

DEPARTMENT OF VETERANS AFFAIRS
 VHA MASTER SPECIFICATIONS

TABLE OF CONTENTS
 Section 00 01 10

	DIVISION 00 - SPECIAL SECTIONS	DATE
00 01 15	List of Drawing Sheets	09-11
00 11 21	Request for Proposal	
	DIVISION 01 - GENERAL REQUIREMENTS	
01 00 00	General Requirements	05-13
01 32 16.15	Project Schedules (Small Projects - Design/Bid/Build	04-13
01 33 23	Shop Drawings, Product Data, and Samples	11-08
01 42 19	Reference Standards	09-11
01 45 29	Testing Laboratory Services	07-13
01 15 26	Temporary Lighting	
01 54 16	Temporary Hoists and Gates	
01 57 19	Temporary Environmental Controls	01-11
01 58 16	Temporary Interior Signage	08-11
01 74 19	Construction Waste Management	05-12
01 91 00	General Commissioning Requirements	06-13
	DIVISION 02 - EXISTING CONDITIONS	
02 41 00	Demolition	04-13
02 82 11	Traditional Asbestos Abatement	07-11
	DIVISION 03 - CONCRETE	
03 30 53	Cast-in-Place Concrete	10-01
03 54 16	Hydraulic Cement Underlayment	
	DIVISION 04 - MASONRY - NOT USED	
	DIVISION 05 - METALS	
05 40 00	Cold-Formed Metal Framing	07-11
05 50 00	Metal Fabrications	09-11
	DIVISION 06 - WOOD, PLASTICS AND COMPOSITES	
06 10 00	Rough Carpentry	09-11
06 20 00	Finish Carpentry	06-13
	DIVISION 07 - THERMAL AND MOISTURE PROTECTION	
07 12 00	Built-Up Bituminous Waterproofing	09-11
07 21 13	Thermal Insulation	03-09
07 40 00	Roofing and Siding Panels	10-11

07 81 00	Applied Fireproofing	11-11
07 84 00	Firestopping	10-11
07 92 00	Joint Sealants	12-11
	DIVISION 08 - OPENINGS	
08 11 13	Hollow Metal Doors and Frames	01-13
08 11 16	Aluminum Doors and Frames	
08 14 00	Interior Wood Doors	10-12
08 11 16	Integrated Door Assemblies	02-12
08 31 13	Access Doors and Frames	10-11
08 33 00	Coiling Doors and Grilles	10-11
08 34 53	Security Doors and Frames	12-09
08 51 13	Aluminum Windows	
08 71 00	Door Hardware	09-11
08 80 00	Glazing	10-12
08 90 00	Louvers and Vents	10-11
	DIVISION 09 - FINISHES	
09 22 16	Non-Structural Metal Framing	07-13
09 29 00	Gypsum Board	02-13
09 30 13	Ceramic/Porcelain Tiling	05-12
09 51 00	Acoustical Ceilings	10-10
09 65 13	Resilient Base and Accessories	10-11
09 65 16	Resilient Sheet Flooring	07-13
09 65 19	Resilient Tile Flooring	03-11
09 68 00	Carpeting	10-11
09 77 23	Fabric-Wrapped Panels	
09 91 00	Painting	07-13
	DIVISION 10 - SPECIALTIES	
10 14 00	Signage	11-11
10 21 13	Toilet Compartments	05-12
10 21 23	Cubicle Curtain Tracks	11-11
10 26 00	Wall and Door Protection	01-11
10 28 00	Toilet, Bath, and Laundry Accessories	11-11
10 44 13	Fire Extinguisher Cabinets	11-11
	DIVISION 11 - EQUIPMENT	
11 70 00	Healthcare Equipment	
	DIVISION 12 - FURNISHINGS	
12 24 00	Window Shades	11-11
12 36 00	Countertops	06-13
	DIVISION 13 - SPECIAL CONSTRUCTION	
13 05 41	Seismic Restraint Requirements for Non-Structural Components	08-11

	DIVISION 14- CONVEYING EQUIPEMENT - NOT USED	
	DIVISION 21- FIRE SUPPRESSION	
21 05 11	Common Work Results for Fire Suppression	11-09
21 10 00	Water-Based Fire-Suppression Systems	09-11
	DIVISION 22 - PLUMBING	
22 05 11	Common Work Results for Plumbing	04-11
22 05 23	General-Duty Valves for Plumbing Piping	12-09
22 07 11	Plumbing Insulation	05-11
22 11 00	Facility Water Distribution	07-13
22 13 00	Facility Sanitary and Vent Piping	12-09
22 40 00	Plumbing Fixtures	03-11
	DIVISION 23 - HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)	
23 05 11	Common Work Results for HVAC	11-10
23 05 12	General Motor Requirements for HVAC and Steam Generation Equipment	11-10
23 05 41	Noise and Vibration Control for HVAC Piping and Equipment	11-10
23 05 93	Testing, Adjusting, and Balancing for HVAC	05-11
23 07 11	HVAC and Boiler Plant Insulation	05-11
23 09 23	Direct-Digital Control System for HVAC	09-11
23 21 13	Hydronic Piping	09-12
23 21 23	Hydronic Pumps	02-10
23 22 13	Steam and Condensate Heating Piping	03-10
23 25 00	HVAC Water Treatment	02-10
23 31 00	HVAC Ducts and Casings	03-13
23 34 00	HVAC Fans	11-09
23 36 00	Air Terminal Units	03-10
23 37 00	Air Outlets and Inlets	11-09
23 40 00	HVAC Air Cleaning Devices	02-12
23 73 00	Indoor Central-Station Air-Handling Units	04-11
23 82 00	Convection Heating and Cooling Units	04-11
23 82 16	Air Coils	04-11
	DIVISION 25 - INTEGRATED AUTOMATION - NOT USED	
	DIVISION 26 - ELECTRICAL	
26 05 11	Requirements for Electrical Installations	12-12
26 05 19	Low-Voltage Electrical Power Conductors and Cables	07-13
26 05 26	Grounding and Bonding for Electrical Systems	12-12
26 05 33	Raceway and Boxes for Electrical Systems	09-10
26 09 23	Lighting Controls	09-10
26 24 16	Panelboards	12-12
26 27 26	Wiring Devices	12-12
26 29 11	Motor Controllers	12-12

26 29 21	Enclosed Switches and Circuit Breakers	12-12
26 51 00	Interior Lighting	12-12
	DIVISION 27 - COMMUNICATIONS	
27 05 11	Requirements for Communications Installations	11-09
27 05 26	Grounding and Bonding for Communications Systems	10-06
27 05 28	Cable Trays for Communications Systems	
27 05 33	Raceways and Boxes for Communications Systems	12-05
27 10 00	Structured Cabling	12-05
27 11 00	Communications Equipment Room Fittings	06-13
27 15 00	Communications Horizontal Cabling	06-13
27 41 31	Master Antenna Television Equipment and Systems	08-09
27 51 16	Sound Masking Public Address and Mass Notification Systems	01-10
27 52 23	Nurse Call/ Code Blue Systems	01-10
	DIVISION 28 - ELECTRONIC SAFETY AND SECURITY	
28 05 00	Common Work Results for Electronic Safety and Security	06-13
28 05 13	Conductors and Cables for Electronic Safety and Security	09-11
28 05 26	Grounding and Bonding for Electronic Safety and Security	09-11
28 05 28.33	Conduits and Backboxes for Electronic Safety and Security	09-11
28 13 00	Physical Access Control Systems	10-11
28 23 00	Video Surveillance	09-11
28 26 00	Electronic Personal Protection System	09-11
28 31 00	Fire Detection and Alarm	10-11
	DIVISION 31 - EARTHWORK - NOT USED	
	DIVISION 32 - EXTERIOR IMPROVEMENTS - NOT USED	
	DIVISION 33 - UTILITIES - NOT USED	
	DIVISION 34 - TRANSPORTATION - NOT USED	
	DIVISION 48 - ELECTRICAL POWER GENERATION - NOT USED	

SECTION 03 30 53
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION:

This section specifies cast-in-place structural concrete and material and mixes for other concrete.

1.2 RELATED WORK:

- A. Materials testing and inspection during construction: Section 01 45 29, TESTING LABORATORY SERVICES.

1.3 TOLERANCES:

- A. ACI 117.
- B. Slab Finishes: ACI 117, F-number method in accordance with ASTM E1155.

1.4 REGULATORY REQUIREMENTS:

- A. ACI SP-66 ACI Detailing Manual
- B. ACI 318 - Building Code Requirements for Reinforced Concrete.

1.5 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Concrete Mix Design.
- C. Shop Drawings: Reinforcing steel: Complete shop drawings.
- D. Manufacturer's Certificates: Air-entraining admixture, chemical admixtures, curing compounds, bonding agents and polymer patching mortar.

1.6 APPLICABLE PUBLICATIONS:

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.
- B. American Concrete Institute (ACI):
 - 117-10.....Specification for Tolerances for Concrete Construction, Materials and Commentary
 - 211.1-91(R2009).....Standard Practice for Proportions for Normal, Heavyweight, and Mass Concrete
 - 211.2-98(R2004).....Standard Practice for Selecting Proportions for Structural Lightweight Concrete
 - 301-10.....Specifications for Structural Concrete
 - 305.1-06.....Specification for Hot Weather Concreting
 - 306.1-90(R2002).....Standard Specification for Cold Weather Concreting
 - SP-66-04ACI Detailing Manual

- 318-11.....Building Code Requirements for Structural
Concrete and Commentary
- C. American Society for Testing And Materials (ASTM):
- A185/A185M-07.....Standard Specification for Steel Welded Wire
Reinforcement, Plain, for Concrete Reinforcement
- A615/A615M-09.....Standard Specification for Deformed and Plain
Carbon Steel Bars for Concrete Reinforcement
- C31/C31M-10.....Standard Practice for Making and Curing Concrete
Test Specimens in the Field
- C33/C33M-11a.....Standard Specification for Concrete Aggregates
- C39/C39M-12.....Standard Test Method for Compressive Strength of
Cylindrical Concrete Specimens
- C94/C94M-12.....Standard Specification for Ready Mixed Concrete
- C143/C143M-10.....Standard Test Method for Slump of Hydraulic
Cement Concrete
- C150-11.....Standard Specification for Portland Cement
- C171-07.....Standard Specification for Sheet Material for
Curing Concrete
- C172-10.....Standard Practice for Sampling Freshly Mixed
Concrete
- C173-10.....Standard Test Method for Air Content of Freshly
Mixed Concrete by the Volumetric Method
- C192/C192M-07.....Standard Practice for Making and Curing Concrete
Test Specimens in the Laboratory
- C231-10.....Standard Test Method for Air Content of Freshly
Mixed Concrete by the Pressure Method
- C260-10.....Standard Specification for Air-Entraining
Admixtures for Concrete
- C330-09.....Standard Specification for Lightweight
Aggregates for Structural Concrete
- C494/C494M-11.....Standard Specification for Chemical Admixtures
for Concrete
- C618-12.....Standard Specification for Coal Fly Ash and Raw
or Calcined Natural Pozzolan for Use in Concrete
- D1751-04(R2008)Standard Specification for Preformed Expansion
Joint Fillers for Concrete Paving and Structural
Construction (Non-extruding and Resilient
Bituminous Types)

D4397-10.....Standard Specification for Polyethylene Sheeting
for Construction, Industrial and Agricultural
Applications

E1155-96(2008).....Standard Test Method for Determining F_F Floor
Flatness and F_L Floor Levelness Numbers

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Portland Cement: ASTM C150, Type I or II.
- B. Fly Ash: ASTM C618, Class C or F including supplementary optional requirements relating to reactive aggregates and alkalis, and loss on ignition (LOI) not to exceed 5 percent.
- C. Coarse Aggregate: ASTM C33, Size 67. Size 467 may be used for footings and walls over 300 mm (12 inches) thick. Coarse aggregate for applied topping and metal pan stair fill shall be Size 7.
- D. Fine Aggregate: ASTM C33.
- E. Lightweight Aggregate for Structural Concrete: ASTM C330, Table 1
- F. Mixing Water: Fresh, clean, and potable.
- G. Air-Entraining Admixture: ASTM C260.
- H. Chemical Admixtures: ASTM C494.
- I. Reinforcing Steel: ASTM A615 or ASTM A996, deformed. See structural drawings for grade.
- J. Welded Wire Fabric: ASTM A185.
- K. Sheet Materials for Curing Concrete: ASTM C171.
- L. Abrasive Aggregates: Aluminum oxide grains or emery grits.
- M. Polymer Patching Mortar: Free flowing, polymer modified cementitious mortar. Subject to compliance with requirements provide one of the following:
 - 1. Sikatop or Sikatop 123 Plus (vertical and overhead repairs) by Sika Corporation.
 - 2. Thin-Top Supreme or Concrete-Top Supreme (horizontal repairs) or Verticoat/Verticoat Supreme (vertical and overhead repairs) by The Euclid Chemical Co.
- N. Epoxy Resin Bonding Agent: ASTM C 881 two component 100 percent solids mineral filled epoxy-polysulfide polymer. Subject to compliance with requirements provide one of the following:
 - 1. Sikadur 32 Hi-Mod by Sika Corporation.
 - 2. Euco #452 or #620 (MV) by The Euclid Chemical Co.
 - 3. Epobond by L&M Construction Chemicals.
 - 4. Concrevisive 1090 by BASF Construction Chemicals.

2.3 CONCRETE MIXES:

- A. Design of concrete mixes using materials specified shall be the responsibility of the Contractor as set forth under Option C of ASTM C94.
- B. Compressive strength at 28 days shall be not less than 3000 psi.
- C. Maximum slump for vibrated concrete is 100 mm (4 inches) tested in accordance with ASTM C143.

**TABLE II TOTAL AIR CONTENT
AIR CONTENT OF LIGHTWEIGHT STRUCTURAL CONCRETE**

Nominal Maximum Size of Total Air Content	Coarse Aggregate, mm's (Inches) Percentage by Volume
Greater than 10 mm (3/8 in) 4 to 8	10 mm (3/8 in) or less 5 to 9

2.4 BATCHING & MIXING:

- A. Store, batch, and mix materials as specified in ASTM C94.
 - 1. Job-Mixed: Concrete mixed at job site shall be mixed in a batch mixer in manner specified for stationary mixers in ASTM C94.
 - 2. Ready-Mixed: Ready-mixed concrete comply with ASTM C94, except use of non-agitating equipment for transporting concrete to the site will not be permitted. With each load of concrete delivered to project, ready-mixed concrete producer shall furnish, in duplicate, certification as required by ASTM C94.
 - 3. Mixing structural lightweight concrete: Charge mixer with 2/3 of total mixing water and all of the aggregate. Mix ingredients for not less than 30 seconds in a stationary mixer or not less than 10 revolutions at mixing speed in a truck mixer. Add remaining mixing water and other ingredients and continue mixing. Above procedure may be modified as recommended by aggregate producer.

PART 3 - EXECUTION

3.1 REINFORCEMENT:

Details of concrete reinforcement, unless otherwise shown, in accordance with ACI 318 and ACI SP-66. Support and securely tie reinforcing steel to prevent displacement during placing of concrete.

3.2 PLACING CONCRETE:

- A. Remove water from excavations before concrete is placed. Remove hardened concrete, debris and other foreign materials from interior of forms, and from inside of mixing and conveying equipment. Obtain approval of

Resident Engineer before placing concrete. Provide screeds at required elevations for concrete slabs.

- B. Before placing new concrete on or against concrete which has set, existing surfaces shall be roughened and cleaned free from all laitance, foreign matter, loose particles, and apply bonding agent.
- C. Convey concrete from mixer to final place of deposit by method which will prevent segregation or loss of ingredients. Do not deposit in work concrete that has attained its initial set or has contained its water or cement more than 1 1/2 hours. Do not allow concrete to drop freely more than 1500 mm (5 feet) in unexposed work nor more than 900 mm (3 feet) in exposed work. Place and consolidate concrete in horizontal layers not exceeding 300 mm (12 inches) in thickness. Consolidate concrete by spading, rodding, and mechanical vibrator. Do not secure vibrator to forms or reinforcement. Vibration shall be carried on continuously with placing of concrete.
- D. Hot weather placing of concrete: Follow recommendations of ACI 305R to prevent problems in the manufacturing, placing, and curing of concrete that can adversely affect the properties and serviceability of the hardened concrete.
- E. Cold weather placing of concrete: Follow recommendations of ACI 306R, to prevent freezing of thin sections less than 300 mm (12 inches) and to permit concrete to gain strength properly, except that use of calcium chloride shall not be permitted without written approval from Resident Engineer.

3.3 PROTECTION AND CURING:

Protect exposed surfaces of concrete from premature drying, wash by rain or running water, wind, mechanical injury, and excessively hot or cold temperature. Curing method shall be subject to approval by Resident Engineer.

3.4 FINISHES:

- A. Vertical and Overhead Surface Finishes:
 - 1. Unfinished Areas: Vertical and overhead concrete surfaces exposed in unfinished areas, above suspended ceilings in manholes, and other unfinished areas exposed or concealed will not require additional finishing.
- B. Slab Finishes:
 - 1. Scratch Finish: Slab surfaces to receive a bonded applied cementitious application shall all be thoroughly raked or wire broomed after partial setting (within 2 hours after placing) to

roughen surface to insure a permanent bond between base slab and applied cementitious materials.

2. Floating: Allow water brought to surface by float used for rough finishing to evaporate before surface is again floated or troweled. Do not sprinkle dry cement on surface to absorb water.

3.5 APPLIED TOPPING:

- A. Separate concrete topping with thickness and strength shown with only enough water to insure a stiff, workable, plastic mix.
- B. Continuously place applied topping until entire section is complete, struck off with straightedge, compact by rolling or tamping, float and steel trowel to a hard smooth finish.

3.6 RESURFACING FLOORS:

Remove existing flooring, in areas to receive resurfacing, to expose existing structural slab ~~and to extend not less than 25 mm (1 inch) below new finished floor level~~. Prepare exposed structural slab surface by roughening, broom cleaning, wetting, and grouting. **Prepare level floor surface by means of floating to accommodate specified floor finishes.** Apply topping as specified.

- - - E N D - - -

SECTION 05 50 00

METAL FABRICATIONS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies items and assemblies fabricated from structural steel shapes, stainless steel, and other materials as shown and specified.
- B. Items specified.
 - 1. Support for Wall and Ceiling Mounted Items: ~~(12, 14A, 14C)~~
 - 2. Steel Counter or Bench Top Frame and Leg
 - 3. Stainless steel column enclosures
 - 4. Stainless steel metal base
 - 5. Stainless steel trim at Reception Desk
 - ~~6. Steel fin tube cover with aluminum grille as shown on Drawings.~~
 - 7.6. Aluminum extrusion at terminations of tile as shown on Drawings.

1.2 RELATED WORK

- A. Colors, finishes, and textures: Finish Schedule.
- B. Prime and finish painting: Section 09 91 00, PAINTING.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings:
 - 1. Each item specified, showing complete detail, location in the project, material and size of components, method of joining various components and assemblies, finish, and location, size and type of anchors.
 - 2. Mark items requiring field assembly for erection identification and furnish erection drawings and instructions.
 - 3. Provide templates and rough-in measurements as required.

1.4 QUALITY ASSURANCE

- A. Each manufactured product shall meet, as a minimum, the requirements specified, and shall be a standard commercial product of a manufacturer regularly presently manufacturing items of type specified.
- B. Each product type shall be the same and be made by the same manufacturer.

