment Racks:

- A. Provide standard electronic equipment mounting racks as required for installation of data patch panels and other equipment. Allow 50% free space in each rack to accommodate Owner furnished equipment.
- B. Equipment racks shall provide EIA standard mounting provisions, with pre-drilled, pre-tapped holes to accommodate industry standard patch panels and rack mounted equipment.
- C. Racks shall be floor mounted, open. Provide multiple racks at each location to provide equipment mounting space as indicated above.
- D. Electronic racks shall be Ortronics or approved equal.
- E. Provide complete horizontal and vertical cable management facilities on each front and rear of each rack.

2.9 Voice Termination Punchblocks:

- A. Manufacturers: Subject to compliance with requirements, provide products by Hubbell Premise Wiring, which shall form the basis of design. Subject to compliance with all contract requirements, proposed substitutions may be considered from one of the following:
 1. American Technology Systems Industries, Inc.
 2. Dynacom Corporation.
 3. KRONE Incorporated.
 4. Leviton Voice & Data Division.
 5. Molex Premise Networks; a division of Molex, Inc.
 6. Nordex/CDT; a subsidiary of Cable Design Technologies.
 7. Panduit Corp.
 8. Siemon Co. (The).
 9. Tyco Electronics/AMP Netconnect; Tyco International Ltd.
- B. Terminate voice horizontal and riser cables on type 110 punchblocks. Voice Termination Punchblocks shall be AT&T 110-300 or approved equal. Provide a sufficient quantity of the required 110 type hardware to terminate all voice cables being installed under this contract. Provide all required stand-off brackets, D-Rings, and cable dressing hardware to provide, a neat and workmanlike installation.

2.10 Video (RF) Outlets, Cables and Miscellaneous Equipment

- A. All Video (RF) cables, connectors, splitters, tap-off units, etc. shall be certified as suitable for use on the satellite television signal vendor's system.

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B. Video (RF) Jacks and Outlets:

- 1) Video (RF) Jacks shall be standard "F" connector feed through type jacks, Ortronics 6090017 or approved equal.
- 2) Each jack shall be fed by an RG6/U coaxial drop cable which shall connect to a television trunk cable tap-off unit in the Communications Closet in each Cottage.

C. Video (RF) Cabling:

- 1) Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - (a) West Penn Wire Company, which shall form the basis of design. Subject to compliance with all contract requirements proposed equal substitutions may be considered from the following:
 - (b) Alpha Wire Company.
 - (c) Belden CDT Inc.; Electronics Division.
 - (d) Coleman Cable, Inc.
 - (e) CommScope, Inc.
 - (f) Draka USA.
- 2) All video (RF) coaxial cable shall be UL listed and labeled "Suitable for installation in air handling plenums."
- 3) Video (RF) drop cable less than 125 feet in length shall be RG6/U – 1 Conductor 18 AWG Solid, Quad-Shield and an overall Plenum rated Jacket. RG6/U cable shall be West Penn 25Q841.
- 4) Video (RF) drop cable longer than 125 feet in length shall be RG11/U – 1 Conductor 14 AWG Solid, Quad-Shield and an overall Plenum rated Jacket. RG11/U cable shall be West Penn 25Q821.
- 5) Video (RF) trunk cable shall be RG11/U – 1 Conductor 14 AWG Solid, Quad-Shield and an overall plenum rated jacket. RG11/U cable shall be West Penn 25Q821.

D. Video (RF) Taps, Splitters, Connectors and Miscellaneous Equipment:

- 1) Video (RF) System Tapoff (Blonder Tongue CRT 4A or approved equal): Each tapoff shall be fully two way, radiation shielded, have integral mounting tabs and shall be engineered by the installing contractor to be of the appropriate Tap Down Loss value to meet the testing specifications and requirements.
- 2) Video (RF) System Splitter (Blonder Tongue CRS-2 or approved equal): Each splitter shall be fully two way, radiation shielded and shall have integral mounting tabs.
- 3) Video (RF) System RG-11 Connector (Blonder Tongue BTF-110 or approved equal): This connector shall be a two piece crimp on type.

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- 4) Video (RF) System RG-6 Connector (Blonder Tongue BTF-561 or approved equal): This connector shall be a two piece crimp on type.
- 5) Video (RF) System Terminator (Blonder Tongue BTF-TP or approved equal): This terminator shall be rated at .25 watt, with a 25 dB return loss at 400 MHz.