- C. Assemble product to the greatest extent possible before delivery to the site.
- D. Include additional features, which are not specifically prohibited by this specification, but which are a part of the manufacturer's standard commercial product.

1.5 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society of Mechanical Engineers (ASME):
 - 1. B18.6.1-81(R1997) Wood Screws
 - 2. B18.2.2-87(R2005) Square and Hex Nuts
- C. American Society for Testing and Materials (ASTM):
 - 1. A36/A36M-05 Structural Steel
 - 2. A47-99(R2004) Malleable Iron Castings
 - 3. A48-03 Gray Iron Castings
 - 4. A53-06 Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
 - 5. A123-02 Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
 - 6. A307-07 Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength
 - 7. A653/A653M-07 Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process
 - 8. F436-07 Hardened Steel Washers
 - 9. F468-06 Nonferrous Bolts, Hex Cap Screws, and Studs for General Use
 - 10. F593-02 Stainless Steel Bolts, Hex Cap Screws, and Studs
 - 11. F1667-05 Driven Fasteners: Nails, Spikes and Staples
- D. American Welding Society (AWS):
 - 1. D1.1-04 Structural Welding Code Steel
 - 2. D1.3-98 Structural Welding Code Sheet Steel
- E. Structural Steel Painting Council (SSPC):
 - 1. SP 1-05 No. 1, Solvent Cleaning
 - 2. SP 2-05 No. 2, Hand Tool Cleaning
 - 3. SP 3-05 No. 3, Power Tool Cleaning

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Structural Steel: ASTM A36.
- B. Stainless Steel: ASTM A167, Type 302 or 304.
- C. Aluminum, Extruded: ASTM B221, Alloy 6063-T5 unless otherwise specified. For structural shapes use alloy 6061-T6 and alloy 6061-T4511.
- D. Steel Pipe: ASTM A53.
 - 1. Galvanized for exterior locations.
 - 2. Type S, Grade A unless specified otherwise.
 - 3. NPS (inside diameter) as shown.
- E. Primer Paint: As specified in Section 09 91 00, PAINTING.

2.2 HARDWARE

- A. Rough Hardware:
 - 1. Furnish rough hardware with a standard plating, applied after punching, forming and assembly of parts; galvanized, cadmium plated, or zinc-coated by electro-galvanizing process. Galvanized G-90 where specified.
- B. Fasteners:
 - 1. Bolts with Nuts:
 - a. ASME B18.2.2.
 - b. ASTM A307 for 415 MPa (60,000 psi) tensile strength bolts.
 - c. ASTM F468 for nonferrous bolts.
 - 2. Screws: ASME B18.6.1.
 - 3. Washers: ASTM F436, type to suit material and anchorage.
 - 4. Nails: ASTM F1667, Type I, style 6 or 14 for finish work.

2.3 FABRICATION GENERAL

- A. Material
 - 1. Use material as specified. Use material of commercial quality and suitable for intended purpose for material that is not named or its standard of quality not specified.
 - 2. Use material free of defects which could affect the appearance or service ability of the finished product.
- B. Size:
 - 1. Size and thickness of members as shown.
 - 2. When size and thickness is not specified or shown for an individual part, use size and thickness not less than that used for the same

component on similar standard commercial items or in accordance with established shop methods.

C. Connections

1. Except as otherwise specified, connections may be made by welding, riveting or bolting.
2. Field riveting will not be approved.
3. Design size, number and placement of fasteners, to develop a joint strength of not less than the design value.
4. Holes, for rivets and bolts: Accurately punched or drilled and burrs removed.
5. Size and shape welds to develop the full design strength of the parts connected by welds and to transmit imposed stresses without permanent deformation or failure when subject to service loadings.
6. Use Rivets and bolts of material selected to prevent corrosion (electrolysis) at bimetallic contacts. Plated or coated material will not be approved.

D. Fasteners and Anchors

1. Use methods for fastening or anchoring metal fabrications to building construction as shown or specified.
2. Where fasteners and anchors are not shown, design the type, size, location and spacing to resist the loads imposed without deformation of the members or causing failure of the anchor or fastener, and suit the sequence of installation.
3. Use material and finish of the fasteners compatible with the kinds of materials which are fastened together and their location in the finished work.
4. Fasteners for securing metal fabrications to new construction only, may be by use of threaded or wedge type inserts or by anchors for welding to the metal fabrication for installation before the concrete is placed or as masonry is laid.
5. Fasteners for securing metal fabrication to existing construction or new construction may be expansion bolts, toggle bolts, power actuated drive pins, welding, self drilling and tapping screws or bolts.

E. Workmanship

1. General:
 - a. Fabricate items to design shown.

- b. Furnish members in longest lengths commercially available within the limits shown and specified.
 - c. Fabricate straight, true, free from warp and twist, and where applicable square and in same plane.
 - d. Provide holes, sinkages and reinforcement shown and required for fasteners and anchorage items.
 - e. Provide openings, cut-outs, and tapped holes for attachment and clearances required for work of other trades.
 - f. Prepare members for the installation and fitting of hardware.
 - g. Cut openings in gratings and floor plates for the passage of ducts, sumps, pipes, conduits and similar items. Provide reinforcement to support cut edges.
 - h. Fabricate surfaces and edges free from sharp edges, burrs and projections which may cause injury.
2. Welding:
- a. Weld in accordance with AWS.
 - b. Welds shall show good fusion, be free from cracks and porosity and accomplish secure and rigid joints in proper alignment.
 - c. Where exposed in the finished work, continuous weld for the full length of the members joined and have depressed areas filled and protruding welds finished smooth and flush with adjacent surfaces.
 - d. Finish welded joints to match finish of adjacent surface.
3. Joining:
- a. Miter or butt members at corners.
 - b. Where frames members are butted at corners, cut leg of frame member perpendicular to surface, as required for clearance.
4. Anchors:
- a. Where metal fabrications are shown to be preset in concrete, weld 32 x 3 mm (1-1/4 by 1/8 inch) steel strap anchors, 150 mm (6 inches) long with 25 mm (1 inch) hooked end, to back of member at 600 mm (2 feet) on center, unless otherwise shown.
 - b. Where metal fabrications are shown to be built into masonry use 32 x 3 mm (1-1/4 by 1/8 inch) steel strap anchors, 250 mm (10 inches) long with 50 mm (2 inch) hooked end, welded to back of member at 600 mm (2 feet) on center, unless otherwise shown.

5. Cutting and Fitting:

- a. Accurately cut, machine and fit joints, corners, copes, and miters.
- b. Fit removable members to be easily removed.
- c. Design and construct field connections in the most practical place for appearance and ease of installation.
- d. Fit pieces together as required.
- e. Fabricate connections for ease of assembly and disassembly without use of special tools.
- f. Joints firm when assembled.
- g. Conceal joining, fitting and welding on exposed work as far as practical.
- h. Do not show rivets and screws prominently on the exposed face.
- i. The fit of components and the alignment of holes shall eliminate the need to modify component or to use exceptional force in the assembly of item and eliminate the need to use other than common tools.

F. Finish:

1. Finish exposed surfaces in accordance with NAAMM Metal Finishes Manual.
2. Aluminum: NAAMM AMP 501.
 - a. Clear anodic coating, AA-C22A41, chemically etched medium matte, with Architectural Class 1, 0.7 mils or thicker.
 - b. Colored anodic coating, AA-C22A42, chemically etched medium matte with Architectural Class 1, 0.7 mils or thicker.
 - c. Painted: AA-C22R10.
3. Steel and Iron: NAAMM AMP 504.
 - a. Zinc coated (Galvanized): ASTM A123, G90 unless noted otherwise.
 - b. Surfaces exposed in the finished work:
 - 1) Finish smooth rough surfaces and remove projections.
 - 2) Fill holes, dents and similar voids and depressions with epoxy type patching compound.
 - c. Shop Prime Painting:
 - 1) Surfaces of Ferrous metal:
 - a) Items not specified to have other coatings.
 - b) Galvanized surfaces specified to have prime paint.

- c) Remove all loose mill scale, rust, and paint, by hand or power tool cleaning as defined in SSPC-SP2 and SP3.
- d) Clean of oil, grease, soil and other detrimental matter by use of solvents or cleaning compounds as defined in SSPC-SP1.
- e) After cleaning and finishing apply one coat of primer as specified in Section 09 91 00, PAINTING.

2) Non ferrous metals: Comply with MAAMM-500 series.

4. Stainless Steel: NAAMM AMP-504 Finish No. 4.

G. Protection:

- 1. Insulate aluminum surfaces that will come in contact with concrete, masonry, plaster, or metals other than stainless steel, zinc or white bronze by giving a coat of heavy-bodied alkali resisting bituminous paint or other approved paint in shop.
- 2. Spot prime all abraded and damaged areas of zinc coating which expose the bare metal, using zinc rich paint on hot-dip zinc coat items and zinc dust primer on all other zinc coated items.

2.4 SUPPORTS

A. General:

- 1. Fabricate ASTM A36 structural steel shapes as shown.
- 2. Use clip angles or make provisions for welding hangers and braces to overhead construction.
- 3. Field connections may be welded or bolted.

B. For Ceiling Hung Toilet Stall:

- 1. Use a continuous steel channel above pilasters with hangers centered over pilasters.
- 2. Make provision for installation of stud bolts in lower flange of channel.
- 3. Provide a continuous steel angle at wall and channel braces spaced as shown.
- 4. Use threaded rod hangers.
- 5. Provide diagonal angle brace where the suspended ceiling over toilet stalls does not extend to side wall of room.
- 6. Provide supports for ceiling hung pilasters at dressing booths and entrance screen to toilet room similar to support for toilet stall pilasters.

C. For Wall Mounted Items:

1. For items supported by metal stud partitions.
2. Steel strip or hat channel minimum of 1.5 mm (0.0598 inch) thick.
3. Steel strip minimum of 150 mm (6 inches) wide, length extending one stud space beyond end of item supported.
4. Steel hat channels where shown. Flange cut and flatted for anchorage to stud.
5. Structural steel tube or channel for grab bar at water closets floor to structure above with clip angles or end plates formed for anchors.
6. Use steel angles for thru wall counters. Drill angle for fasteners at ends and not over 100 mm (4 inches) on center between ends.

D. Supports for Various Conditions at Suspended Ceilings:

1. Fabricate of structural steel shapes as shown.
2. Drill for anchor bolts of suspended item.

2.5 STEEL COUNTER OR BENCH TOP FRAME AND LEGS

- A. Fabricate channel or angle frame with mitered and welded corners as shown.
- B. Drill top of frame with 6 mm (1/4 inch) holes spaced 200 mm (8 inches) on center for securing countertop.
- C. Fabricate legs of angle or pipe shapes and continuously weld to frame.
- D. Finish frame with backed on enamel prime coat.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set work accurately, in alignment and where shown, plumb, level, free of rack and twist, and set parallel or perpendicular as required to line and plane of surface.
- B. Items set into concrete or masonry.
 1. Provide temporary bracing for such items until concrete or masonry is set.
 2. Place in accordance with setting drawings and instructions.
 3. Build strap anchors, into masonry as work progresses.
- C. Set frames of gratings, covers, corner guards, trap doors and similar items flush with finish floor or wall surface and, where applicable, flush with side of opening.
- D. Field weld in accordance with AWS.
 1. Design and finish as specified for shop welding.

2. Use continuous weld unless specified otherwise.
- E. Install anchoring devices and fasteners as shown and as necessary for securing metal fabrications to building construction as specified. Power actuated drive pins may be used except for removable items and where members would be deformed or substrate damaged by their use.
- F. Spot prime all abraded and damaged areas of zinc coating as specified and all abraded and damaged areas of shop prime coat with same kind of paint used for shop priming.
- G. Isolate aluminum from dissimilar metals and from contact with concrete and masonry materials as required to prevent electrolysis and corrosion.
- H. Secure escutcheon plate with set screw.

3.2 INSTALLATION OF SUPPORTS

- A. Anchorage to structure.
 1. Secure angles or channels and clips to overhead structural steel by continuous welding unless bolting is shown.
 2. Secure supports to concrete inserts by bolting or continuous welding as shown.
 3. Secure supports to mid height of concrete beams when inserts do not exist with expansion bolts and to slabs, with expansion bolts. unless shown otherwise.
 4. Secure steel plate or hat channels to studs as detailed.
- B. Ceiling Hung Toilet Stalls:
 1. Securely anchor hangers of continuous steel channel above pilasters to structure above.
 2. Bolt continuous steel angle at wall to masonry or weld to face of each metal stud.
 3. Secure brace for steel channels over toilet stall pilasters to wall angle supports with bolts at each end spaced as shown.
 4. Install diagonal angle brace where the suspended ceiling over toilet stalls does not extend to side wall of room.
 5. Install stud bolts in lower flange of channel before installing furred down ceiling over toilet stalls.
 6. Install support for ceiling hung pilasters at entrance screen to toilet room similar to toilet stall pilasters.
- C. Supports for Wall Mounted items:
 1. Locate center of support at anchorage point of supported item.

2. Locate support at top and bottom of wall hung cabinets.
3. Locate support at top of floor cabinets and shelving installed against walls.
4. Locate supports where required for items shown.

3.3 STEEL COMPONENTS FOR MILLWORK ITEMS

- A. Coordinate and deliver to Millwork fabricator for assembly where millwork items are secured to metal fabrications.

3.4 CLEAN AND ADJUSTING

- A. Adjust movable parts including hardware to operate as designed without binding or deformation of the members centered in the opening or frame and, where applicable, contact surfaces fit tight and even without forcing or warping the components.
- B. Clean after installation exposed prefinished and plated items and items fabricated from stainless steel, aluminum and copper alloys, as recommended by the metal manufacture and protected from damage until completion of the project.

- - - E N D - - -

SECTION 085113

ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Aluminum windows of type and size shown, complete with hardware, related components and accessories.
- B. Types:
 - 1. Casement

1.2 DEFINITIONS

- A. Accessories: Mullions, staff beads, casings, closures, trim, moldings, panning systems, sub-sills, clips anchors, fasteners, weather-stripping, insect screens [mechanical operators,] and other necessary components required for fabrication and installation of window units.
- B. Uncontrolled Water: Water not drained to the exterior, or water appearing on the room side of the window.

1.3 RELATED WORK

- A. Steel subframes: Section 055000, METAL FABRICATIONS.
- B. Glazing: Section 088000, GLAZING.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Protect windows from damage during handling and construction operations before, during and after installation.
- B. Store windows under cover, setting upright.
- C. Do not stack windows flat.
- D. Do not lay building materials or equipment on windows.

1.5 QUALITY ASSURANCE

- A. Approval by contracting officer is required of products or service of proposed manufacturers and installers.
- B. Approval will be based on submission of certification by Contractor that:
 - 1. Manufacturer regularly and presently manufactures the specified windows as one of its principal products.
 - 2. Installer has technical qualifications, experience, trained personnel and facilities to install specified items.
- C. Provide each type of window produced from one source of manufacture.
- D. Quality Certified Labels or certificate:
 - 1. Architectural Aluminum Manufacturers Association, "AAMA label" affixed to each window indicating compliance with specification.

2. Certificates in lieu of label with copy of recent test report (not more than 4 years old) from an independent testing laboratory and certificate signed by window manufacturer stating that windows provided comply with specified requirements and AAMA 101/I.S.2/A440 for type of window specified.

1.6 SUBMITTAL

- A. Submit in accordance with Section 013323, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings:
 1. Minimum of 1/2 full scale [types of windows on project].
 2. Identifying parts of window units by name and kind of metal or material, show construction, locking systems, mechanical operators, trim, installation and anchorages.
 3. Include glazing details and standards for factory glazed units.
- C. Manufacturer's Literature and Data:
 1. Window.
 2. Sash locks, keepers, and key.
- D. Certificates:
 1. Certificates as specified in paragraph QUALITY ASSURANCE.
 2. Indicating manufacturers and installers qualifications.
 3. Manufacturer's Certification that windows delivered to project are identical to windows tested.
- E. Copies of test reports as specified in paragraph QUALITY ASSURANCE.
- F. Samples: Provide 150 mm (six-inch) length samples showing finishes, specified.

1.7 WARRANTY

- A. Warrant windows against malfunctions due to defects in thermal breaks, hardware, materials and workmanship, subject to the terms of Article "WARRANTY OF CONSTRUCTION", FAR clause 52.246-21, except provide 10 year warranty period.

1.8 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.
- B. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE)
 1. 90.1-07 Energy Standard of Buildings
- C. American Architectural Manufacturers Association (AAMA):
 1. 101/I.S.2/A440-11 Windows, Doors, and Unit Skylights
 2. 505-09 Dry Shrinkage and Composite Performance Thermal Cycling Test Procedures

3. 2605-05 Superior Performing Organic Coatings on Architectural Aluminum Extrusions and Panels
 4. TIR-A8-08 Structural Performance of Poured and Debridged Framing Systems
- D. American Society for Testing and Materials (ASTM):
1. A653/A653M-09 Steel Sheet, Zinc Coated (Galvanized), Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-dip Process
 2. E 90-09 Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions
- E. National Fenestration Rating Council (NFRC):
1. NFRC 100-10 Determining Fenestration Product U-Factors
 2. NFRC 200-10 Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence
- F. National Association of Architectural Metal Manufacturers (NAAMM):
1. AMP 500-06 Metal Finishes Manual

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aluminum Extrusions; Sheet and Plate: AAMA 101/I.S.2/A440.
- B. Sheet Steel, Galvanized: ASTM A653; G90 galvanized coating.
- C. Weather-strips: AAMA 101/I.S.2/A440; except leaf type weather-stripping is not permitted.
- D. Insect Screening:
 1. Regular mesh, 18 by 18, AAMA 101/I.S.2/A440.
 2. Aluminum with dark bronze anodized finish unless specified otherwise.
- E. Fasteners: AAMA 101/I.S.2/A440. Screws, bolts, nuts, rivets and other fastening devices to be non-magnetic stainless steel.
 1. Fasteners to be concealed when window is closed. Where wall thickness is less than 3 mm (0.125 inch) thick, provide backup plates or similar reinforcements for fasteners.
 2. Stainless steel self tapping screws may be used to secure Venetian blind hanger clips, vent guide blocks, friction adjuster, and limit opening device.
 3. Attach locking and hold-open devices to windows with concealed fasteners. Provide reinforcing plates where wall thickness is less than 3 mm (0.125 inch) thick.
- F. Weather-strips: AAMA 101/I.S.2/A440.
- G. Hardware:
 1. Locks: Two position locking bolts or cam type tamperproof custodial locks with a single point control located not higher than five feet from floor level. Locate locking devices in the vent side rail. Fastenings for locks and keepers shall be concealed or nonremovable.

2. Locking Device Strikes: Locate strikes in frame jamb. Strikes shall be adjustable for locking tension. Fabricate strikes from Type 304 stainless steel or white bronze.
3. Fabricate hinges of noncorrosive metal. Hinges may be either fully concealed when window is closed or semi-concealed with exposed knuckles. All exposed knuckle hinges shall have hospital tips, at both ends. Surface mounted hinges will not be accepted.
4. Guide Blocks: Fabricate guide blocks of injection molded nylon. Install guide block fully concealed in vent/frame sill.
5. Hardware for Emergency Ventilation of Windows:
 - a. Provide windows with a hold open linkage for emergency ventilation.
 - b. Hold open hardware shall provide for maximum six inches of window opening and shall include an adjustable friction shoe to provide resistance when closing the window.
 - c. Handles shall be removable.
6. Hardware for Maintenance Opening of Windows: Opening beyond the six inch position shall be accomplished with a window washers key. The release device shall capture the key when window is in the open position.
7. Design operating device to prevent opening with standard tools, coins or bent wire devices.

2.2 THERMAL AND CONDENSATION PERFORMANCE

- A. Condensation Resistance Factor (CRF): Minimum CRF of C 55.
- B. Thermal Transmittance:
 1. Maximum U value class for dual glazed windows: 50 (U=0.50), or as required by ASHRAE 90.1.
- C. Solar Heat Gain Coefficient (SHGC): Less than or equal to 0.40.

2.3 FABRICATION

- A. Fabrication to exceed or meet requirements of Physical Load Tests, Air Infiltration Test, and Water Resistance Test of AAMA 101/I.S.2/A440.
- B. Glazing: Triple glazed with insulating glass (exterior) and separate single glazing (interior).
 1. Factory or field glazing optional.
 2. Glaze in accordance with Section 088000, GLAZING.
 3. Windows reglazable without dismantling sash framing.
 4. Design rabbet to suit glass thickness and glazing method specified. [Increase rabbet depths for plastic glazing when used; minimum, depth of 25 mm (1-inch).]
 5. Glaze from interior except where not accessible.
 6. Provide removable fin type glazing beads.

7. Provide integral commercial quality blinds between exterior insulating glass and interior single glazing. Include tilt mechanism to operate blinds without removing interior glass pane.

C. Trim:

1. Trim includes casings, closures, and panning.
2. Fabricate to shapes shown of aluminum not less than 1.6 mm (0.062 inch) thick
3. Extruded or formed sections, straight, true, and smooth on exposed surfaces. [Curved sections true to line.]
4. Exposed external corners mitered and internal corners coped; fitted with hairline joints.
5. Reinforce 1.6 mm (0.062 inch) thick members with not less than 3 mm (1/8-inch) thick aluminum.
6. Except for strap anchors, provide reinforcing for fastening near ends and at intervals not more than 305 mm (12 inches) between ends.
7. Design to allow unrestricted expansion and contraction of members and window frames.
8. Secure to window frames with machine screws or expansion rivets.
9. Exposed screws, fasteners or pop rivets are not acceptable on exterior of the casing or trim cover system.

D. Thermal-Break Construction:

1. Manufacturer's Standard.
2. Low conductance thermal barrier.
3. Capable of structurally holding sash in position and together.
4. All Thermal Break Assemblies (Pour & Debridge, Insulbar or others) shall be tested as per AAMA TIR A8 and AAMA 505 for Dry Shrinkage and Composite Performance.
5. Location of thermal barrier and design of window shall be such that, in closed position, outside air shall not come in direct contact with interior frame of the window.

E. Mullions: AAMA 101/I.S.2/A440.

F. Subsills and Stools:

1. Fabricate to shapes shown of not less than 2 mm (0.080 inch) thick extruded aluminum.
2. One piece full length of opening with concealed anchors.
3. Sills turned up back edge not less than 6 mm (1/4 inch). Front edge provide with drip.
4. Sill back edge behind face of window frame. Do not extend to interior surface or bridge thermal breaks.
5. Do not perforate for anchorage, clip screws, or other requirements.

G. Insect Screens:

1. AAMA 101/I.S.2/A440.
2. Vinyl clad aluminum screen cloth.

2.4 CASEMENT WINDOWS

- A. AAMA 101/I.S.2/A440; Type: C-AW65.
- B. AAMA certified product to the AAMA 101/I.S.2/A440. - 11 standard.

2.5 FINISH

- A. In accordance with NAAMM AMP 500 series.
- B. Finish exposed aluminum surfaces as follows to match existing windows:
 - 1. Anodized Aluminum:
 - a. Finish in accordance with AMP 501 letters and numbers.
 - b. Clear anodized Finish: AA-C22A41 Medium matte, clear anodic coating, Class 1 Architectural, 0.7 mils thick.
 - c. Colored anodized Finish: AA-C22A42 (anodized) or AA-C22A44 (electrolytically deposited metallic compound) medium matte, integrally colored coating, Class 1 Architectural, 0.7 mils thick.
 - 1) Dyes not accepted.
 - 2) Coated Aluminum:
 - 3) Variation of more than 50 percent of maximum shade range approved will not be accepted in a single window or in adjacent windows and mullions on a continuous series.
 - a) AMP 501 and 505.
 - b) Fluorocarbon Finish: AAMA 2605, superior performing organic coating.
- C. Hardware: Finish hardware exposed when window is in the closed position: Match window color.

PART 3 - EXECUTION

3.1 PROTECTION (DISSIMILAR MATERIALS):

- A. AAMA 101/I.S.2/A440.

3.2 INSTALLATION, GENERAL

- A. Install window units in accordance with manufacturer's specifications and recommendations for installation of window units, hardware, operators and other components of work.
- B. Where type, size or spacing of fastenings for securing window accessories or equipment to building construction is not shown or specified, use expansion or toggle bolts or screws, as best suited to construction material.
 - 1. Provide bolts or screws minimum 6 mm (1/4-inch) in diameter.
 - 2. Sized and spaced to resist the tensile and shear loads imposed.
 - 3. Do not use exposed fasteners on exterior, except when unavoidable for application of hardware.
 - 4. Provide non-magnetic stainless steel Phillips flat-head machine screws for exposed fasteners, where required, or special tamper-proof fasteners.

5. Locate fasteners to not disturb the thermal break construction of windows.
- C. Set windows plumb, level, true, and in alignment; without warp or rack of frames or sash.
- D. Anchor windows on four sides with anchor clips or fin trim.
 1. Do not allow anchor clips to bridge thermal breaks.
 2. Use separate clips for each side of thermal breaks.
 3. Make connections to allow for thermal and other movements.
 4. Do not allow building load to bear on windows.
 5. Use manufacturer's standard clips at corners and not over 600 mm (24 inches) on center.
 6. Where fin trim anchorage is shown build into adjacent construction, anchoring at corners and not over 600 mm (24 inches) on center.
- E. Sills and Stools:
 1. Set in bed of mortar or other compound to fully support, true to line shown.
 2. Do not extend sill to inside window surface or past thermal break.
 3. Leave space for sealants at ends and to window frame unless shown otherwise.
- F. Replacement Windows:
 1. Do not remove existing windows until new replacement is available, ready for immediate installation.
 2. Remove existing work carefully; avoid damage to existing work to remain.
 3. Perform all other operations as necessary to prepare openings for proper installation and operation of new units.
 4. Do not leave openings uncovered at end of working day, during precipitation or temperatures below 16 degrees C (60 degrees F.).

3.3 MULLIONS CLOSURES, TRIM, AND PANNING

- A. Cut mullion full height of opening and anchor directly to window frame on each side.
- B. Closures, Trim, and Panning: External corners mitered and internal corners coped, fitted with hairline, tightly closed joints.
- C. Secure to concrete or solid masonry with expansion bolts, expansion rivets, split shank drive bolts, or powder actuated drive pins.
- D. Toggle bolt to hollow masonry units. Screwed to wood or metal.
- E. Fasten except for strap anchors, near ends and corners and at intervals not more than 300 mm (12 inches) between.
- F. Seal units following installation to provide weathertight system.

3.4 ADJUST AND CLEAN

- A. Adjust ventilating sash and hardware to provide tight fit at contact points, and at weather-stripping for smooth operation and weathertight closure.
- B. Clean aluminum surfaces promptly after installation of windows, exercising care to avoid damage to protective coatings and finishes.
- C. Remove excess glazing and sealant compounds, dirt, and other substances.
- D. Lubricate hardware and moving parts.
- E. Clean glass promptly after installation of windows. Remove glazing and sealant compound, dirt and other substances.
- F. Except when a window is being adjusted or tested, keep locked in the closed position during the progress of work on the project.

3.5 OPERATION DEVICES

- A. Provide wrenches, keys, or removable locking operating handles, as specified to operate windows.
- B. Provide one emergency ventilating operating handle for every four windows.
- C. Provide maintenance or window washer operating handles as directed by Contracting Officer.

- - - E N D - - -

SECTION 102800

TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies manufactured items usually used in dressing rooms, toilets, baths, locker rooms and at sinks in related spaces.
- B. Items Specified:
 - 1. **Paper towel dispenser.**
 - 2. **Toilet tissue dispenser.**
 - 3. Grab Bars.
 - 4. **Clothes hooks, robe or coat.**
 - 5. Metal framed mirror.
 - 6. Mop racks.
 - 7. Stainless steel shelves.
 - 8. **Sanitary napkin disposal.**
 - 9. **Diaper changing station.**
- C. This section also specifies custom fabricated items used in toilets and related spaces.

1.2 RELATED WORK

- A. Color of finishes: Finish Schedule
- B. Ceramic toilet and bath accessories: Section 093013, CERAMIC TILING
- C. Custom fabricated accessories: Section 102800, TOILET, BATH, AND LAUNDRY ACCESSORIES.
- D. Manufactured toilet and bath accessories: Section 102800, TOILET, BATH, AND LAUNDRY ACCESSORIES.

1.3 SUBMITTALS

- A. Submit in accordance with Section 013323, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings:
 - 1. Each product specified.
 - 2. Metal framed mirrors, showing shelf where required, fillers, and design and installation of units when installed on ceramic tile wainscots and offset surfaces.
 - 3. Grab bars, showing design and each different type of anchorage.
 - 4. Show material and finish, size of members, and details of construction, installation and anchorage of mop racks.
- C. Samples:
 - 1. One of each type of accessory specified.

2. After approval, samples may be used in the work.

D. Manufacturer's Literature and Data:

1. All accessories specified.
2. Show type of material, gages or metal thickness in inches, finishes, and when required, capacity of accessories.
3. Mop racks.

1.4 QUALITY ASSURANCE

- A. Each product shall meet, as a minimum, the requirements specified, and shall be a standard commercial product of a manufacturer regularly presently manufacturing items of type specified.
- B. Each accessory type shall be the same and be made by the same manufacturer.
- C. Each accessory shall be assembled to the greatest extent possible before delivery to the site.
- D. Include additional features, which are not specifically prohibited by this specification, but which are a part of the manufacturer's standard commercial product.

1.5 PACKAGING AND DELIVERY

- A. Pack accessories individually to protect finish.
- B. Deliver accessories to the project only when installation work in rooms is ready to receive them.
- C. Deliver inserts and rough-in frames to site at appropriate time for building-in.
- D. Deliver products to site in sealed packages of containers; labeled for identification with manufacturer's name, brand, and contents.

1.6 STORAGE

- A. Store products in weathertight and dry storage facility.
- B. Protect from damage from handling, weather and construction operations before, during and after installation in accordance with manufacturer's instructions.

1.7 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):
 1. A167-99(R2009) Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
 2. A176-99(R2009) Stainless and Heat-Resisting Chromium Steel Plate, Sheet, and Strip
 3. A269-10 Seamless and Welded Austenitic Stainless Steel Tubing for General Service

4. A312/A312M-09 Seamless and Welded Austenitic Stainless Steel Pipes
 5. A653/A653M-10 Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
 6. B221-08 Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
 7. B456-03(R2009) Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium
 8. C1036-06 Flat Glass
 9. C1048-04 Heat-Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated Glass
 10. D635-10 Rate of Burning and/or Extent and Time of Burning of Self Supporting Plastics in a Horizontal Position
 11. F446-85(R2009) Consumer Safety Specification for Grab Bars and Accessories Installed in the Bathing Area.
 12. D3453-07 Flexible Cellular Materials - Urethane for Furniture and Automotive Cushioning, Bedding, and Similar Applications
- C. The National Association of Architectural Metal Manufacturers (NAAMM):
1. AMP 500 Series Metal Finishes Manual
- D. American Welding Society (AWS):
1. D10.4-86 (R2000) Welding Austenitic Chromium-Nickel Stainless Steel Piping and Tubing
- E. Federal Specifications (Fed. Specs.):
1. A-A-3002 Mirrors, Glass
 2. FF-S-107C (2) Screw, Tapping and Drive
 3. FF-S-107C Screw, Tapping and Drive.
 4. WW-P-541E(1) Plumbing Fixtures (Accessories, Land Use) Detail Specification

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aluminum: ASTM B221, alloy 6063-T5 and alloy 6463-T5.
- B. Stainless Steel:
1. Plate or sheet: ASTM A167, Type 302, 304, or 304L, except ASTM A176 where Type 430 is specified, 0.0299-inch thick unless otherwise specified.
 2. Tube: ASTM A269, Alloy Type 302, 304, or 304L.
- C. Stainless Steel Tubing: ASTM A269, Grade 304 or 304L, seamless or welded.
- D. Stainless Steel Pipe: ASTM A312; Grade TP 304 or TP 304L.

- E. Steel Sheet: ASTM A653, zinc-coated (galvanized) coating designation G90.
- F. Glass:
 - 1. ASTM C1036, Type 1, Class 1, Quality q2, for mirrors, and for mirror doors in medicine cabinets.
 - 2. ASTM C1036, Type 1 Class 1 Quality q3, for shelves in medicine cabinets.
 - 3. ASTM C1048, Kind FT, Condition A, Type 1, Class 1 (use in Mental Health and Behavior Nursing Unit Psychiatric Patient Areas and Security Examination Rooms where mirrors and glass are specified).

2.2 FASTENERS

- A. Exposed Fasteners: Stainless steel or chromium plated brass, finish to match adjacent surface.
- B. Concealed Fasteners: Steel, hot-dip galvanized (except in high moisture areas such as showers or bath tubs use stainless steel).
- C. Toggle Bolts: For use in hollow masonry or frame construction.
- D. Hex bolts: For through bolting on thin panels.
- E. Expansion Shields: Lead or plastic as recommended by accessory manufacturer for component and substrate for use in solid masonry or concrete.
- F. Screws:
 - 1. ASME B18.6.4.
 - 2. Fed Spec. FF-S-107, Stainless steel Type A.

2.3 FINISH

- A. In accordance with NAAMM AMP 500 series.
- B. Anodized Aluminum:
 - 1. AA-C22A41 Chemically etched medium matte, with clear anodic coating, Class I Architectural, 0.7-mil thick.
 - 2. AA-C22A44 Chemically etched medium matte with electrolytically deposited metallic compound, integrally colored coating Class I Architectural, 0.7-mil thick finish. Dyes will not be accepted.
- C. AA-M32 Mechanical finish, medium satin.
 - 1. Chromium Plating: ASTM B456, satin or bright as specified, Service Condition No. SC2.
 - 2. Stainless Steel: NAAMM AMP 503, finish number 4.
 - 3. Ferrous Metal:
 - a. Shop Prime: Clean, pretreat and apply one coat of primer and bake.
 - b. Finish: Over primer apply two coats of alkyd or phenolic resin enamel, and bake.
 - 4. Nylon Coated Steel: Nylon coating powder formulated for a fluidized bonding process to steel to provide a hard smooth, medium gloss finish, not less than 0.3 mm (0.012-inch) thick, rated as

self-extinguishing when tested in accordance with ASTM D635.

2.4 FABRICATION - GENERAL

- A. Welding, AWS D10.4.
- B. Grind dress, and finish welded joints to match finish of adjacent surface.
- C. Form exposed surfaces from one sheet of stock, free of joints.
- D. Provide steel anchors and components required for secure installation.
- E. Form flat surfaces without distortion. Keep exposed surfaces free from scratches and dents. Reinforce doors to prevent warp or twist.
- F. Isolate aluminum from dissimilar metals and from contact with building materials as required to prevent electrolysis and corrosion.
- G. Hot-dip galvanized steel, except stainless steel, anchors and fastening devices.
- H. Shop-assemble accessories and package with all components, anchors, fittings, fasteners and keys.
- I. Key items alike.
- J. Provide templates and rough-in measurements as required.
- K. Round and deburr edges of sheets to remove sharp edges.

2.5 PAPER TOWEL DISPENSERS

- A. Surface mounted automated, touchless, battery-operated.
- B. One-at-a-time towel dispensing with adjustable settings for sheet length, time delay, and dispense mode.
- C. Fabricate of high-impact translucent plastic.
- D. UL listed.

2.6 TOILET TISSUE DISPENSERS

- A. High-capacity, 9-inch jumbo roll bath tissue dispenser, surface mounted type.
- B. High-impact plastic; see-through gray color.
- C. Key-lock design.

2.7 GRAB BARS

- A. Fed. Spec WW-P-541/8B, Type IV, bars, surface mounted, Class 2, grab bars and ASTM F446.
- B. Fabricate of either stainless steel or nylon coated steel, except use only one type throughout the project:
 - 1. Stainless steel: Grab bars, flanges, mounting plates, supports, screws, bolts, and exposed nuts and washers.
- C. Concealed mount, except grab bars mounted at floor, swing up and on metal toilet partitions.

D. Bars:

1. Fabricate from 38 mm (1-1/2 inch) outside diameter tubing.
 - a. Stainless steel, minimum 1.2 mm (0.0478 inch) thick.
2. Fabricate in one continuous piece with ends turned toward walls, except swing up and where grab bars are shown continuous around three sides of showers, bars may be fabricated in two sections, with concealed slip joint between.
3. Continuous weld intermediate support to the grab bar.
4. Swing up bars manually operated. Designed to prevent bar from falling when in raised position.

E. Flange for Concealed Mounting:

1. Minimum of 2.65 mm (0.1046 inch) thick, approximately 75 mm (3 inch) diameter by 13 mm (1/2 inch) deep, with provisions for not less than three set screws for securing flange to back plate.
2. Insert grab bar through center of the flange and continuously weld perimeter of grab bar flush to back side of flange.

F. In lieu of providing flange for concealed mounting, and back plate as specified, grab rail may be secured by being welded to a back plate and be covered with flange.

G. Back Plates:

1. Minimum 2.65 mm (0.1046 inch) thick metal.
2. Fabricate in one piece, approximately 6 mm (1/4 inch) deep, with diameter sized to fit flange. Provide slotted holes to accommodate anchor bolts.
3. Furnish spreaders, through bolt fasteners, and cap nuts, where grab bars are mounted on partitions.

2.8 CLOTHES HOOKS-ROBE OR COAT

- A. Fabricate hook units either of chromium plated brass with a satin finish, or stainless steel, using 6 mm (1/4 inch) minimum thick stock, with edges and corners rounded smooth to the thickness of the metal, or 3 mm (1/8 inch) minimum radius.
- B. Fabricate each unit as a double hook on a single shaft, integral with or permanently fastened to the wall flange, provided with concealed fastenings.

2.9 METAL FRAMED MIRRORS

- A. Fed. Spec. A-A-3002 metal frame; stainless steel, type 302 or 304.
- B. Mirror Glass:
 1. Minimum 6 mm (1/4 inch) thick.
 2. Set mirror in a protective vinyl glazing tape.
 3. Use tempered glass for mirrors in Mental Health and Behavioral Nursing units.

C. Frames:

1. Channel or angle shaped section with face of frame not less than 9 mm (3/8 inch) wide. Fabricate with square corners.
2. Use either 0.9 mm (0.0359 inch) thick stainless steel, chrome finished steel, or extruded aluminum, with clear anodized finish 0.4 mils thick.
3. Filler:
 - a. Where mirrors are mounted on walls having ceramic tile wainscots not flush with wall above, provide fillers at void between back of mirror and wall surface.
 - b. Fabricate fillers from same material and finish as the mirror frame, contoured to conceal the void behind the mirror at sides and top.
4. Attached Shelf for Mirrors:
 - a. Fabricate shelf of the same material and finish as the mirror frame.
 - b. Make shelf approximately 125 mm (five inches) in depth, and extend full width of the mirror.
 - c. Close the ends and the front edge of the shelf to the same thickness as the mirror frame width.
 - d. Form shelf for aluminum framed mirror as an integral part of the bottom frame member. Form stainless steel shelf with concealed brackets to attach to mirror frame.