3 PART 3 - EXECUTION

3.1 Examination:

- A. Examine pathway elements to receive cable. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 Installation:

A. Wiring Methods:

1. Wall outlets for telephone, data or television outlets shall consist of a 4" square box 2-1/8" deep, with raised single gang covers equipped with blank stainless steel device plate. Extend conduit, minimum size 1", from each outlet to accessible space above corridor ceiling and terminate with end bushing. Provide larger size or additional conduits where required to accommodate the actual wiring to be installed.
2. Install horizontal runs of cables exposed above finished ceilings. Provide category 6/fiberoptic rated flat "J" hooks or other suitable cable management devices as approved by the cabling system manufacturer at intervals not to exceed 5'-0" on center.
3. Install trunk cables between IDF Rooms and central equipment spaces in conduits. Where IDF Rooms stack vertically, provide sleeves between rooms as indicated on the drawings or as required.

- B. Color Coding of Wiring: The outer sheath of all low voltage wiring shall be color coded as follows:

1. House Data Network – Blue
2. House Telephone – White
3. Resident Telephone – Green
4. Resident Internet/Data (future) – Pink
5. Resident Television – White RG6/U
6. House Television – Black RG6/U
7. Fire Alarm – Red
8. Nurse Call – Violet/Purple
9. Door Monitoring – Yellow
10. Wander Guard – Gray
11. 62.5/125-micrometer Fiberoptic cable – Orange
12. 50/125-micrometer Fiberoptic cable – Aqua

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- C. All elbows in conduit runs shall be wide sweep field bends. Provide pull boxes as required and where directed by the telephone or cable television company and/or as required by the National Electrical Code.
- D. All raceways shall be terminated with nylon insulating bushings.
- E. Install components as indicated or required, according to manufacturers' written instructions. Use techniques, practices, and methods that are consistent with the Category 6 rating of the components and that assure Category 6 performance of completed and linked signal paths, end-to-end.
- F. Install cables without damaging conductors, shield, or jacket.
- G. Do not bend cable in handling or installation to smaller radii than minimums recommended by manufacturers.
- H. Pull cables without exceeding cable manufacturer's recommended pulling tensions.
 - 1. Pull cables simultaneously where more than one is being installed in the same raceway or cable run.
 - 2. Use water soluble, non-hardening pulling compound or lubricant where necessary. Use compounds that will not damage conductor or insulation.
 - 3. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage media or raceway.
- I. Install exposed cable parallel and perpendicular to surfaces or exposed structural members, and follow surface contours where possible.
- J. Secure and support exposed cable at intervals not exceeding 30 inches and not more than 6 inches from boxes, cable trays, fittings, racks, frames, and terminals.
- K. Separation from Electro-Magnetic Interference (EMI) Sources: Comply with EIA/TIA-569 rules for separation of unshielded copper voice and data system cables from potential EMI sources, including electrical power lines and equipment.
 - 1. Comply with BICSI TDMM and TIA/EIA-569-A for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
 - 2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
 - (a) Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches (127 mm).
 - (b) Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches (300 mm).
 - (c) Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches (610 mm).

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3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
 - (a) Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches (64 mm).
 - (b) Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches (150 mm).
 - (c) Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches (300 mm).
 4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
 - (a) Electrical Equipment Rating Less Than 2 kVA: No requirement.
 - (b) Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches (76 mm).
 - (c) Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches (150 mm).
 5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches (1200 mm).
 6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches (127 mm).
- L. Make splices, taps, and terminations only at outlets, terminals, and cross-connect and patch panels.
- M. Use splice and tap connectors compatible with media types.

3.3 Installation at Equipment Rooms and Wiring Closets:

- A. Provide fire retardant treated plywood backboards on all walls of each MPOP Room, IDF Room, Telephone Closet or elsewhere as noted on the drawings. Plywood shall be 3/4" thick, 8 feet high, grade C or better, and shall extend for the full width of each wall. Provide plywood wraps around all columns or other protrusions. Paint plywood to match surrounding wall surfaces prior to installation of any wiring or equipment. Mask fire retardant rating label on each plywood panel prior to painting so that fire retardant rating remains visible.
- B. Provide cable tray, as specified above, in continuous run above each rack, continuous along each wall with plywood backboard, and between backboards, racks and room entry point.
- C. Provide both vertical and horizontal cable and wire management facilities along all backboards, and racks within each room. Wire and cable management facilities on backboards shall consist of D rings, spools, etc. Wire and cable management facilities for racks shall consist of manufacturers standard rings for horizontal runs and vertical cable management channel on at each rack end, and between each pair of racks.
- D. Provide adequate length of conductors and cables. Train the conductors to terminal points with no excess. Provide 30 foot service loop for each fiberoptic cable, and 5 foot

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service loop for each copper cable within each IDF or equipment Room. Use cable management system to restrain cables, to prevent straining connections, and to prevent bending cables to radii smaller than allowed.