D. Back Plate:

1. Fabricate backplate for concealed wall hanging of either zinc-coated, or cadmium plated 0.9 mm (0.036 inch) thick sheet steel, die cut to fit face of mirror frame, and furnish with theft resistant concealed wall fastenings.
2. Use set screw type theft resistant concealed fastening system for mounting mirrors.

E. Mounting Bracket:

1. Designed to support mirror tight to wall.
2. Designed to retain mirror with concealed set screw fastenings.

2.10 MOP RACKS

A. Minimum 1.0M (40 inches) long with five holders.

B. Clamps:

1. Minimum of 1.3 mm (0.050-inch) thick stainless steel bracket retaining channel with a hard rubber serrated cam; pivot mounted to channel.
2. Clamps to hold handles from 13 mm (1/2-inch) minimum to 32 mm (1-1/4 inch) maximum diameter.

C. Support:

1. Minimum of 1 mm (0.0375 inch) thick stainless steel hat shape channel to hold clamps away from wall as shown.

- 2. Drill wall flange for 3 mm (1/8 inch) fasteners above and below clamp locations.
 - D. Secure clamps to support with oval head machine screws or rivets into continuous reinforcing back of clamps.
 - E. Finish on stainless Steel: AMP 503-No. 4.
- 2.11 **STAINLESS STEEL SHELVES, TYPES 45, AND 45C.**
- A. Fabricate shelves and brackets to design shown of 1.2 mm (0.0478-inch) thick stainless steel.
 - B. Round and finish smooth projecting corners of shelves and edge corners of brackets. Drill brackets for 6 mm (1/4-inch) anchor bolts.
 - C. Screw or weld brackets to shelves.
- 2.12 **SANITARY NAPKIN DISPOSAL**
- A. Surface-mounted 22-gage stainless steel container, all-welded construction, satin finish on exposed surfaces. Includes integral finger depression for opening cover.
 - B. 22-gage stainless steel cover with satin finish; drawn, one-piece seamless construction with radius to match container. Secured to container with full-length stainless steel piano-hinge.
 - C. Operation: Cover flips up for disposal of sanitary napkins and for servicing. Includes provision for disposable paper liners.
- 2.13 **DIAPER CHANGING STATION**
- A. Horizontal wall-mounted baby changing station with concealed pneumatic cylinder and metal mounting chassis with concealed steel-on-steel hinges, providing slow, controlled opening and closing of bed.
 - B. Fabricated of injection-molded polypropylene with integral microbial.
 - C. Bed provides contoured changing area, 450 square inches, with nylon safety strap and bag hook
 - D. Comply with 2010 ADA Standards for Accessible Design, 2009 ICC A117.1, Accessible and Usable Buildings and Facilities, ASTM F2285-04, ANSI S535.4, and ASTM G22.
 - E. Includes integral liner dispenser for 3-ply bed liners holding approximately 50 bed liners, instructional graphics, and safety messages in four languages and Braille label.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before starting work notify Resident Engineer in writing of any conflicts detrimental to installation or operation of units.
- B. Verify with the Resident Engineer the exact location of accessories.

3.2 INSTALLATION

- A. Set work accurately, in alignment and where shown. Items shall be plumb, level, free of rack and twist, and set parallel or perpendicular as required to line and plane of surface.
- B. Toggle bolt to steel anchorage plates in frame partitions or hollow masonry. Expansion bolt to concrete or solid masonry.
- C. Install accessories in accordance with the manufacturer's printed instructions and ASTM F446.
- D. Install accessories plumb and level and securely anchor to substrate.
- E. Install accessories in a manner that will permit the accessory to function as designed and allow for servicing as required without hampering or hindering the performance of other devices.
- F. Position and install dispensers, and other devices in countertops, clear of drawers, permitting ample clearance below countertop between devices, and ready access for maintenance as needed.
- G. Align mirrors, dispensers and other accessories even and level, when installed in battery.
- H. Install accessories to prevent striking by other moving, items or interference with accessibility.

3.3 SCHEDULE OF ACCESSORIES

3.4 CLEANING

- A. After installation, clean as recommended by the manufacturer and protect from damage until completion of the project.

- - - E N D - - -

SECTION 23 09 23

DIRECT-DIGITAL THERMO-MECHANICAL, AND ELECTRIC CONTROL SYSTEMS FOR HVAC

PART 1 - GENERAL

1.1 DESCRIPTION

- A. In addition to direct digital controls (DDC) also include as indicated herein, thermo-mechanical controls for convectors, as well as electric controls for the induction units.
- B. Provide (a) direct-digital control system (DDC) as indicated on the project documents, point list, interoperability tables, drawings and as described in these specifications. The new direct digital control (DDC) system, associated equipment and components shall be by Automated Logic, connecting to and expanding the existing campus DDC systems into a single, cohesive system. Include a complete and working direct-digital control system. Include all engineering, programming, controls and installation materials, installation labor, commissioning and start-up, training, final project documentation and warranty.

- 1. The direct-digital control system) shall consist of high-speed, peer-to-peer network of DDC controllers. Provide a remote user using a standard web browser to access the control system graphics and change adjustable setpoints with the proper password.
- 2. The direct-digital control system(s) shall be native BACnet. All new controllers, devices and components shall be listed by BACnet Testing Laboratories. All new controller, devices and components shall be accessible using a Web browser interface and shall communicate exclusively using the ASHRAE Standard 135 BACnet communications protocol without the use of gateways, unless otherwise allowed by this Section of the technical specifications, specifically shown on the design drawings and specifically requested otherwise by the VA.

The work administered by this Section of the technical specifications shall include all labor, materials, special tools, equipment, enclosures, power supplies, software, software licenses, Project specific software configurations and database entries, interfaces, wiring, tubing, installation, labeling, engineering, calibration, documentation, submittals, testing, verification, training services, permits and licenses, transportation, shipping, handling,

administration, supervision, management, insurance, Warranty, specified services and items required for complete and fully functional Controls Systems.

3. The control systems shall be designed such that each mechanical system shall operate under stand-alone mode. The contractor administered by this Section of the technical specifications shall provide controllers for each mechanical system. In the event of a network communication failure, or the loss of any other controller, the control system shall continue to operate independently. Failure of the ECC shall have no effect on the field controllers, including those involved with global strategies.

B. Some products are furnished but not installed by the contractor administered by this Section of the technical specifications. The contractor administered by this Section of the technical specifications shall formally coordinate in writing and receive from other contractors formal acknowledgements in writing prior to submission the installation of the products. These products include the following:

1. Control valves.
2. Flow switches.
3. Flow meters.
4. Sensor wells and sockets in piping.
5. Terminal unit controllers.

C. Some products are installed but not furnished by the contractor administered by this Section of the technical specifications. The contractor administered by this Section of the technical specifications shall formally coordinate in writing and receive from other contractors formal acknowledgements in writing prior to submission the procurement of the products. These products include the following:

D. Some products are not provided by, but are nevertheless integrated with the work executed by, the contractor administered by this Section of the technical specifications. The contractor administered by this Section of the technical specifications shall formally coordinate in writing and receive from other contractors formal acknowledgements in writing prior to submission the particulars of the products. These products include the following:

1. Fire alarm systems. If zoned fire alarm is required by the project-specific requirements, this interface shall require multiple relays,

which are provided and installed by the fire alarm system contractor,
 to be monitored.

E. Responsibility Table:

Work/Item/System	Furnish	Install	Low Voltage Wiring	Line Power
Control system low voltage and communication wiring	23 09 23	23 09 23	23 09 23	N/A
Terminal units	23	23	N/A	26
Controllers for terminal units	23 09 23	23	23 09 23	16
LAN conduits and raceway	23 09 23	23 09 23	N/A	N/A
Automatic dampers (not furnished with equipment)	23 09 23	23	N/A	N/A
Automatic damper actuators	23 09 23	23 09 23	23 09 23	23 09 23
Manual valves	23	23	N/A	N/A
Automatic valves	23 09 23	23	23 09 23	23 09 23
Pipe insertion devices and taps, flow and pressure stations.	23	23	N/A	N/A
Thermowells	23 09 23	23	N/A	N/A
Current Switches	23 09 23	23 09 23	23 09 23	N/A
Control Relays	23 09 23	23 09 23	23 09 23	N/A
Power distribution system monitoring interfaces	23 09 23	23 09 23	23 09 23	26
All control system nodes, equipment, housings, enclosures and panels.	23 09 23	23 09 23	23 09 23	26
Smoke detectors	28 31 00	28 31 00	28 31 00	28 31 00
Fire/Smoke Dampers	23	23	28 31 00	28 31 00
Smoke Dampers	23	23	28 31 00	28 31 00
Fire Dampers	23	23	N/A	N/A
Water treatment system	23	23	23	26
VFDs/VSDS	23 09 23	26	23 09 23	26
Medical gas panels	23	23	26	26
Control system interface with CRU A/C controls	23 09 23	23 09 23	23 09 23	26
CRU A/C unit controls interface with control system	23	23 09 23	23 09 23	26

Work/Item/System	Furnish	Install	Low Voltage Wiring	Line Power
Fire Alarm shutdown relay interlock wiring	28	28	28	26
Control system monitoring of fire alarm smoke control relay	28	28	23 09 23	28
Fire-fighter's smoke control station (FSCS)	28	28	28	28
Fan Coil Unit controls (not furnished with equipment)	23 09 23	23 09 23	23 09 23	26
Packaged CSG unit-mounted controls (not furnished with equipment)	23 09 23	23 09 23	23 09 23	26
Starters, HOA switches	23	23	N/A	26

F. This facility's existing direct-digital control system is manufactured by Automated Logic (Integrated Controls Environmental, LLC) and its ECC is located at Chiller Plant. The existing Automated Logic DDC system will be expanded to accommodate the new scope of work. The contractor administered by this Section of the technical specifications shall observe the capabilities, communication network, services, spare capacity of the existing control system and its ECC prior to beginning work.

a. The combined system shall operate and function as one complete system including one database of control point objects and global control logic capabilities. Facility operators shall have complete operations and control capability over all systems, new and existing including; monitoring, trending, graphing, scheduling, alarm management, global point sharing, global strategy deployment, graphical operations interface and custom reporting as specified.

G. The General Contractor of this project shall directly hire the Control System Integrator in a contract separate from the contract procuring the controls contractor administered by this Section of the technical specifications.

1. The contractor administered by this Section of the technical specifications shall coordinate all work with the Control System Integrator. The contractor administered by this Section of the

technical specifications shall integrate the ASHRAE Standard 135, BACnet/IP control network(s) with the Control System Integrator's area control through an Ethernet connection provided by the Control System Integrator.

2. The contractor administered by this Section of the technical specifications shall provide a peer-to-peer networked, stand-alone, distributed control system. This direct digital control (DDC) system shall include one portable operator terminal - laptop, one digital display unit, microprocessor-based controllers, instrumentation, end control devices, wiring, piping, software, and related systems. This contractor is responsible for all device mounting and wiring.

3. Responsibility Table:

Item/Task	Section 23 09 23 contactor	Control system integrator	VA
ECC expansion		X	
ECC programming		X	
Devices, controllers, control panels and equipment	X		
Point addressing: all hardware and software points including setpoint, calculated point, data point(analog/binary), and reset schedule point	X		
Point mapping		X	
Network Programming	X		
ECC Graphics		X	
Controller programming and sequences	X		
Integrity of LAN communications	X		
Electrical wiring	X		
Operator system training		X	
LAN connections to devices	X		
LAN connections to ECC		X	
IP addresses			X
Overall system verification		X	
Controller and LAN system verification	X		

H. Unitary standalone systems including induction units and convectors, and similar units for control of room environment conditions may be equipped with integral controls furnished and installed by the equipment manufacturer or field mounted. Refer to equipment specifications and as indicated in project documents. Application of standalone unitary controls is limited to at least those systems wherein remote monitoring, alarm and start-up are not necessary.

I. The direct-digital control system shall start and stop equipment, move (position) damper actuators and valve actuators, and vary speed of

equipment to execute the mission of the control system. Use electricity as the motive force for all damper and valve actuators, unless use of pneumatics as motive force is specifically granted by the VA.

1.2 RELATED WORK

- A. Section 21 05 11, Common Work Results for Fire Suppression.
- B. Section 23 09 11, Instrumentation and Control for Boiler Plant.
- C. Section 23 21 13, Hydronic Piping.
- D. Section 23 22 13, Steam and Condensate Heating Piping.
- E. Section 23 31 00, HVAC Ducts and Casings.
- F. Section 23 36 00, Air Terminal Units.
- G. Section 23 73 00, Indoor Central-Station Air-Handling Units.
- H. Section 23 84 00, Humidity Control Equipment.
- I. Section 26 05 11, Requirements for Electrical Installations.
- J. Section 26 05 21, Low-Voltage Electrical Power Conductors and Cables (600 Volts and Below).
- K. Section 26 05 26, Grounding and Bonding for Electrical Systems.
- L. Section 26 05 33, Raceway and Boxes for Electrical Systems.
- M. Section 26 27 26, Wiring Devices.
- N. Section 26 29 11, Motor Starters.
- O. Section 27 15 00, Communications Horizontal Cabling
- P. Section 28 31 00, Fire Detection and Alarm.

1.3 DEFINITION

- A. Algorithm: A logical procedure for solving a recurrent mathematical problem; A prescribed set of well-defined rules or processes for the solution of a problem in a finite number of steps.
- B. ARCNET: ANSI/ATA 878.1 - Attached Resource Computer Network. ARCNET is a deterministic LAN technology; meaning it's possible to determine the maximum delay before a device is able to transmit a message.
- C. Analog: A continuously varying signal value (e.g., temperature, current, velocity etc.
- D. BACnet: A Data Communication Protocol for Building Automation and Control Networks , ANSI/ASHRAE Standard 135. This communications protocol allows diverse building automation devices to communicate data over and services over a network.
- E. BACnet/IP: Annex J of Standard 135. It defines and allows for using a reserved UDP socket to transmit BACnet messages over IP networks. A

BACnet/IP network is a collection of one or more IP sub-networks that share the same BACnet network number.

- F. BACnet Internetwork: Two or more BACnet networks connected with routers. The two networks may use different LAN technologies.
- G. BACnet Network: One or more BACnet segments that have the same network address and are interconnected by bridges at the physical and data link layers.
- H. BACnet Segment: One or more physical segments of BACnet devices on a BACnet network, connected at the physical layer by repeaters.
- I. BACnet Broadcast Management Device (BBMD): A communications device which broadcasts BACnet messages to all BACnet/IP devices and other BBMDs connected to the same BACnet/IP network.
- J. BACnet Interoperability Building Blocks (BIBBs): BACnet Interoperability Building Blocks (BIBBs) are collections of one or more BACnet services. These are prescribed in terms of an "A" and a "B" device. Both of these devices are nodes on a BACnet internetwork.
- K. BACnet Testing Laboratories (BTL). The organization responsible for testing products for compliance with the BACnet standard, operated under the direction of BACnet International.
- L. Baud: It is a signal change in a communication link. One signal change can represent one or more bits of information depending on type of transmission scheme. Simple peripheral communication is normally one bit per Baud. (e.g., Baud rate = 78,000 Baud/sec is 78,000 bits/sec, if one signal change = 1 bit).
- M. Binary: A two-state system where a high signal level represents an "ON" condition and an "OFF" condition is represented by a low signal level.
- N. BMP or bmp: Suffix, computerized image file, used after the period in a DOS-based computer file to show that the file is an image stored as a series of pixels.
- O. Bus Topology: A network topology that physically interconnects workstations and network devices in parallel on a network segment.
- P. Control Unit (CU): Generic term for any controlling unit, stand-alone, microprocessor based, digital controller residing on secondary LAN or Primary LAN, used for local controls or global controls
- Q. Deadband: A temperature range over which no heating or cooling is supplied, i.e., 22-25 degrees C (72-78 degrees F), as opposed to a single point change over or overlap).

- R. Device: a control system component that contains a BACnet Device Object and uses BACnet to communicate with other devices.
- S. Device Object: Every BACnet device requires one Device Object, whose properties represent the network visible properties of that device. Every Device Object requires a unique Object Identifier number on the BACnet internetwork. This number is often referred to as the device instance.
- T. Device Profile: A specific group of services describing BACnet capabilities of a device, as defined in ASHRAE Standard 135-2008, Annex L. Standard device profiles include BACnet Operator Workstations (B-OWS), BACnet Building Controllers (B-BC), BACnet Advanced Application Controllers (B-AAC), BACnet Application Specific Controllers (B-ASC), BACnet Smart Actuator (B-SA), and BACnet Smart Sensor (B-SS). Each device used in new construction is required to have a PICS statement listing which service and BIBBs are supported by the device.
- U. Diagnostic Program: A software test program, which is used to detect and report system or peripheral malfunctions and failures. Generally, this system is performed at the initial startup of the system.
- V. Direct Digital Control (DDC): Microprocessor based control including Analog/Digital conversion and program logic. A control loop or subsystem in which digital and analog information is received and processed by a microprocessor, and digital control signals are generated based on control algorithms and transmitted to field devices in order to achieve a set of predefined conditions.
- W. Distributed Control System: A system in which the processing of system data is decentralized and control decisions can and are made at the subsystem level. System operational programs and information are provided to the remote subsystems and status is reported back to the Engineering Control Center. Upon the loss of communication with the Engineering Control center, the subsystems shall be capable of operating in a stand-alone mode using the last best available data.
- X. Download: The electronic transfer of programs and data files from a central computer or operation workstation with secondary memory devices to remote computers in a network (distributed) system.
- Y. DXF: An AutoCAD 2-D graphics file format. Many CAD systems import and export the DXF format for graphics interchange.

- Z. Electrical Control: A control circuit that operates on line or low voltage and uses a mechanical means, such as a temperature sensitive bimetal or bellows, to perform control functions, such as actuating a switch or positioning a potentiometer.
- AA. Electronic Control: A control circuit that operates on low voltage and uses a solid-state components to amplify input signals and perform control functions, such as operating a relay or providing an output signal to position an actuator.
- BB. Engineering Control Center (ECC): The centralized control point for the intelligent control network. The ECC comprises of personal computer and connected devices to form a single workstation.
- CC. Ethernet: A trademark for a system for exchanging messages between computers on a local area network using coaxial, fiber optic, or twisted-pair cables.
- DD. Firmware: Firmware is software programmed into read only memory (ROM) chips. Software may not be changed without physically altering the chip.
- EE. Gateway: Communication hardware connecting two or more different protocols. It translates one protocol into equivalent concepts for the other protocol. In BACnet applications, a gateway has BACnet on one side and non-BACnet (usually proprietary) protocols on the other side.
- FF. GIF: Abbreviation of Graphic interchange format.
- GG. Graphic Program (GP): Program used to produce images of air handler systems, fans, chillers, pumps, and building spaces. These images can be animated and/or color-coded to indicate operation of the equipment.
- HH. Graphic Sequence of Operation: It is a graphical representation of the sequence of operation, showing all inputs and output logical blocks.
- II. I/O Unit: The section of a digital control system through which information is received and transmitted. I/O refers to analog input (AI, digital input (DI), analog output (AO) and digital output (DO). Analog signals are continuous and represent temperature, pressure, flow rate etc, whereas digital signals convert electronic signals to digital pulses (values), represent motor status, filter status, on-off equipment etc.
- JJ. I/P: a method for conveying and routing packets of information over LAN paths. User Datagram Protocol (UDP) conveys information to "sockets" without confirmation of receipt. Transmission Control Protocol (TCP)

establishes "sessions", which have end-to-end confirmation and guaranteed sequence of delivery.

- KK. JPEG: A standardized image compression mechanism stands for Joint Photographic Experts Group, the original name of the committee that wrote the standard.
- LL. Local Area Network (LAN): A communication bus that interconnects operator workstation and digital controllers for peer-to-peer communications, sharing resources and exchanging information.
- MM. Network Repeater: A device that receives data packet from one network and rebroadcasts to another network. No routing information is added to the protocol.
- NN. MS/TP: Master-slave/token-passing (ISO/IEC 8802, Part 3). It is not an acceptable LAN option for VA health-care facilities. It uses twisted-pair wiring for relatively low speed and low cost communication.
- OO. Native BACnet Device: A device that uses BACnet as its primary method of communication with other BACnet devices without intermediary gateways. A system that uses native BACnet devices at all levels is a native BACnet system.
- PP. Network Number: A site-specific number assigned to each network segment to identify for routing. This network number must be unique throughout the BACnet internetwork.
- QQ. Object: The concept of organizing BACnet information into standard components with various associated properties. Examples include analog input objects and binary output objects.
- RR. Object Identifier: An object property used to identify the object, including object type and instance. Object Identifiers must be unique within a device.
- SS. Object Properties: Attributes of an object. Examples include present value and high limit properties of an analog input object. Properties are defined in ASHRAE 135; some are optional and some are required. Objects are controlled by reading from and writing to object properties.
- TT. Operating system (OS): Software, which controls the execution of computer application programs.
- UU. PCX: File type for an image file. When photographs are scanned onto a personal computer they can be saved as PCX files and viewed or changed by a special application program as Photo Shop.

- VV. Peripheral: Different components that make the control system function as one unit. Peripherals include monitor, printer, and I/O unit.
- WW. Peer-to-Peer: A networking architecture that treats all network stations as equal partners- any device can initiate and respond to communication with other devices.
- XX. PICS: Protocol Implementation Conformance Statement, describing the BACnet capabilities of a device. All BACnet devices have published PICS.
- YY. PID: Proportional, integral, and derivative control, used to control modulating equipment to maintain a setpoint.
- ZZ. Repeater: A network component that connects two or more physical segments at the physical layer.
- AAA. Router: a component that joins together two or more networks using different LAN technologies. Examples include joining a BACnet Ethernet LAN to a BACnet MS/TP LAN.
- BBB. Sensors: devices measuring state points or flows, which are then transmitted back to the DDC system.
- CCC. Thermostats : devices measuring temperatures, which are used in control of standalone or unitary systems and equipment not attached to the DDC system.

1.4 QUALITY ASSURANCE

A. Criteria:

1. Single Source Responsibility of subcontractor: The Contractor shall obtain hardware and software supplied under this Section and delegate the responsibility to a single source controls installation subcontractor. The controls subcontractor shall be responsible for the complete design, installation, and commissioning of the system. The controls subcontractor shall be in the business of design, installation and service of such building automation control systems similar in size and complexity.
2. Equipment and Materials: Equipment and materials shall be cataloged products of manufacturers regularly engaged in production and installation of HVAC control systems. Products shall be manufacturer's latest standard design and have been tested and proven in actual use.
3. The controls subcontractor shall provide a list of no less than five similar projects which have building control systems as specified in

this Section. These projects must be on-line and functional such that the Department of Veterans Affairs (VA) representative would observe the control systems in full operation.

4. The controls subcontractor shall have in-place facility within 50 miles with technical staff, spare parts inventory for the next five (5) years, and necessary test and diagnostic equipment to support the control systems.
5. The controls subcontractor shall have minimum of three years experience in design and installation of building automation systems similar in performance to those specified in this Section. Provide evidence of experience by submitting resumes of the project manager, the local branch manager, project engineer, the application engineering staff, and the electronic technicians who would be involved with the supervision, the engineering, and the installation of the control systems. Training and experience of these personnel shall not be less than three years. Failure to disclose this information will be a ground for disqualification of the supplier.
6. Provide a competent and experienced Project Manager employed by the Controls Contractor. The Project Manager shall be supported as necessary by other Contractor employees in order to provide professional engineering, technical and management service for the work. The Project Manager shall attend scheduled Project Meetings as required and shall be empowered to make technical, scheduling and related decisions on behalf of the Controls Contractor.

B. Codes and Standards:

1. All work shall conform to the applicable Codes and Standards.
2. Electronic equipment shall conform to the requirements of FCC Regulation, Part 15, Governing Radio Frequency Electromagnetic Interference, and be so labeled.

1.5 PERFORMANCE

A. The system shall conform to the following:

1. Graphic Display: The system shall display up to four (4) graphics on a single screen with a minimum of twenty (20) dynamic points per graphic. All current data shall be displayed within ten (10) seconds of the request.

2. Graphic Refresh: The system shall update all dynamic points with current data within eight (8) seconds. Data refresh shall be automatic, without operator intervention.
3. Object Command: The maximum time between the command of a binary object by the operator and the reaction by the device shall be two(2) seconds. Analog objects shall start to adjust within two (2) seconds.
4. Object Scan: All changes of state and change of analog values shall be transmitted over the high-speed network such that any data used or displayed at a controller or work-station will be current, within the prior six (6) seconds.
5. Alarm Response Time: The maximum time from when an object goes into alarm to when it is annunciated at the workstation shall not exceed (10) seconds.
6. Program Execution Frequency: Custom and standard applications shall be capable of running as often as once every (5) seconds. The Contractor shall be responsible for selecting execution times consistent with the mechanical process under control.
7. Multiple Alarm Annunciations: All workstations on the network shall receive alarms within five (5) seconds of each other.
8. Performance: Programmable Controllers shall be able to execute DDC PID control loops at a selectable frequency from at least once every one (1) second. The controller shall scan and update the process value and output generated by this calculation at this same frequency.
9. Reporting Accuracy: Listed below are minimum acceptable reporting end-to-end accuracies for all values reported by the specified system:

Measured Variable	Reported Accuracy
Space temperature	$\pm 0.5^{\circ}\text{C}$ ($\pm 1^{\circ}\text{F}$)
Ducted air temperature	$\pm 0.5^{\circ}\text{C}$ [$\pm 1^{\circ}\text{F}$]
Outdoor air temperature	$\pm 1.0^{\circ}\text{C}$ [$\pm 2^{\circ}\text{F}$]
Water temperature	$\pm 0.5^{\circ}\text{C}$ [$\pm 1^{\circ}\text{F}$]
Relative humidity	$\pm 2\%$ RH
Water flow	$\pm 1\%$ of reading
Air flow (terminal)	$\pm 10\%$ of reading

Air flow (measuring stations)	±5% of reading
Carbon Dioxide (CO ₂)	±50 ppm
Air pressure (ducts)	±25 Pa [±0.1"w.c.]
Air pressure (space)	±0.3 Pa [±0.001"w.c.]
Water pressure	±2% of full scale *Note 1
Electrical Power	±0.5% of reading

Note 1: for both absolute and differential pressure

10. Control stability and accuracy: Control sequences shall maintain measured variable at setpoint within the following tolerances:

Controlled Variable	Control Accuracy	Range of Medium
Air Pressure	±50 Pa (±0.2 in. w.g.)	0-1.5 kPa (0-6 in. w.g.)
Air Pressure	±3 Pa (±0.01 in. w.g.)	-25 to 25 Pa (-0.1 to 0.1 in. w.g.)
Airflow	±10% of full scale	
Space Temperature	±1.0°C (±2.0°F)	
Duct Temperature	±1.5°C (±3°F)	
Humidity	±5% RH	
Fluid Pressure	±10 kPa (±1.5 psi)	0-1 MPa (1-150 psi)
Fluid Pressure	±250 Pa (±1.0 in. w.g.)	0-12.5 kPa (0-50 in. w.g.) differential

11. Extent of direct digital control: control design shall allow for at least the points indicated on the points lists on the drawings.

1.6 WARRANTY

- A. Labor and materials for control systems shall be warranted for a period as specified under Warranty in FAR clause 52.246-21.
- B. Control system failures during the warranty period shall be adjusted, repaired, or replaced at no cost or reduction in service to the owner. The system includes all computer equipment, transmission equipment, and all sensors and control devices.
- C. The on-line support service shall allow the Controls supplier to dial out over telephone lines to or connect via (through password-limited access) VPN through the internet monitor and control the facility's building automation system. This remote connection to the facility shall be within two (2) hours of the time that the problem is reported. This coverage shall be extended to include normal business hours, after

business hours, weekend and holidays. If the problem cannot be resolved with on-line support services, the Controls supplier shall dispatch the qualified personnel to the job site to resolve the problem within 24 hours after the problem is reported.

- D. Controls and Instrumentation subcontractor shall be responsible for temporary operations and maintenance of the control systems during the construction period until final commissioning, training of facility operators and acceptance of the project by VA.

1.7 SUBMITTALS

- A. Submit shop drawings in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's literature and data for all components including the following:
1. A wiring diagram for each type of input device and output device including DDC controllers, modems, repeaters, etc. Diagram shall show how the device is wired and powered, showing typical connections at the digital controllers and each power supply, as well as the device itself. Show for all field connected devices, including but not limited to, control relays, motor starters, electric or electronic actuators, and temperature pressure, flow and humidity sensors and transmitters.
 2. A diagram of each terminal strip, including digital controller terminal strips, terminal strip location, termination numbers and the associated point names.
 3. Control dampers and control valves schedule, including the size and pressure drop.
 4. Control air-supply components, and computations for sizing compressors, receivers and main air-piping, if pneumatic controls are furnished.
 5. Catalog cut sheets of all equipment used. This includes, but is not limited to software (by manufacturer and by third parties), DDC controllers, panels, peripherals, airflow measuring stations and associated components, and auxiliary control devices such as sensors, actuators, and control dampers. When manufacturer's cut sheets apply to a product series rather than a specific product, the data specifically applicable to the project shall be highlighted. Each submitted piece of literature and drawings should clearly

- reference the specification and/or drawings that it supposed to represent.
6. Sequence of operations for each HVAC system and the associated control diagrams. Equipment and control labels shall correspond to those shown on the drawings.
 7. Color prints of proposed graphics with a list of points for display.
 8. Furnish a BACnet Protocol Implementation Conformance Statement (PICS) for each BACnet-compliant device.
 9. Schematic wiring diagrams for all control, communication and power wiring. Provide a schematic drawing of the central system installation. Label all cables and ports with computer manufacturers' model numbers and functions. Show all interface wiring to the control system.
 10. An instrumentation list for each controlled system. Each element of the controlled system shall be listed in table format. The table shall show element name, type of device, manufacturer, model number, and product data sheet number.
 11. Riser diagrams of wiring between central control unit and all control panels.
 12. Scaled plan drawings showing routing of LAN and locations of control panels, controllers, routers, gateways, ECC, and larger controlled devices.
 13. Construction details for all installed conduit, cabling, raceway, cabinets, and similar. Construction details of all penetrations and their protection.
 14. Quantities of submitted items may be reviewed but are the responsibility of the contractor administered by this Section of the technical specifications.
- C. Product Certificates: Compliance with Article, QUALITY ASSURANCE.
- D. Licenses: Provide licenses for all software residing on and used by the Controls Systems and transfer these licenses to the Owner prior to completion.
- E. As Built Control Drawings:
1. Furnish three (3) copies of as-built drawings for each control system. The documents shall be submitted for approval prior to final completion.

2. Furnish one (1) stick set of applicable control system prints for each mechanical system for wall mounting. The documents shall be submitted for approval prior to final completion.
 3. Furnish one (1) CD-ROM in CAD DWG and/or .DXF format for the drawings noted in subparagraphs above.
- F. Operation and Maintenance (O/M) Manuals):
1. Submit in accordance with Article, INSTRUCTIONS, in Specification Section 01 00 00, GENERAL REQUIREMENTS.
 2. Include the following documentation:
 - a. General description and specifications for all components, including logging on/off, alarm handling, producing trend reports, overriding computer control, and changing set points and other variables.
 - b. Detailed illustrations of all the control systems specified for ease of maintenance and repair/replacement procedures, and complete calibration procedures.
 - c. One copy of the final version of all software provided including operating systems, programming language, operator workstation software, and graphics software.
 - d. Complete troubleshooting procedures and guidelines for all systems.
 - e. Complete operating instructions for all systems.
 - f. Recommended preventive maintenance procedures for all system components including a schedule of tasks for inspection, cleaning and calibration. Provide a list of recommended spare parts needed to minimize downtime.
 - g. Training Manuals: Submit the course outline and training material to the Owner for approval three (3) weeks prior to the training to VA facility personnel. These persons will be responsible for maintaining and the operation of the control systems, including programming. The Owner reserves the right to modify any or all of the course outline and training material.
 - h. Licenses, guaranty, and other pertaining documents for all equipment and systems.
- G. Submit Performance Report to Resident Engineer prior to final inspection.

1.8 INSTRUCTIONS

- A. Instructions to VA operations personnel: Perform in accordance with Article, INSTRUCTIONS, in Specification Section 01 00 00, GENERAL REQUIREMENTS, and as noted below. Contractor shall also video tape instruction sessions noted below.
1. First Phase: Formal instructions to the VA facilities personnel for a total of 16 hours, given in multiple training sessions (each no longer than four hours in length), conducted sometime between the completed installation and prior to the performance test period of the control system, at a time mutually agreeable to the Contractor and the VA.
 2. Second Phase: This phase of training shall comprise of on the job training during start-up, checkout period, and performance test period. VA facilities personnel will work with the Contractor's installation and test personnel on a daily basis during start-up and checkout period. During the performance test period, controls subcontractor will provide 8 hours of instructions, given in multiple training sessions (each no longer than four hours in length), to the VA facilities personnel.
 3. The O/M Manuals shall contain approved submittals as outlined in Article 1.7, SUBMITTALS. The Controls subcontractor will review the manual contents with VA facilities personnel during second phase of training.
 4. Training shall be given by direct employees of the controls system subcontractor.

1.9 PROJECT CONDITIONS (ENVIRONMENTAL CONDITIONS OF OPERATION)

- A. The ECC and peripheral devices and system support equipment shall be designed to operate in ambient condition of 20 to 35°C (65 to 90°F) at a relative humidity of 20 to 80% non-condensing.
- B. The CUs used outdoors shall be mounted in NEMA 4 waterproof enclosures, and shall be rated for operation at -40 to 65°C (-40 to 150°F).
- C. All electronic equipment shall operate properly with power fluctuations of plus 10 percent to minus 15 percent of nominal supply voltage.
- D. Sensors and controlling devices shall be designed to operate in the environment, which they are sensing or controlling.

1.10 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE):
 - Standard 135-10.....BACNET Building Automation and Control Networks
- C. American Society of Mechanical Engineers (ASME):
 - B16.18-01.....Cast Copper Alloy Solder Joint Pressure Fittings.
 - B16.22-01.....Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- D. American Society of Testing Materials (ASTM):
 - B32-08.....Standard Specification for Solder Metal
 - B88-09.....Standard Specifications for Seamless Copper Water Tube
 - B88M-09.....Standard Specification for Seamless Copper Water Tube (Metric)
 - B280-08.....Standard Specification for Seamless Copper Tube for Air-Conditioning and Refrigeration Field Service
 - D2737-03.....Standard Specification for Polyethylene (PE) Plastic Tubing
- E. Federal Communication Commission (FCC):
 - Rules and Regulations Title 47 Chapter 1-2001 Part 15: Radio Frequency Devices.
- F. Institute of Electrical and Electronic Engineers (IEEE):
 - 802.3-11.....Information Technology-Telecommunications and Information Exchange between Systems-Local and Metropolitan Area Networks- Specific Requirements-Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access method and Physical Layer Specifications
- G. National Fire Protection Association (NFPA):
 - 70-11.....National Electric Code
 - 90A-09.....Standard for Installation of Air-Conditioning and Ventilation Systems
- H. Underwriter Laboratories Inc (UL):
 - 94-10.....Tests for Flammability of Plastic Materials for Parts and Devices and Appliances
 - 294-10.....Access Control System Units
 - 486A/486B-10.....Wire Connectors
 - 555S-11.....Standard for Smoke Dampers
 - 916-10.....Energy Management Equipment
 - 1076-10.....Proprietary Burglar Alarm Units and Systems

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Use new products that the manufacturer is currently manufacturing and that have been installed in a minimum of 25 installations. Spare parts shall be available for at least five years after completion of this contract.

2.2 CONTROLS SYSTEM ARCHITECTURE

A. General

1. The Controls Systems shall consist of multiple Nodes and associated equipment connected by industry standard digital and communication network arrangements.
2. The building controllers and principal communications network equipment shall be standard products of recognized major manufacturers available through normal PC and computer vendor channels - not "Clones" assembled by a third-party subcontractor.
3. The networks shall, at minimum, comprise, as necessary, the following:
 - a. A fixed ECC and a portable operator's terminal.
 - b. Network computer processing, data storage and BACnet-compliant communication equipment including Servers and digital data processors.
 - c. BACnet-compliant routers, bridges, switches, hubs, modems, gateways, interfaces and similar communication equipment.
 - d. Active processing BACnet-compliant building controllers connected to other BACNet-compliant controllers together with their power supplies and associated equipment.
 - e. Addressable elements, sensors, transducers and end devices.
 - f. Third-party equipment interfaces and gateways as described and required by the Contract Documents.
 - g. Other components required for a complete and working Control Systems as specified.

- B. The Specifications for the individual elements and component subsystems shall be minimum requirements and shall be augmented as necessary by the Contractor to achieve both compliance with all applicable codes, standards and to meet all requirements of the Contract Documents.

C. Network Architecture

1. The Controls communication network shall utilize BACnet communications protocol operating over a standard Ethernet LAN and operate at a minimum speed of 100 Mb/sec.
2. The networks shall utilize only copper and optical fiber communication media as appropriate and shall comply with applicable codes, ordinances and regulations. They may also utilize digital wireless technologies as appropriate to the application and if approved by the VA.
3. All necessary telephone lines, ISDN lines and internet Service Provider services and connections will be provided by the VA.

D. Third Party Interfaces:

1. The contractor administered by this Section of the technical specifications shall include necessary hardware, equipment, software and programming to allow data communications between the controls systems and building systems supplied by other trades.
2. Other manufacturers and contractors supplying other associated systems and equipment shall provide their necessary hardware, software and start-up at their cost and shall cooperate fully with the contractor administered by this Section of the technical specifications in a timely manner and at their cost to ensure complete functional integration.

E. Servers:

1. Provide data storage server(s) to archive historical data including trends, alarm and event histories and transaction logs.
2. Equip these server(s) with the same software tool set that is located in the BACnet building controllers for system configuration and custom logic definition and color graphic configuration.
3. Access to all information on the data storage server(s) shall be through the same browser functionality used to access individual nodes. When logged onto a server the operator will be able to also interact with any other controller on the control system as required for the functional operation of the controls systems. The contractor administered by this Section of the technical specifications shall provide all necessary digital processor programmable data storage server(s).

4. These server(s) shall be utilized for controls systems application configuration, for archiving, reporting and trending of data, for operator transaction archiving and reporting, for network information management, for alarm annunciation, for operator interface tasks, for controls application management and similar. These server(s) shall utilize IT industry standard data base platforms which utilize a database declarative language designed for managing data in relational database management systems (RDBMS) such as SQL.