- E. Mount voice punchblocks, terminal strips, and other connecting hardware on backboards, except as otherwise indicated. Provide fire retardant treated plywood backboards as indicated on the drawings or as required. Paint backboards to match surrounding wall surfaces prior to installation of any equipment.
- F. Mount data patch panels in electronic racks suitable for the purpose. Provide sufficient racks to mount all data patch panels and other equipment. Allow space in each rack as specified above for Owner furnished equipment. Equally distribute space at top and bottom of each rack, and between multiple racks, unless otherwise directed in the field.
- G. Group connecting hardware for cables into separate logical fields.

3.4 Identification:

- A. Identify system components in compliance with the applicable requirements of Section 16010 "Basic Electrical Requirements" and in EIA/TIA 606-A.
- B. Follow EIA/TIA recommendations and Owner's standards for identification of voice and data jacks, cables and terminations.
- C. Workstation: Label cables within outlet boxes. Label each jack with a unique identifying nomenclature. Follow industry standard identifying practice, including building floor, cottage area and jack type designation.
- D. Distribution Racks and Frames: Label each unit and field within that unit.
- E. Within Connector Fields, in Wiring Closets and Equipment Rooms: Label each connector and each discrete unit of cable-terminating and connecting hardware. Label individual station cable terminations to match individual jack designations.
- F. Cables, Generally: Label each cable within 4 inches (100 mm) of each termination, wherever is is accessible in cabinets, outlet boxes and junction boxes, and elsewhere as indicated.
- G. Exposed Cables and Cables in Cable Trays: Label each cable at intervals not exceeding 5 feet.
- H. Cable Schedule: Post at a prominent location in each IDF Room and equipment room. List incoming and outgoing cables and their designations, origins, and destinations. Protect with a rigid frame and clear plastic cover. Provide a copy of final comprehensive schedules for the project using one of the products available in the current version of Microsoft Office Suite (Word, Excel, Access, etc.), and shall be provided on standard Microsoft Windows compatible 3-1/2" floppy diskette or CD-ROM.

3.5 System Acceptance Testing:

- A. Test the entire installation in accordance with all applicable EIA/TIA standards and recommendations.
- B. The Cable System Installer shall document the cable system testing methodologies in detail, including the scope, procedures and acceptance criteria for testing. The testing process shall be comprised of the test cycles outlined below. All test results (e.g. cable lengths, OTDR photographic traces, test result values, etc.) shall be documented in both hard copy and electronic format for the Owner's review and approval. Electronic format shall be provided using one of the products available in the current version of Microsoft Office Suite (Word, Excel, Access), and shall be provided on standard Microsoft Windows compatible 3-1/2" floppy diskette or CD-ROM.
- C. The Cable System Installer shall provide all necessary diagnostic tools (i.e. Time Domain Reflectometer (TDR), Optical Time Domain Reflectometer (OTDR), cable scanner, meters, logging equipment, or any other required equipment) The Cable System Installer shall describe any testing tools that are used, along with the capabilities and limitations of these tools.
- D. Cable System testing shall be conducted before, during and after installation. Upon completion of all prerequisite tasks to the corresponding test, the Cable System Installer shall notify the Owner in writing that the relevant portion of the cabling system is complete and ready for testing.
- E. Acceptance Test Failure: Failure of any portion of the Cabling System to successfully complete an Acceptance Test shall be deemed a failure of the entire cabling system. Such events shall be cause for Vendor obligation to execute the Retesting procedure outline below:
 1. If the Cabling System, or any part thereof, fails an Acceptance test, the Cabling Installer shall either:
 - (a) Modify or adjust the Cabling System to satisfy the necessary specifications and discrepancies;
 - OR-
 - (b) Replace or add such components as may be necessary to make the Cabling System satisfy the specifications.