2.3 COMMUNICATION

- A. Control products, communication media, connectors, repeaters, hubs, and routers shall comprise a BACnet internetwork. Controller and operator interface communication shall conform to ANSI/ASHRAE Standard 135-2008, BACnet.
 1. The Data link / physical layer protocol (for communication) acceptable to the VA throughout its facilities is Ethernet (ISO 8802-3) and BACnet/IP.
 2. The MS/TP data link / physical layer protocol is not acceptable to the VA in any new BACnet network or sub-network in its healthcare or lab facilities.
- B. Each controller shall have a communication port for connection to an operator interface.
- C. Internetwork operator interface and value passing shall be transparent to internetwork architecture.
 1. An operator interface connected to a controller shall allow the operator to interface with each internetwork controller as if directly connected. Controller information such as data, status, reports, system software, and custom programs shall be viewable and editable from each internetwork controller.
 2. Inputs, outputs, and control variables used to integrate control strategies across multiple controllers shall be readable by each controller on the internetwork. Program and test all cross-controller links required to execute specified control system operation. An authorized operator shall be able to edit cross-controller links by typing a standard object address.
- D. System shall be expandable to at least twice the required input and output objects with additional controllers, associated devices, and

wiring. Expansion shall not require operator interface hardware additions or software revisions.

- E. Controllers with real-time clocks shall use the BACnet Time Synchronization service. The system shall automatically synchronize system clocks daily from an operator-designated device via the internetwork. The system shall automatically adjust for daylight savings and standard time as applicable.

2.4 ENGINEERING CONTROL CENTER (ECC).

A. ECC Software:

1. Provide for automatic system database save and restore on the existing ECC's hard disk a copy of the current database of each Controller. This database shall be updated whenever a change is made in any system panel. In the event of a database loss in a building management panel, the ECC shall automatically restore the database for that panel. This capability may be disabled by the operator.
2. Provide for manual database save and restore. An operator with proper clearance shall be able to save the database from any system panel. The operator also shall be able to clear a panel database and manually initiate a download of a specified database to any panel in the system.
3. Provide a method of configuring the system. This shall allow for future system changes or additions by users with proper clearance.
4. Operating System. Furnish a concurrent multi-tasking operating system. The operating system also shall support the use of other common software applications. Acceptable operating systems are Windows XP, Windows System 7, Linux, and UNIX.
5. System Graphics. The operator workstation software shall be graphically oriented. The system shall allow display of up to 10 graphic screens at once for comparison and monitoring of system status. Provide a method for the operator to easily move between graphic displays and change the size and location of graphic displays on the screen. The system graphics shall be able to be modified while on-line. An operator with the proper password level shall be able to add, delete, or change dynamic objects on a graphic. Dynamic objects shall include analog and binary values, dynamic text, static text, and animation files. Graphics shall have

the ability to show animation by shifting image files based on the status of the object.

6. Custom Graphics. Custom graphic files shall be created with the use of a graphics generation package furnished with the system. The graphics generation package shall be a graphically based system that uses the mouse to create and modify graphics that are saved in industry standard formats such as PCX, TIFF, and GEM. The graphics generation package also shall provide the capability of capturing or converting graphics from other programs such as Designer or AutoCAD.
7. Graphics Library. Furnish a complete library of standard HVAC equipment graphics such as chillers, boilers, air handlers, terminals, fan coils, and unit ventilators. This library also shall include standard symbols for other equipment including fans, pumps, coils, valves, piping, dampers, and ductwork. The library shall be furnished in a file format compatible with the graphics generation package program.
8. The Controls Systems Operator Interfaces shall be user friendly, readily understood and shall make maximum use of colors, graphics, icons, embedded images, animation, text based information and data visualization techniques to enhance and simplify the use and understanding of the displays by authorized users at the ECC. The operating system shall be Windows XP or better, and shall support the third party software.
9. Provide graphical user software, which shall minimize the use of keyboard through the use of the mouse and "point and click" approach to menu selection.
10. The software shall provide a multi-tasking type environment that will allow the user to run several applications simultaneously. The mouse or Alt-Tab keys shall be used to quickly select and switch between multiple applications. The operator shall be able automatically export data to and work in Microsoft Word, Excel, and other Windows based software programs, while concurrently on-line system alarms and monitoring information.
11. On-Line Help. Provide a context-sensitive, on-line help system to assist the operator in operating and editing the system. On-line help shall be available for all applications and shall provide the

- relevant data for that particular screen. Additional help information shall be available through the use of hypertext.
12. User access shall be protected by a flexible and Owner re-definable software-based password access protection. Password protection shall be multi-level and partition able to accommodate the varied access requirements of the different user groups to which individual users may be assigned. Provide the means to define unique access privileges for each individual authorized user. Provide the means to on-line manage password access control under the control of a project specific Master Password. Provide an audit trail of all user activity on the Controls Systems including all actions and changes.
 13. The system shall be completely field-programmable from the common operator's keyboard thus allowing hard disk storage of all data automatically. All programs for the CUs shall be able to be downloaded from the hard disk. The software shall provide the following functionality as a minimum:
 - a. Point database editing, storage and downloading of controller databases.
 - b. Scheduling and override of building environmental control systems.
 - c. Collection and analysis of historical data.
 - d. Alarm reporting, routing, messaging, and acknowledgement.
 - e. Definition and construction of dynamic color graphic displays.
 - f. Real-time graphical viewing and control of environment.
 - g. Scheduling trend reports.
 - h. Program editing.
 - i. Operating activity log and system security.
 - j. Transfer data to third party software.
 14. Provide functionality such that using the least amount of steps to initiate the desired event may perform any of the following simultaneously:
 - a. Dynamic color graphics and graphic control.
 - b. Alarm management.
 - c. Event scheduling.
 - d. Dynamic trend definition and presentation.
 - e. Program and database editing.

f. Each operator shall be required to log on to the system with a user name and password to view, edit or delete the data. System security shall be selectable for each operator, and the password shall be able to restrict the operator's access for viewing and changing the system programs. Each operator shall automatically be logged off the system if no keyboard or mouse activity is detected for a selected time.

15. Graphic Displays:

- a. The workstation shall allow the operator to access various system schematics and floor plans via a graphical penetration scheme, menu selection, or text based commands. Graphic software shall permit the importing of AutoCAD or scanned pictures in the industry standard format (such as PCX, BMP, GIF, and JPEG) for use in the system.
- b. System Graphics shall be project specific and schematically correct for each system. (ie: coils, fans, dampers located per equipment supplied with project.) Standard system graphics that do not match equipment or system configurations are not acceptable. Operator shall have capability to manually operate the entire system from each graphic screen at the ECC. Each system graphic shall include a button/tab to a display of the applicable sequence of operation.
- c. Dynamic temperature values, humidity values, flow rates, and status indication shall be shown in their locations and shall automatically update to represent current conditions without operator intervention and without pre-defined screen refresh values.
- d. Color shall be used to indicate status and change in status of the equipment. The state colors shall be user definable.
- e. A clipart library of HVAC equipment, such as chillers, boilers, air handling units, fans, terminal units, pumps, coils, standard ductwork, piping, valves and laboratory symbols shall be provided in the system. The operator shall have the ability to add custom symbols to the clipart library.
- f. A dynamic display of the site-specific architecture showing status of the controllers, the ECC and network shall be provided.

- g. The windowing environment of the workstation shall allow the user to simultaneously view several applications at a time to analyze total building operation or to allow the display of graphic associated with an alarm to be viewed without interrupting work in progress. The graphic system software shall also have the capability to split screen, half portion of the screen with graphical representation and the other half with sequence of operation of the same HVAC system.
16. Trend reports shall be generated on demand or pre-defined schedule and directed to monitor display, printers or disk. As a minimum, the system shall allow the operator to easily obtain the following types of reports:
- a. A general list of all selected points in the network.
 - b. List of all points in the alarm.
 - c. List of all points in the override status.
 - d. List of all disabled points.
 - e. List of all points currently locked out.
 - f. List of user accounts and password access levels.
 - g. List of weekly schedules.
 - h. List of holiday programming.
 - i. List of limits and dead bands.
 - j. Custom reports.
 - k. System diagnostic reports, including, list of digital controllers on the network.
 - l. List of programs.
17. ASHRAE Standard 147 Report: Provide a daily report that shows the operating condition of each chiller as recommended by ASHRAE Standard 147. At a minimum, this report shall include:
- a. Chilled water (or other secondary coolant) inlet and outlet temperature
 - b. Chilled water (or other secondary coolant) flow
 - c. Chilled water (or other secondary coolant) inlet and outlet pressures
 - d. Evaporator refrigerant pressure and temperature
 - e. Condenser refrigerant pressure and liquid temperature
 - f. Condenser water inlet and outlet temperatures
 - g. Condenser water flow

- h. Refrigerant levels
 - i. Oil pressure and temperature
 - j. Oil level
 - k. Compressor refrigerant discharge temperature
 - l. Compressor refrigerant suction temperature
 - m. Addition of refrigerant
 - n. Addition of oil
 - o. Vibration levels or observation that vibration is not excessive
 - p. Motor amperes per phase
 - q. Motor volts per phase
 - r. PPM refrigerant monitor level
 - s. Purge exhaust time or discharge count
 - t. Ambient temperature (dry-bulb and wet-bulb)
 - u. Date and time logged
18. Electrical, Gas, and Weather Reports
- a. Electrical Meter Report: Provide a monthly report showing the daily electrical consumption and peak electrical demand with time and date stamp for each building meter.
 - b. Provide an annual (12-month) summary report showing the monthly electrical consumption and peak demand with time and date stamp for each meter.
 - c. Gas Meter Report: Provide a monthly report showing the daily natural gas consumption for each meter. Provide an annual (12-month) report that shows the monthly consumption for each meter.
 - d. Weather Data Report: Provide a monthly report showing the daily minimum, maximum, and average outdoor air temperature, as well as the number of heating and cooling degree-days for each day. Provide an annual (12-month) report showing the minimum, maximum, and average outdoor air temperature for the month, as well as the number of heating and cooling degree-days for the month.
19. Scheduling and Override:
- a. Provide override access through menu selection from the graphical interface and through a function key.
 - b. Provide a calendar type format for time-of-day scheduling and overrides of building control systems. Schedules reside in the ECC. The digital controllers shall ensure equipment time scheduling when the ECC is off-line. The ECC shall not be

required to execute time scheduling. Provide the following spreadsheet graphics as a minimum:

- 1) Weekly schedules.
- 2) Zone schedules, minimum of 100 zones.
- 3) Scheduling up to 365 days in advance.
- 4) Scheduled reports to print at workstation.

20. Collection and Analysis of Historical Data:

- a. Provide trending capabilities that will allow the operator to monitor and store records of system activity over an extended period of time. Points may be trended automatically on time based intervals or change of value, both of which shall be user definable. The trend interval could be five (5) minutes to 120 hours. Trend data may be stored on hard disk for future diagnostic and reporting. Additionally trend data may be archived to network drives or removable disk media for off-site retrieval.
- b. Reports may be customized to include individual points or predefined groups of at least six points. Provide additional functionality to allow pre-defined groups of up to 250 trended points to be easily accessible by other industry standard word processing and spreadsheet packages. The reports shall be time and date stamped and shall contain a report title and the name of the facility.
- c. System shall have the set up to generate spreadsheet reports to track energy usage and cost based on weekly or monthly interval, equipment run times, equipment efficiency, and/or building environmental conditions.
- d. Provide additional functionality that will allow the operator to view real time trend data on trend graph displays. A minimum of 20 points may be graphed regardless of whether they have been predefined for trending. In addition, the user may pause the graph and take snapshots of the screens to be stored on the workstation disk for future reference and trend analysis. Exact point values may be viewed and the graph may be printed. Operator shall be able to command points directly on the trend plot by double clicking on the point.

21. Alarm Management:
 - a. Alarm routing shall allow the operator to send alarm notification to selected printers or operator workstation based on time of day, alarm severity, or point type.
 - b. Alarm notification shall be provided via two alarm icons, to distinguish between routine, maintenance type alarms and critical alarms. The critical alarms shall display on the screen at the time of its occurrence, while others shall display by clicking on their icon.
 - c. Alarm display shall list the alarms with highest priority at the top of the display. The alarm display shall provide selector buttons for display of the associated point graphic and message in English language. The operator shall be able to sort out the alarms.
 - d. Alarm messages shall be customized for each point to display detailed instructions to the operator regarding actions to take in the event of an alarm.
 - e. An operator with proper security level access may acknowledge and clear the alarm. All that have not been cleared shall be archived at workstation disk.
22. Remote Communications: The system shall have the ability to dial out in the event of an alarm. Receivers shall include operator workstations, e-mail addresses, and alpha-numeric pagers. The alarm message shall include the name of the calling location, the device that generated the alarm, and the alarm message itself.
23. System Configuration:
 - a. Network control strategies shall not be restricted to a single digital controller, but shall be able to include data from all other network devices to allow the development of global control strategies.
 - b. Provide automatic backup and restore of all digital controller databases on the workstation hard disk. In addition to all backup data, all databases shall be performed while the workstation is on-line without disturbing other system operations.

2.5 PORTABLE OPERATOR'S TERMINAL (POT)

- A. Provide a portable operator's terminal (POT) that shall be capable of accessing all system data. POT may be connected to any point on the

system network or may be connected directly to any controller for programming, setup, and troubleshooting. POT shall communicate using BACnet protocol. POT may be connected to any point on the system network or it may be connected directly to controllers using the BACnet PTP (Point-To-Point) Data Link/ Physical layer protocol. The terminal shall use the Read (Initiate) and Write (Execute) BACnet Services. POT shall be an IBM-compatible notebook-style PC including all software and hardware required.

- B. Hardware: POT shall conform to the BACnet Advanced Workstation (B-AWS) Profile and shall be BTL-Listed as a B-AWS device.
 - 1. POT shall be commercial standard with supporting 32- or 64-bit hardware (as limited by the direct-digital control system software) and software enterprise server. Internet Explorer v6.0 SP1 or higher, Windows Script Hosting version 5.6 or higher, Windows Message Queuing, Windows Internet Information Services (IIS) v5.0 or higher, minimum 2.8 GHz processor, minimum 500 GB 7200 rpm SATA hard drive with 16 MB cache, minimum 2GB DDR3 SDRAM (minimum 1333 Mhz) memory, 512 MB video card, minimum 16 inch (diagonal) screen, 10-100-1000 Base-TX Ethernet NIC with an RJ45 connector or a 100Base-FX Ethernet NIC with an SC/ST connector, 56,600 bps modem, an ASCII RS-232 interface, and a 16 speed high density DVD-RW+/- optical drive.
- C. Software: POT shall include software equal to the software on the ECC.

2.6 CONTROLLERS

- A. General. Provide an adequate number of BTL-Listed B-BC building controllers and an adequate number of BTL-Listed B-AAC advanced application controllers to achieve the performance specified in the Part 1 Article on "System Performance." Each of these controllers shall meet the following requirements.
 - 1. The controller shall have sufficient memory to support its operating system, database, and programming requirements.
 - 2. The building controller shall share data with the ECC and the other networked building controllers. The advanced application controller shall share data with its building controller and the other networked advanced application controllers.
 - 3. The operating system of the controller shall manage the input and output communication signals to allow distributed controllers to

- share real and virtual object information and allow for central monitoring and alarms.
4. Controllers that perform scheduling shall have a real-time clock.
 5. The controller shall continually check the status of its processor and memory circuits. If an abnormal operation is detected, the controller shall:
 - a. assume a predetermined failure mode, and
 - b. generate an alarm notification.
 6. The controller shall communicate with other BACnet devices on the internetwork using the BACnet Read (Execute and Initiate) and Write (Execute and Initiate) Property services.
 7. Communication.
 - a. Each controller shall reside on a BACnet network using the ISO 8802-3 (Ethernet) Data Link/Physical layer protocol for its communications. Each building controller also shall perform BACnet routing if connected to a network of custom application and application specific controllers.
 - b. The controller shall provide a service communication port using BACnet Data Link/Physical layer protocol for connection to a portable operator's terminal.
 8. Keypad. A local keypad and display shall be provided for each controller. The keypad shall be provided for interrogating and editing data. Provide a system security password shall be available to prevent unauthorized use of the keypad and display.
 9. Serviceability. Provide diagnostic LEDs for power, communication, and processor. All wiring connections shall be made to field-removable, modular terminal strips or to a termination card connected by a ribbon cable.
 10. Memory. The controller shall maintain all BIOS and programming information in the event of a power loss for at least 72 hours.
 11. The controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage. Controller operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 1 m (3 ft).
- B. Provide BTL-Listed B-ASC application specific controllers for each piece of equipment for which they are constructed. Application

specific controllers shall communicate with other BACnet devices on the internetwork using the BACnet Read (Execute) Property service.

1. Each B-ASC shall be capable of stand-alone operation and shall continue to provide control functions without being connected to the network.
2. Each B-ASC will contain sufficient I/O capacity to control the target system.
3. Communication.
 - a. Each controller shall reside on a BACnet network using the ISO 8802-3 (Ethernet) Data Link/Physical layer protocol for its communications. Each building controller also shall perform BACnet routing if connected to a network of custom application and application specific controllers.
 - b. Each controller shall reside on an ARCNET network using the ISO 8802-2 Data Link/Physical layer protocol for its communications.
 - c. Each controller shall have a BACnet Data Link/Physical layer compatible connection for a laptop computer or a portable operator's tool. This connection shall be extended to a space temperature sensor port where shown.
4. Serviceability. Provide diagnostic LEDs for power, communication, and processor. All wiring connections shall be made to field-removable, modular terminal strips or to a termination card connected by a ribbon cable.
5. Memory. The application specific controller shall use nonvolatile memory and maintain all BIOS and programming information in the event of a power loss.
6. Immunity to power and noise. Controllers shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80%. Operation shall be protected against electrical noise of 5-120 Hz and from keyed radios up to 5 W at 1 m (3 ft).
7. Transformer. Power supply for the ASC must be rated at a minimum of 125% of ASC power consumption and shall be of the fused or current limiting type.

C. Direct Digital Controller Software

1. The software programs specified in this section shall be commercially available, concurrent, multi-tasking operating system

- and support the use of software application that operates under DOS or Microsoft Windows.
2. All points shall be identified by up to 30-character point name and 16-character point descriptor. The same names shall be used at the ECC.
 3. All control functions shall execute within the stand-alone control units via DDC algorithms. The VA shall be able to customize control strategies and sequences of operations defining the appropriate control loop algorithms and choosing the optimum loop parameters.
 4. All controllers shall be capable of being programmed to utilize stored default values for assured fail-safe operation of critical processes. Default values shall be invoked upon sensor failure or, if the primary value is normally provided by the central or another CU, or by loss of bus communication. Individual application software packages shall be structured to assume a fail-safe condition upon loss of input sensors. Loss of an input sensor shall result in output of a sensor-failed message at the ECC. Each ACU and RCU shall have capability for local readouts of all functions. The UCUs shall be read remotely.
 5. All DDC control loops shall be able to utilize any of the following control modes:
 - a. Two position (on-off, slow-fast) control.
 - b. Proportional control.
 - c. Proportional plus integral (PI) control.
 - d. Proportional plus integral plus derivative (PID) control. All PID programs shall automatically invoke integral wind up prevention routines whenever the controlled unit is off, under manual control of an automation system or time initiated program.
 - e. Automatic tuning of control loops.
 6. System Security: Operator access shall be secured using individual password and operator's name. Passwords shall restrict the operator to the level of object, applications, and system functions assigned to him. A minimum of six (6) levels of security for operator access shall be provided.
 7. Application Software: The controllers shall provide the following programs as a minimum for the purpose of optimizing energy consumption while maintaining comfortable environment for occupants.

All application software shall reside and run in the system digital controllers. Editing of the application shall occur at the ECC or via a portable operator's terminal, when it is necessary, to access directly the programmable unit.

- a. Power Demand Limiting (PDL): Power demand limiting program shall monitor the building power consumption and limit the consumption of electricity to prevent peak demand charges. PDL shall continuously track the electricity consumption from a pulse input generated at the kilowatt-hour/demand electric meter. PDL shall sample the meter data to continuously forecast the electric demand likely to be used during successive time intervals. If the forecast demand indicates that electricity usage will likely to exceed a user preset maximum allowable level, then PDL shall automatically shed electrical loads. Once the demand load has met, loads that have been shed shall be restored and returned to normal mode. Control system shall be capable of demand limiting by resetting the HVAC system set points to reduce load while maintaining indoor air quality.
- b. Economizer: An economizer program shall be provided for VAV systems. This program shall control the position of air handler relief, return, and outdoors dampers. If the // outdoor air dry bulb temperature falls // outdoor air dry bulb temperature and humidity fall // below changeover set point the energy control center will modulate the dampers to provide 100 percent outdoor air. The operator shall be able to override the economizer cycle and return to minimum outdoor air operation at any time.
- c. Night Setback/Morning Warm up Control: The system shall provide the ability to automatically adjust set points for this mode of operation.
- d. Optimum Start/Stop (OSS): Optimum start/stop program shall automatically be coordinated with event scheduling. The OSS program shall start HVAC equipment at the latest possible time that will allow the equipment to achieve the desired zone condition by the time of occupancy, and it shall also shut down HVAC equipment at the earliest possible time before the end of the occupancy period and still maintain desired comfort conditions. The OSS program shall consider both outside weather

conditions and inside zone conditions. The program shall automatically assign longer lead times for weekend and holiday shutdowns. The program shall poll all zones served by the associated AHU and shall select the warmest and coolest zones. These shall be used in the start time calculation. It shall be possible to assign occupancy start times on a per air handler unit basis. The program shall meet the local code requirements for minimum outdoor air while the building is occupied. Modification of assigned occupancy start/stop times shall be possible via the ECC.

- e. Event Scheduling: Provide a comprehensive menu driven program to automatically start and stop designated points or a group of points according to a stored time. This program shall provide the capability to individually command a point or group of points. When points are assigned to one common load group it shall be possible to assign variable time advances/delays between each successive start or stop within that group. Scheduling shall be calendar based and advance schedules may be defined up to one year in advance. Advance schedule shall override the day-to-day schedule. The operator shall be able to define the following information:
 - 1) Time, day.
 - 2) Commands such as on, off, auto.
 - 3) Time delays between successive commands.
 - 4) Manual overriding of each schedule.
 - 5) Allow operator intervention.
- f. Alarm Reporting: The operator shall be able to determine the action to be taken in the event of an alarm. Alarms shall be routed to the ECC based on time and events. An alarm shall be able to start programs, login the event, print and display the messages. The system shall allow the operator to prioritize the alarms to minimize nuisance reporting and to speed operator's response to critical alarms. A minimum of six (6) priority levels of alarms shall be provided for each point.
- g. Remote Communications: The system shall have the ability to dial out in the event of an alarm to the ECC and alpha-numeric pagers. The alarm message shall include the name of the calling location,

the device that generated the alarm, and the alarm message itself. The operator shall be able to remotely access and operate the system using dial up communications. Remote access shall allow the operator to function the same as local access.

- h. Maintenance Management (PM): The program shall monitor equipment status and generate maintenance messages based upon the operators defined equipment run time, starts, and/or calendar date limits. A preventative maintenance alarm shall be printed indicating maintenance requirements based on pre-defined run time. Each preventive message shall include point description, limit criteria and preventative maintenance instruction assigned to that limit. A minimum of 480-character PM shall be provided for each component of units such as air handling units.

2.7 SENSORS (AIR, WATER AND STEAM)

- A. Sensors' measurements shall be read back to the DDC system, and shall be visible by the ECC.
- B. Temperature and Humidity Sensors shall be electronic, vibration and corrosion resistant for wall, immersion, and/or duct mounting. Provide all remote sensors as required for the systems.
1. Temperature Sensors: thermistor type for terminal units and Resistance Temperature Device (RTD) with an integral transmitter type for all other sensors.
- a. Duct sensors shall be rigid or averaging type as shown on drawings. Averaging sensor shall be a minimum of 1 linear ft of sensing element for each sq ft of cooling coil face area.
- b. Immersion sensors shall be provided with a separable well made of stainless steel, bronze or monel material. Pressure rating of well is to be consistent with the system pressure in which it is to be installed.
- c. Space sensors shall be equipped with in-space User set-point adjustment, override switch, numerical temperature display on sensor cover, and communication port. Match room thermostats. Provide a tooled-access cover.
- 1) Public space sensor: setpoint adjustment shall be only through the ECC or through the DDC system's diagnostic device/laptop. Do not provide in-space User set-point adjustment. Provide an

- opaque keyed-entry cover if needed to restrict in-space User set-point adjustment.
- 2) Psychiatric patient room sensor: sensor shall be flush with wall, shall not include an override switch, numerical temperature display on sensor cover, shall not include a communication port and shall not allow in-space User set-point adjustment. Setpoint adjustment shall be only through the ECC or through the DDC system's diagnostic device/laptop. Provide a stainless steel cover plate with an insulated back and security screws.
 - d. Outdoor air temperature sensors shall have watertight inlet fittings and be shielded from direct sunlight.
 - e. Room security sensors shall have stainless steel cover plate with insulated back and security screws.
 - f. Wire: Twisted, shielded-pair cable.
 - g. Output Signal: 4-20 ma.
 2. Humidity Sensors: Bulk polymer sensing element type.
 - a. Duct and room sensors shall have a sensing range of 20 to 80 percent with accuracy of ± 2 to ± 5 percent RH, including hysteresis, linearity, and repeatability.
 - b. Outdoor humidity sensors shall be furnished with element guard and mounting plate and have a sensing range of 0 to 100 percent RH.
 - c. 4-20 ma continuous output signal.
 - C. Static Pressure Sensors: Non-directional, temperature compensated.
 1. 4-20 ma output signal.
 2. 0 to 5 inches wg for duct static pressure range.
 3. 0 to 0.25 inch wg for Building static pressure range.
 - D. Water Flow Sensors: shall be insertion turbine type with turbine element, retractor and preamplifier/transmitter mounted on a two-inch full port isolation valve; assembly easily removed or installed as a single unit under line pressure through the isolation valve without interference with process flow; calibrated scale shall allow precise positioning of the flow element to the required insertion depth within plus or minute 1 mm (0.05 inch); wetted parts shall be constructed of stainless steel. Operating power shall be nominal 24 VDC. Local

instantaneous flow indicator shall be LED type in NEMA 4 enclosure with 3-1/2 digit display, for wall or panel mounting.

1. Performance characteristics:

- a. Ambient conditions: -40°C to 60°C (-40°F to 140°F), 5 to 100% humidity.
- b. Operating conditions: 850 kPa (125 psig), 0°C to 120°C (30°F to 250°F), 0.15 to 12 m per second (0.5 to 40 feet per second) velocity.
- c. Nominal range (turn down ratio): 10 to 1.
- d. Preamplifier mounted on meter shall provide 4-20 ma divided pulse output or switch closure signal for units of volume or mass per a time base. Signal transmission distance shall be a minimum of 1,800 meters (6,000 feet). // Preamplifier for bi-directional flow measurement shall provide a directional contact closure from a relay mounted in the preamplifier //.
- e. Pressure Loss: Maximum 1 percent of the line pressure in line sizes above 100 mm (4 inches).
- f. Ambient temperature effects, less than 0.005 percent calibrated span per °C (°F) temperature change.
- g. RFI effect - flow meter shall not be affected by RFI.
- h. Power supply effect less than 0.02 percent of span for a variation of plus or minus 10 percent power supply.

E. Flow switches:

1. Shall be either paddle or differential pressure type.
 - a. Paddle-type switches (liquid service only) shall be UL Listed, SPDT snap-acting, adjustable sensitivity with NEMA 4 enclosure.
 - b. Differential pressure type switches (air or water service) shall be UL listed, SPDT snap acting, NEMA 4 enclosure, with scale range and differential suitable for specified application.

F. Current Switches: Current operated switches shall be self powered, solid state with adjustable trip current as well as status, power, and relay command status LED indication. The switches shall be selected to match the current of the application and output requirements of the DDC systems.

2.8 CONTROL CABLES

A. General:

1. Ground cable shields, drain conductors, and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments. Comply with Sections 27 05 26 and 26 05 26.
2. Cable conductors to provide protection against induction in circuits. Crosstalk attenuation within the System shall be in excess of -80 dB throughout the frequency ranges specified.
3. Minimize the radiation of RF noise generated by the System equipment so as not to interfere with any audio, video, data, computer main distribution frame (MDF), telephone customer service unit (CSU), and electronic private branch exchange (EPBX) equipment the System may service.
4. The as-installed drawings shall identify each cable as labeled, used cable, and bad cable pairs.
5. Label system's cables on each end. Test and certify cables in writing to the VA before conducting proof-of-performance testing. Minimum cable test requirements are for impedance compliance, inductance, capacitance, signal level compliance, opens, shorts, cross talk, noise, and distortion, and split pairs on all cables in the frequency ranges used. Make available all cable installation and test records at demonstration to the VA. All changes (used pair, failed pair, etc.) shall be posted in these records as the change occurs.
6. Power wiring shall not be run in conduit with communications trunk wiring or signal or control wiring operating at 100 volts or less.

B. Analogue control cabling shall be not less than No. 18 AWG solid, with thermoplastic insulated conductors as specified in Section 26 05 21.

C. Copper digital communication cable between the ECC and the B-BC and B-AAC controllers shall be 100BASE-TX Ethernet, Category 5e or 6, not less than minimum 24 American Wire Gauge (AWG) solid, Shielded Twisted Pair (STP) or Unshielded Twisted Pair (UTP), with thermoplastic insulated conductors, enclosed in a thermoplastic outer jacket, as specified in Section 27 15 00.

1. Other types of media commonly used within IEEE Std 802.3 LANs (e.g., 10Base-T and 10Base-2) shall be used only in cases to interconnect with existing media.
- D. Optical digital communication fiber, if used, shall be Multimode or Singlemode fiber, 62.5/125 micron for multimode or 10/125 micron for singlemode micron with SC or ST connectors as specified in TIA-568-C.1. Terminations, patch panels, and other hardware shall be compatible with the specified fiber and shall be as specified in Section 27 15 00. Fiber-optic cable shall be suitable for use with the 100Base-FX or the 100Base-SX standard (as applicable) as defined in IEEE Std 802.3.

2.9 THERMOSTATS AND HUMIDISTATS

- A. Room thermostats controlling unitary standalone heating and cooling devices not connected to the DDC system shall have three modes of operation (heating - null or dead band - cooling). Thermostats for patient bedrooms shall have capability of being adjusted to eliminate null or dead band. Wall mounted thermostats shall have polished or brushed aluminum finish, setpoint range and temperature display and external adjustment:
 1. Electronic Thermostats: Solid-state, microprocessor based, programmable to daily, weekend, and holiday schedules.
 - a. Public Space Thermostat: Public space thermostat shall have a thermistor sensor and shall not have a visible means of set point adjustment. Adjustment shall be via the digital controller to which it is connected.
 - b. Patient Room Thermostats: thermistor with in-space User set point adjustment and an on-casing room temperature numerical temperature display.
 - c. Psychiatric Patient Room Sensors: Electronic duct sensor as noted under Article 2.4.
 - d. Battery replacement without program loss.
- B. Strap-on thermostats shall be enclosed in a dirt-and-moisture proof housing with fixed temperature switching point and single pole, double throw switch.
- C. Freezestats shall have a minimum of 300 mm (one linear foot) of sensing element for each 0.093 square meter (one square foot) of coil area. A freezing condition at any increment of 300 mm (one foot) anywhere along

the sensing element shall be sufficient to operate the thermostatic element. Freezestats shall be manually-reset.

- D. Room Humidistats: Provide fully proportioning humidistat with adjustable throttling range for accuracy of settings and conservation. The humidistat shall have set point scales shown in percent of relative humidity located on the instrument. Systems showing moist/dry or high/low are not acceptable.

2.10 THERMO-MECHANICAL CONVECTOR CONTROLS

- A. Furnish and install package assembly including thermostatic steam control valve, operator, remote mount sensor and dial and 6 foot capillary tube.

2.11 ELECTRIC CONTROLS FOR INDUCTION UNITS

- A. The induction units shall not be connected to the DDC BAS, but shall be controlled by low voltage electric control devices. The system shall be provided emergency power from the electric panel indicated on the drawings. Furnish and install transformer banks as indicated on the plans to convert 120V power to low voltage suitable for selected devices. Furnish and install low voltage power to each induction unit's control package.
- B. Induction Unit Control Package.
1. Furnish and install low voltage temperature sensor with features similar to DDC temperature sensor specified elsewhere. Provide low voltage 2-way modulating control valves to the induction unit manufacturer for factory assembly of their valve package. All devices in the induction unit control package shall be suitable for future conversion to the new DDC system. Install all required wiring and perform all associated programming to achieve sequence of operation indicated on the drawings.

2.12 FINAL CONTROL ELEMENTS AND OPERATORS

- A. Fail Safe Operation: Control valves and dampers shall provide "fail safe" operation in either the normally open or normally closed position as required for freeze, moisture, and smoke or fire protection.
- B. Spring Ranges: Range as required for system sequencing and to provide tight shut-off.
- C. Power Operated Control Dampers (other than VAV Boxes): Factory fabricated, balanced type dampers. All modulating dampers shall be opposed blade type and gasketed. Blades for two-position, duct-mounted

dampers shall be parallel, airfoil (streamlined) type for minimum noise generation and pressure drop.

1. Leakage: maximum leakage in closed position shall not exceed 7 L/S (15 CFMs) differential pressure for outside air and exhaust dampers and 200 L/S/ square meter (40 CFM/sq. ft.) at 50 mm (2 inches) differential pressure for other dampers.
 2. Frame shall be galvanized steel channel with seals as required to meet leakage criteria.
 3. Blades shall be galvanized steel or aluminum, 200 mm (8 inch) maximum width, with edges sealed as required.
 4. Bearing shall be nylon, bronze sleeve or ball type.
 5. Hardware shall be zinc-plated steel. Connected rods and linkage shall be non-slip. Working parts of joints shall be brass, bronze, nylon or stainless steel.
 6. Maximum air velocity and pressure drop through free area the dampers:
 - a. Smoke damper in air handling unit: 305 meter per minute (1000 fpm).
 - b. Duct mounted damper: 600 meter per minute (2000 fpm).
 - c. Maximum static pressure loss: 50 Pascal (0.20 inches water gage).
- D. Smoke Dampers and Combination Fire/Smoke Dampers: Dampers and operators are specified in Section 23 31 00, HVAC DUCTS AND CASINGS. Control of these dampers is specified under this Section.
- E. Control Valves:
1. Valves shall be rated for a minimum of 150 percent of system operating pressure at the valve location but not less than 900 kPa (125 psig).
 2. Valves 50 mm (2 inches) and smaller shall be bronze body with threaded or flare connections.
 3. Valves 60 mm (2 1/2 inches) and larger shall be bronze or iron body with flanged connections.
 4. Brass or bronze seats except for valves controlling media above 100 degrees C (210 degrees F), which shall have stainless steel seats.
 5. Flow characteristics:
 - a. Three way modulating valves shall be globe pattern. Position versus flow relation shall be linear relation for steam or equal percentage for water flow control.

- b. Two-way modulating valves shall be globe pattern. Position versus flow relation shall be linear for steam and equal percentage for water flow control.
 - c. Two-way 2-position valves shall be ball, gate or butterfly type.
6. Maximum pressure drop:
- a. Two position steam control: 20 percent of inlet gauge pressure.
 - b. Modulating Steam Control: 80 percent of inlet gauge pressure (acoustic velocity limitation).
 - c. Modulating water flow control, greater of 3 meters (10 feet) of water or the pressure drop through the apparatus.
7. Two position water valves shall be line size.
- F. Damper and Valve Operators and Relays:
- 1. Electric operator shall provide full modulating control of dampers and valves. A linkage and pushrod shall be furnished for mounting the actuator on the damper frame internally in the duct or externally in the duct or externally on the duct wall, or shall be furnished with a direct-coupled design. Metal parts shall be aluminum, mill finish galvanized steel, or zinc plated steel or stainless steel. Provide actuator heads which allow for electrical conduit attachment. The motors shall have sufficient closure torque to allow for complete closure of valve or damper under pressure. Provide multiple motors as required to achieve sufficient close-off torque.
 - a. Minimum valve close-off pressure shall be equal to the system pump's dead-head pressure, minimum 50 psig for valves smaller than 4 inches.
 - 2. Electronic damper operators: Metal parts shall be aluminum, mill finish galvanized steel, or zinc plated steel or stainless steel. Provide actuator heads which allow for electrical conduit attachment. The motors shall have sufficient closure torque to allow for complete closure of valve or damper under pressure. Provide multiple motors as required to achieve sufficient close-off torque.
 - a. VAV Box actuator shall be mounted on the damper axle or shall be of the air valve design, and shall provide complete modulating control of the damper. The motor shall have a closure torque of 35-inch pounds minimum with full torque applied at close off to attain minimum leakage.

3. See drawings for required control operation.

2.13 AIR FLOW CONTROL

- A. Airflow and static pressure shall be controlled via digital controllers with inputs from airflow control measuring stations and static pressure inputs as specified. Controller outputs shall be analog or pulse width modulating output signals. The controllers shall include the capability to control via simple proportional (P) control, proportional plus integral (PI), proportional plus integral plus derivative (PID), and on-off. The airflow control programs shall be factory-tested programs that are documented in the literature of the control manufacturer.
- B. Air Flow Measuring Station -- Electronic Thermal Type:
1. Air Flow Sensor Probe:
 - a. Each air flow sensor shall contain two individual thermal sensing elements. One element shall determine the velocity of the air stream while the other element shall compensate for changes in temperature. Each thermal flow sensor and its associated control circuit and signal conditioning circuit shall be factory calibrated and be interchangeable to allow replacement of a sensor without recalibration of the entire flow station. The sensor in the array shall be located at the center of equal area segment of the duct and the number of sensors shall be adequate to accommodate the expected velocity profile and variation in flow and temperature. The airflow station shall be of the insertion type in which sensor support structures are inserted from the outside of the ducts to make up the complete electronic velocity array.
 - b. Thermal flow sensor shall be constructed of hermetically sealed thermistors or nickel chromium or reference grade platinum wire, wound over an epoxy, stainless steel or ceramic mandrel and coated with a material suitable for the conditions to be encountered. Each dual sensor shall be mounted in an extruded aluminum alloy strut.
 2. Air Flow Sensor Grid Array:
 - a. Each sensor grid shall consist of a lattice network of temperature sensors and linear integral controllers (ICs) situated inside an aluminum casing suitable for mounting in a

duct. Each sensor shall be mounted within a strut facing downstream of the airflow and located so that it is protected on the upstream side. All wiring shall be encased (out of the air stream) to protect against mechanical damage.