The cabling System installer shall notify the Owner in writing of the diagnosed problem, proposed method for correction, and then once the corrections have been completed of the readiness of the Cabling System for re-execution of the Acceptance test.
 2. The contractor shall be responsible for correcting and resolving any issues raised by the General Contractor or the Owner's representative with respect to workmanship or deviation from standards stated herein.
 3. Contractor shall download the results and measurements obtained from the cable plant testing to a computer program daily. Contractor shall tabulate individual test results in chart and graph forms. The test results shall be submitted to the project manager or its approved agent for evaluation and approval. Contractor shall comply and implement all comments from the project management without any

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additional cost to the Owner. Upon receipt of approval, Contractor shall certify the cable plant and issue the warranty as specified hereinbefore.

4. If a problem fail test occurs, the Contractor shall evaluate and remedy the problem without any additional cost to the Owner.
5. After a problem has been remedied, the contractor shall re-test the circuit and re-submit the test results for approval. Contractor shall continue this process until required results are achieved.
6. Once all Acceptance Tests have been successfully completed, the Cabling System Installer shall provide for the Owner's signature, a document indicating that the system has passed all acceptance tests and certifying the installation on the manufacturer's standard certification test report forms. This document shall then be signed by the Owner as acceptance of the Cabling Installation and Acceptance Testing methodology and results.

F. Cable Systems Acceptance Tests:

1. Fiberoptic Cable Systems: All fiberoptic cabling and terminations shall be tested, characterized and documented. At a minimum, the following tests must be performed:
 - (a) Continuity Testing of optical fibers with a light source shall be analogous to a ringing out of copper cables. The test shall determine that each fiber strand is continuous before, during and after the cable has been installed. The test shall involve coupling visible light, from a red LED, into the fiber strand. Presence of visible light at the opposite end shall indicate continuity.
 - (b) Fiberoptic Power Meters shall measure the total loss or attenuation (including fiber and connectors) of a specific section or sections of fiberoptic cable and shall be conducted on all installed end-to-end fiber strands. Bi-directional optical loss testing shall be done at the nominal operating wavelengths of 850nm and 1300nm for multi-mode fiber, and at the nominal operating wavelengths of 1300nm and 1550nm for single mode fibers.
 - (c) Optical Time Domain Reflectometer (OTDR) shall utilize the fundamental reflection or backscatter properties of optical fibers by launching a well defined optical pulse shape into the fiber and then measuring the return level. This test shall be used to evaluate fiber loss per unit length (Db/km), distance to, and quality of, localized attenuation point sources, and overall cable lengths. Optical length and photographic picture of OTDR traces of each fiber strand shall be submitted as part of the documented test results.
 - (d) Link Confidence Testing shall determine the actual ability of the fiber to transmit 10Mb/s (Ethernet speed), 100Mb/s (fast Ethernet), and 1000 Mb/s (gigabit Ethernet). This test shall verify not only that all fiber cables meet or exceed all specified parameters, but that they also can accommodate the rigors of high bit rate transmission.

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- (e) Connector Insertion Loss shall measure the quality of the finish and performance of the overall terminated optical connector. This test shall ensure that all fiber connectors meet or exceed the specifications set forth in this specification.
- (a) The following guidelines must be followed for each system test:
 - (1) All test jumpers shall be of the same fiber core size and connector type as the cable system.
 - (2) OTDR must operate within the range of 850 ± 30 nm and 1300 ± 20 nm in accordance with EIA/TIA 526-14. The test equipment shall be calibrated and traceable to National Bureau of Standards (NBS).
 - (3) All connectors, sleeves and jumpers shall be properly cleaned before start of any test procedure.
 - (4) No strand shall exceed the expected attenuation.
 - (5) Contractor shall down-load test results and submit in report/graph form. The test results shall show, at minimum, date, time and setup calibration and parameters, overall-all loss, distance, end-to-end graph and shall show identification for each strand of each cable.

(f) The matrix below defines when each of the above tests shall be performed:

Optical Fiber Cable Test Requirements				
Unit Test Name	On-Reel	After Install	Post Term.	Final Test
Continuity		•	•	
Bi-Directional Fiberoptic Power Meter @ 850nm (multi-mode)		•	•	•
Bi-Directional Fiberoptic Power Meter @1300 nm (single & multi-mode)		•	•	•
Bi-Directional Fiberoptic Power Meter @1550 nm (single-mode)		•	•	•
OTDR @ 850nm (multi-mode)	•	•		•
OTDR @ 1300nm (single & multi-mode)	•	•		•
OTDR @ 1550nm (single-mode)	•	•		•
Link Confidence Test @10 Mb/s	•			•
Link Confidence Test @16 Mb/s	•			•
Link Confidence Test @100 Mb/s	•			•
Link Confidence Test @1000 Mb/s	•			•
Connector Insertion Loss			•	•

G. Category 6 UTP Cable Testing:

1. Each telecommunications outlet and cable shall be tested and certified for compliance with EIA/TIA Category 6. Each pair shall be tested end-to-end (from the outlet port through the port at Category 6. Each patch panel). Two (2) 10 foot patch cables shall be used at the test unit end so that the outlet, outlet termination, cable and termination block can be observed in the test. End-to-end attenuation loss and near-end-cross-talk shall meet or exceed Category 6 EIA/TIA 568 and TSB-67.
2. All copper cabling and terminations shall be tested, characterized and documented. At a minimum, the following tests must be performed:
 - (b) Continuity Testing shall be performed to determine that the copper conductors are continuous with no opens or shorts.

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- (c) Cable Characteristic Testing shall be performed to measure the intrinsic characteristics of a copper cable segment. Information derived from this test shall include the cables near end crosstalk (NEXT), capacitance, and characteristic impedance. This test shall be conducted on all installed end-to-end cable sections.
- (d) Time Domain Reflectometer (TDR) shall be used to evaluate copper loss per unit length (Db/ft) to measure both the quality and length of copper cable. The TDR information shall be used to verify that the cable meets required IEEE 802.3 specifications for 10BaseT connections and IEEE 802.5 specifications for 16Mb/s Token Ring over unshielded twisted pair cable.
- (e) Termination Testing shall be performed after the cable has been installed to verify that all cable pairs have been properly terminated. This testing shall assure that the pin-outs are correct and that there have been no flipped or unterminated pairs.
- (f) Link Confidence Testing shall measure the copper cable's ability to support 10 Mb/s (Ethernet) and 100 Mb/s (Fast Ethernet) transmissions.
 - (1) The matrix below defines when each of the above tests shall be performed:

Copper Cable Test Requirements				
Unit Test Name	On-Reel	After Install	Post Term.	Final Test
Continuity Test		•	•	
Cable Characteristic Test				•
Time Domain Reflectometer (TDR)			•	•
Termination Testing			•	•
Link Confidence Test @10 Mb/s			•	•
Link Confidence Test @16 Mb/s			•	•
Link Confidence Test @100 Mb/s			•	•
Link Confidence Test @1000 Mb/s			•	•

H. Test Performance:

- 1. All tested cables shall pass all performed test. End-to-end attenuation loss and NEXT shall meet or exceed Category 6, EIA/TIA 568 requirements.

I. Video (RF) Coaxial Cable Television Signal Distribution System Cabling and Outlets:

1. All Video (RF) Outlets/Jacks in the facility must be tested end to end between the video jack in a room and the video head-end located in the Mezzanine Communications Room. The signal measured by a signal strength meter at any video jack in the facility must be between 0 and +10 dB.
2. Tests and Inspections:
 - (a) Replace malfunctioning or damaged portions of the system.
 - (b) Retest until satisfactory performance and conditions are achieved.
 - (c) Use an agile receiver and signal strength meter or spectrum analyzer for testing.
 - (d) CATV Sources: Connect receiver to an agile demodulator or CATV set-top converter at CATV service entrance to the facility.
 - (e) Satellite Earth-Station System Sources: Adapt receiver to the output of satellite-television receiver.
 - (f) Test Schedule: Schedule tests after pretesting has successfully been completed and system has been in normal functional operation for at least 14 days. Provide a minimum of 10 days' notice of test schedule.
 - (g) Operational Tests: Perform tests of operational system to verify that system complies with Specifications. Include all modes of system operation. Test equipment for proper operation in all functional modes.
 - (h) Distribution System Acceptance Tests:
 - (i) Field-Strength Instrument: Rated for minus 40-dBmV measuring sensitivity and a frequency range of 54 to 812 MHz, minimum. Provide documentation of recent calibration against recognized standards.
 - (j) Signal Level and Picture Quality: Use a field-strength meter or spectrum analyzer, and a standard television receiver to measure signal levels and check picture quality at all user-interface outlets.
 - (k) Test the signal strength in dBmV at 55, 151, 547, and 750 MHz.
 - (l) Minimum acceptable signal level is 0 dBmV (1000 mV).
 - (m) Maximum acceptable signal level over the entire bandwidth is 15 dBmV.
 - (n) Television receiver shall show no evidence of cross-channel intermodulation, ghost images, or beat interference.
 - (o) Signal-to-Noise-Ratio Test: Use a field-strength meter to make a sequence of measurements at the output of the last distribution amplifier or of another agreed-on location in system. With system operating at normal levels, tune meter to the picture carrier frequency of each of the designated channels in turn and record the level. With signal removed and input to corresponding headend amplifier terminated at 75 ohms, measure the level of noise at same tuning settings. With meter correction factor added to last readings, differences from first set must not be less than 45 dB.
 - (p) Qualitative and Quantitative Performance Tests: Demonstrate reception quality of color-television program transmissions at each user interface from each designated channel and source. Quality shall be equal to or superior than that obtained with performance checks specified below, using a standard, commercial, cable-ready, color-television receiver. Level and quality of signal at each outlet and from each service and source shall comply with the following Specifications when tested according to 47 CFR 76:

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- (1) RF video-carrier level.
 - (2) Relative video-carrier level.
 - (3) Carrier level stability, during 60-minute and 24-hour periods.
 - (4) Broadband frequency response.
 - (5) Channel frequency response.
 - (6) Carrier-to-noise ratio.
 - (7) RF visual signal-to-noise ratio.
 - (8) Antenna combiner insertion loss.
 - (9) Signal power splitter loss.
 - (10) Cable connector attenuation.
 - (11) Tests in subparagraphs below require more expensive equipment than tests in subparagraphs above.
 - (12) Cross modulation.
 - (13) Carrier-to-echo ratio.
 - (14) Composite triple beat.
 - (15) Second order beat.
 - (16) Terminal isolation.
 - (17) Terminal isolation between television and FM.
 - (18) Hum modulation.
- (q) Minimum acceptable performance of distribution system at all user-interface points shall be as follows:
- (1) RF Video-Carrier Level: Between 3 and 12 dBmV.
 - (2) Relative Video-Carrier Level: Within 3 dB to adjacent channel.
 - (3) Carrier Level Stability, Short Term: Level shall not change more than 0.5 dB during a 60-minute period.
 - (4) Carrier Level Stability, Long Term: Level shall not change more than 2 dB during a 24-hour period.
 - (5) Channel Frequency Response: Across any 6-MHz channel in the 54- to 220-MHz frequency range, referenced to video; signal amplitude shall be plus or minus 1 dB, maximum.
 - (6) Carrier-to-Noise Ratio: 45 dB or more.
 - (7) RF Visual Signal-to-Noise Ratio: 43 dB or more.
 - (8) Antenna Combiner Insertion Loss: 40 dB maximum.
 - (9) Signal Power Splitter and Isolation Tap Return Loss: 17 dB maximum.
 - (10) Cable Connectors Attenuation: Less than 0.1 dB.
 - (11) Tests in subparagraphs below require more expensive equipment than tests in subparagraphs above. Retain tests below for high-fidelity or high-definition systems.
 - (12) Cross Modulation: Less than minus 50 dB.
 - (13) Carrier-to-Echo Ratio: More than 40 dB.
 - (14) Composite Triple Beat: Less than minus 53 dB.
 - (15) Second Order Beat: Less than minus 60 dB.
 - (16) Terminal Isolation from Television to Television: 25 dB, minimum.
 - (17) Terminal Isolation between Television and FM: 35 dB, minimum.
 - (18) Hum Modulation: 2 percent, maximum.
- (r) Headend and distribution system will be considered defective if they do not pass all tests and inspections.

- (s) Prepare test and inspection reports. Submit both hard copy and electronic files on CD-ROM. Provide one (1) set in each project Operation and Maintenance Manual.

J. Other Copper Cabling System Testing:

1. Each pair of all other copper cabling shall be tested. Each test shall be performed for end to end results.
2. The test shall be performed with approved test equipment. Contractor shall test each outlet cable according to manufacturer's instructions. Each outlet cable test shall include.
 - a. Overall cable length;
 - b. System continuity;
 - c. Proper connectivity;
 - d. Open pairs;
 - e. Short circuits;
 - f. Reserved pairs;
 - g. EMI noise induction;
 - h. Damaged cable;
 - i. Stretched, kinked or crimped cable;
 - j. Attenuation load in dB;
 - k. NEXT in dB.

3.6 Cleaning:

- A. On completion of system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, adhesive residue and construction debris and repair damaged finish, including chips, scratches, and abrasions.

3.7 Demonstration

- A. Train Owner's maintenance personnel in cable-plant management operations, including changing signal pathways for different workstations, rerouting signals in failed cables, and keeping records of cabling assignments and revisions when extending wiring to establish new workstation outlets.

***** END OF SECTION *****