- b. The casing shall be made of welded aluminum of sufficient strength to prevent structural bending and bowing. Steel or iron composite shall not be acceptable in the casing material.
 - c. Pressure drop through the flow station shall not exceed 4 Pascal (0.015" W.G.) at 1,000 meter per minute (3,000 FPM).
3. Electronics Panel:
- a. Electronics Panel shall consist of a surface mounted enclosure complete with solid-state microprocessor and software.
 - b. Electronics Panel shall be A/C powered 24 VAC and shall have the capability to transmit signals of 0-5 VDC, 0-10 VCD or 4-20 ma for use in control of the HVAC Systems. The electronic panel shall have the capability to accept user defined scaling parameters for all output signals.
 - c. Electronics Panel shall have the capability to digitally display airflow in CFM and temperature in degrees F. The displays shall be provided as an integral part of the electronics panel. The electronic panel shall have the capability to totalize the output flow in CFM for two or more systems, as required. A single output signal may be provided which will equal the sum of the systems totalized. Output signals shall be provided for temperature and airflow. Provide remote mounted air flow or temperature displays where indicated on the plans.
 - d. Electronics Panel shall have the following:
 - 1) Minimum of 12-bit A/D conversion.
 - 2) Field adjustable digital primary output offset and gain.
 - 3) Airflow analog output scaling of 100 to 10,000 FPM.
 - 4) Temperature analog output scaling from -45°C to 70°C (-50°F to 160°F).
 - 5) Analog output resolution (full scale output) of 0.025%.
 - e. All readings shall be in I.P.units.

4. Thermal flow sensors and its electronics shall be installed as per manufacturer's instructions. The probe sensor density shall be as follows:

Probe Sensor Density	
Area (sq.ft.)	Qty. Sensors
<=1	2
>1 to <4	4
4 to <8	6
8 to <12	8
12 to <16	12
>=16	16

- a. Complete installation shall not exhibit more than $\pm 2.0\%$ error in airflow measurement output for variations in the angle of flow of up to 10 percent in any direction from its calibrated orientation. Repeatability of readings shall be within $\pm 0.25\%$.
- D. Static Pressure Measuring Station: shall consist of one or more static pressure sensors and transmitters along with relays or auxiliary devices as required for a complete functional system. The span of the transmitter shall not exceed two times the design static pressure at the point of measurement. The output of the transmitter shall be true representation of the input pressure with plus or minus 25 Pascal (0.1 inch) W.G. of the true input pressure:
1. Static pressure sensors shall have the same requirements as Airflow Measuring Devices except that total pressure sensors are optional, and only multiple static pressure sensors positioned on an equal area basis connected to a network of headers are required.
 2. For systems with multiple major trunk supply ducts, furnish a static pressure transmitter for each trunk duct. The transmitter signal representing the lowest static pressure shall be selected and this shall be the input signal to the controller.
 3. The controller shall receive the static pressure transmitter signal and CU shall provide a control output signal to the supply fan capacity control device. The control mode shall be proportional plus integral (PI) (automatic reset) and where required shall also include derivative mode.
 4. In systems with multiple static pressure transmitters, provide a switch located near the fan discharge to prevent excessive pressure

- during abnormal operating conditions. High-limit switches shall be manually-reset.
- E. Constant Volume Control Systems shall consist of an air flow measuring station along with such relays and auxiliary devices as required to produce a complete functional system. The transmitter shall receive its air flow signal and static pressure signal from the flow measuring station and shall have a span not exceeding three times the design flow rate. The CU shall receive the transmitter signal and shall provide an output to the fan volume control device to maintain a constant flow rate. The CU shall provide proportional plus integral (PI) (automatic reset) control mode and where required also inverse derivative mode. Overall system accuracy shall be plus or minus the equivalent of 2 Pascal (0.008 inch) velocity pressure as measured by the flow station.
- F. Airflow Synchronization:
1. Systems shall consist of an air flow measuring station for each supply and return duct, the CU and such relays, as required to provide a complete functional system that will maintain a constant flow rate difference between supply and return air to an accuracy of $\pm 10\%$. In systems where there is no suitable location for a flow measuring station that will sense total supply or return flow, provide multiple flow stations with a differential pressure transmitter for each station. Signals from the multiple transmitters shall be added through the CU such that the resultant signal is a true representation of total flow.
 2. The total flow signals from supply and return air shall be the input signals to the CU. This CU shall track the return air fan capacity in proportion to the supply air flow under all conditions.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Induction Unit Control Valves:
1. Ship induction unit control valves to induction unit manufacturer for assembly into valve package prior to induction unit shipment from factory.
- B. General:
1. Examine project plans for control devices and equipment locations; and report any discrepancies, conflicts, or omissions to Resident Engineer for resolution before proceeding for installation.

2. Install equipment, piping, wiring /conduit parallel to or at right angles to building lines.
3. Install all equipment and piping in readily accessible locations. Do not run tubing and conduit concealed under insulation or inside ducts.
4. Mount control devices, tubing and conduit located on ducts and apparatus with external insulation on standoff support to avoid interference with insulation.
5. Provide sufficient slack and flexible connections to allow for vibration of piping and equipment.
6. Run tubing and wire connecting devices on or in control cabinets parallel with the sides of the cabinet neatly racked to permit tracing.
7. Install equipment level and plum.

C. Electrical Wiring Installation:

1. All wiring cabling shall be installed in conduits. Install conduits and wiring in accordance with Specification Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS. Conduits carrying control wiring and cabling shall be dedicated to the control wiring and cabling: these conduits shall not carry power wiring. Provide plastic end sleeves at all conduit terminations to protect wiring from burrs.
2. Install analog signal and communication cables in conduit and in accordance with Specification Section 26 05 21. Install digital communication cables in conduit and in accordance with Specification Section 27 15 00, Communications Horizontal Cabling.
3. Install conduit and wiring between operator workstation(s), digital controllers, electrical panels, indicating devices, instrumentation, miscellaneous alarm points, thermostats, and relays as shown on the drawings or as required under this section.
4. Install all electrical work required for a fully functional system and not shown on electrical plans or required by electrical specifications. Where low voltage (less than 50 volt) power is required, provide suitable Class B transformers.

5. Install all system components in accordance with local Building Code and National Electric Code.
 - a. Splices: Splices in shielded and coaxial cables shall consist of terminations and the use of shielded cable couplers. Terminations shall be in accessible locations. Cables shall be harnessed with cable ties.
 - b. Equipment: Fit all equipment contained in cabinets or panels with service loops, each loop being at least 300 mm (12 inches) long. Equipment for fiber optics system shall be rack mounted, as applicable, in ventilated, self-supporting, code gauge steel enclosure. Cables shall be supported for minimum sag.
 - c. Cable Runs: Keep cable runs as short as possible. Allow extra length for connecting to the terminal board. Do not bend flexible coaxial cables in a radius less than ten times the cable outside diameter.
 - d. Use vinyl tape, sleeves, or grommets to protect cables from vibration at points where they pass around sharp corners, through walls, panel cabinets, etc.
 6. Conceal cables, except in mechanical rooms and areas where other conduits and piping are exposed.
 7. Permanently label or code each point of all field terminal strips to show the instrument or item served. Color-coded cable with cable diagrams may be used to accomplish cable identification.
 8. Grounding: ground electrical systems per manufacturer's written requirements for proper and safe operation.
- D. Install Sensors and Controls:
1. Temperature Sensors:
 - a. Install all sensors and instrumentation according to manufacturer's written instructions. Temperature sensor locations shall be readily accessible, permitting quick replacement and servicing of them without special skills and tools.
 - b. Calibrate sensors to accuracy specified, if not factory calibrated.
 - c. Use of sensors shall be limited to its duty, e.g., duct sensor shall not be used in lieu of room sensor.

- d. Install room sensors permanently supported on wall frame. They shall be mounted at 1.5 meter (5.0 feet) above the finished floor.
 - e. Mount sensors rigidly and adequately for the environment within which the sensor operates. Separate extended-bulb sensors from contact with metal casings and coils using insulated standoffs.
 - f. Sensors used in mixing plenum, and hot and cold decks shall be of the averaging of type. Averaging sensors shall be installed in a serpentine manner horizontally across duct. Each bend shall be supported with a capillary clip.
 - g. All pipe mounted temperature sensors shall be installed in wells.
 - h. All wires attached to sensors shall be air sealed in their conduits or in the wall to stop air transmitted from other areas affecting sensor reading.
 - i. Permanently mark terminal blocks for identification. Protect all circuits to avoid interruption of service due to short-circuiting or other conditions. Line-protect all wiring that comes from external sources to the site from lightning and static electricity.
2. Pressure Sensors:
- a. Install duct static pressure sensor tips facing directly downstream of airflow.
 - b. Install high-pressure side of the differential switch between the pump discharge and the check valve.
 - c. Install snubbers and isolation valves on steam pressure sensing devices.
3. Actuators:
- a. Mount and link damper and valve actuators according to manufacturer's written instructions.
 - b. Check operation of damper/actuator combination to confirm that actuator modulates damper smoothly throughout stroke to both open and closed position.
 - c. Check operation of valve/actuator combination to confirm that actuator modulates valve smoothly in both open and closed position.

4. Flow Switches:
 - a. Install flow switch according to manufacturer's written instructions.
 - b. Mount flow switch a minimum of 5 pipe diameters up stream and 5 pipe diameters downstream or 600 mm (2 feet) whichever is greater, from fittings and other obstructions.
 - c. Assure correct flow direction and alignment.
 - d. Mount in horizontal piping-flow switch on top of the pipe.
- E. Installation of network:
 1. Ethernet:
 - a. The network shall employ Ethernet LAN architecture, as defined by IEEE 802.3. The Network Interface shall be fully Internet Protocol (IP) compliant allowing connection to currently installed IEEE 802.3, Compliant Ethernet Networks.
 - b. The network shall directly support connectivity to a variety of cabling types. As a minimum provide the following connectivity: 100 Base TX (Category 5e cabling) for the communications between the ECC and the B-BC and the B-AAC controllers.
 2. Third party interfaces: Contractor shall integrate real-time data from building systems by other trades and databases originating from other manufacturers as specified and required to make the system work as one system.
- F. Installation of digital controllers and programming:
 1. Provide a separate digital control panel for each major piece of equipment, such as air handling unit, chiller, pumping unit etc. Points used for control loop reset such as outdoor air, outdoor humidity, or space temperature could be located on any of the remote control units.
 2. Provide sufficient internal memory for the specified control sequences and trend logging. There shall be a minimum of 25 percent of available memory free for future use.
 3. System point names shall be modular in design, permitting easy operator interface without the use of a written point index.
 4. Provide software programming for the applications intended for the systems specified, and adhere to the strategy algorithms provided.
 5. Provide graphics for each piece of equipment and floor plan in the building. This includes each, air handling unit, fan, terminal unit,

pumping unit etc. These graphics shall show all points dynamically as specified in the point list.

3.2 SYSTEM VALIDATION AND DEMONSTRATION

- A. As part of final system acceptance, a system demonstration is required (see below). Prior to start of this demonstration, the contractor is to perform a complete validation of all aspects of the controls and instrumentation system.
- B. Validation
1. Prepare and submit for approval a validation test plan including test procedures for the performance verification tests. Test Plan shall address all specified functions of the ECC and all specified sequences of operation. Explain in detail actions and expected results used to demonstrate compliance with the requirements of this specification. Explain the method for simulating the necessary conditions of operation used to demonstrate performance of the system. Test plan shall include a test check list to be used by the Installer's agent to check and initial that each test has been successfully completed. Deliver test plan documentation for the performance verification tests to the owner's representative 30 days prior to start of performance verification tests. Provide draft copy of operation and maintenance manual with performance verification test.
 2. After approval of the validation test plan, installer shall carry out all tests and procedures therein. Installer shall completely check out, calibrate, and test all connected hardware and software to insure that system performs in accordance with approved specifications and sequences of operation submitted. Installer shall complete and submit Test Check List.
- C. Demonstration
1. System operation and calibration to be demonstrated by the installer in the presence of the Architect or VA's representative on random samples of equipment as dictated by the Architect or VA's representative. Should random sampling indicate improper commissioning, the owner reserves the right to subsequently witness complete calibration of the system at no addition cost to the VA.
 2. Demonstrate to authorities that all required safeties and life safety functions are fully functional and complete.

3. Make accessible, personnel to provide necessary adjustments and corrections to systems as directed by balancing agency.
4. The following witnessed demonstrations of field control equipment shall be included:
 - a. Observe HVAC systems in shut down condition. Check dampers and valves for normal position.
 - b. Test application software for its ability to communicate with digital controllers, operator workstation, and uploading and downloading of control programs.
 - c. Demonstrate the software ability to edit the control program off-line.
 - d. Demonstrate reporting of alarm conditions for each alarm and ensure that these alarms are received at the assigned location, including operator workstations.
 - e. Demonstrate ability of software program to function for the intended applications-trend reports, change in status etc.
 - f. Demonstrate via graphed trends to show the sequence of operation is executed in correct manner, and that the HVAC systems operate properly through the complete sequence of operation, e.g., seasonal change, occupied/unoccupied mode, and warm-up condition.
 - g. Demonstrate hardware interlocks and safeties functions, and that the control systems perform the correct sequence of operation after power loss and resumption of power loss.
 - h. Prepare and deliver to the VA graphed trends of all control loops to demonstrate that each control loop is stable and the set points are maintained.
 - i. Demonstrate that each control loop responds to set point adjustment and stabilizes within one (1) minute. Control loop trend data shall be instantaneous and the time between data points shall not be greater than one (1) minute.
5. Witnessed demonstration of ECC functions shall consist of:
 - a. Running each specified report.
 - b. Display and demonstrate each data entry to show site specific customizing capability. Demonstrate parameter changes.
 - c. Step through penetration tree, display all graphics, demonstrate dynamic update, and direct access to graphics.
 - d. Execute digital and analog commands in graphic mode.

- e. Demonstrate DDC loop precision and stability via trend logs of inputs and outputs (6 loops minimum).
- f. Demonstrate EMS performance via trend logs and command trace.
- g. Demonstrate scan, update, and alarm responsiveness.
- h. Demonstrate spreadsheet/curve plot software, and its integration with database.
- i. Demonstrate on-line user guide, and help function and mail facility.
- j. Demonstrate digital system configuration graphics with interactive upline and downline load, and demonstrate specified diagnostics.
- k. Demonstrate multitasking by showing dynamic curve plot, and graphic construction operating simultaneously via split screen.
- l. Demonstrate class programming with point options of beep duration, beep rate, alarm archiving, and color banding.

----- END -----

Manhattan VAMC Bldg. 1 - 9th Floor Renovations
Manhattan Veteran's Affairs Medical Center
New York, New York

Replaced: September 9 2013
Addendum No. 2

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 27 52 23
~~NURSE CALL AND CODE BLUE SYSTEMS~~

PART 1 - GENERAL

1.1 SECTION SUMMARY

- A. Work covered by this document includes design, engineering, labor, material and products, equipment warranty and system warranty, training and services for, and incidental to, the complete installation of new and fully operating National Fire Protection Association (NFPA) - Life Safety Code 101.3-2 (a) Labeled and (b) Listed, Emergency Service Nurse-Call ~~and/or Life Safety listed Code Blue Communication System~~ and associated equipment (here-in-after referred to as the System) provided in approved locations indicated on the contract drawings. These items shall be tested and certified capable of receiving, distributing, interconnecting and supporting Nurse-Call and/or Code Blue communications signals generated local and remotely as detailed herein.
- B. Work shall be complete, Occupational Safety and Health Administration (OSHA), National Recognized Testing Laboratory (NRTL - i.e. Underwriters Laboratory [UL]) Listed and Labeled; and VA Central Office (VACO), Telecommunications Voice Engineering (TVE 0050P3B) tested, certified and ready for operation.
- C. The System shall be delivered free of engineering, manufacturing, installation, and functional defects. It shall be designed, engineered and installed for ease of operation, maintenance, and testing.
- D. The term "provide", as used herein, shall be defined as: designed, engineered, furnished, installed, certified, tested, and warranty by the Contractor.
- E. Specification Order of Precedence: In the event of a conflict between the text of this document and the Project's Contract Drawings outlined and/or cited herein; **THE TEXT OF THIS DOCUMENT TAKES PRECEDENCE.** *HOWEVER, NOTHING IN THIS DOCUMENT WILL SUPERSEDE APPLICABLE EMERGENCY LAWS AND REGULATIONS, SPECIFICALLY NATIONAL AND/OR LOCAL LIFE AND PUBLIC SAFETY CODES.* The Local Fire Marshall and/or VA Public Safety Officer are the only authorities that may modify this document's EMERGENCY CODE COMPLIANCE REQUIREMENTS, on a case by case basis, in writing and confirmed by VA's Project Manager (PM), Resident Engineer (RE) and TVE-0050P3B. The VA PM is the only approving authority for other amendments to this document that may be granted, on a case by

case basis, in writhing with technical concurrencies by VA's PM, RE, TVE-0050P3B and identified Facility Project Personnel.

- F. The Original Equipment Manufacturer (OEM) and Contractor shall ensure that all management, sales, engineering and installation personnel have read and understand the requirements of this specification before the system is designed, engineered, delivered and provided. The Contractor shall furnish a written statement stating this requirement as a part of the technical submittal that includes each name and certification, including the OEMs. The Contractor is cautioned to obtain in writing, all approvals for system changes relating to the published contract specifications and drawings, from the PM and/or the RE before proceeding with the change.

1.2 RELATED SECTIONS

- A. 01 33 23 - Shop Drawings, Product Data and Samples.
B. 07 84 00 - Firestopping.
C. 26 05 21 - Low - Voltage Electrical Power Conductors and Cables (600 Volts and Below).
~~D. 26 41 00 - Facility Lightning Protection.~~
~~ED. 27 05 11 - Requirements for Communications Installations.~~
~~FE. 27 05 26 - Grounding and Bonding for Communications Systems.~~
F. 27 05 28 - Cable Trays for Communications Systems.
G. 27 05 33 - Raceways and Boxes for Communications Systems.
H. 27 10 00 - TIP Structured Communications Systems Cabling.
I. 27 11 00 - TIP Communications Interface and Equipment Rooms Fittings.
J. 27 15 00 - TIP Communications Horizontal and Vertical Cabling.
~~// J. 27 15 00.61 / 71 - Radio Entertainment Equipment and System; and/or Extension. //~~
~~// K. 27 41 31 / 41 - Master Antenna Television Equipment and Systems and/or Extension. //~~
~~// L. 27 51 16 - Public Address & Mass Notification System (PA). //~~
~~// M. 27 52 31 - Physical Security Management Equipment and System. //~~
~~// N. 10 25 13 - Patient Bed Service Walls. //~~

1.3 DEFINITION

- A. Provide: Design, engineer, furnish, install, connect complete, test, certify and warranty.
B. Work: Materials furnished and completely installed.

C. Review of contract drawings: A service by the engineer to reduce the possibility of materials being ordered which do not comply with contract documents. The engineer's review shall not relieve the Contractor of responsibility for dimensions or compliance with the contract documents. The reviewer's failure to detect an error does not constitute permission for the Contractor to proceed in error.

D. Headquarters (aka VACO) Technical Review, for National and VA Communications and Security, Codes, Frequency Licensing Standards, Guidelines and Compliance:

Office of Telecommunications
Special Communications Team (0050P3B)
1335 East West Highway - 3rd Floor
Silver Spring, Maryland 20910,
(O) 301-734-0350, (F) 301-734-0360

~~E. Engineer: // XXXXXXXX //~~
~~_____ // XXXXXXXX //~~
~~_____ // XXXXXXXX //~~
~~_____ // XXXXXXXX //~~
~~_____ // XXXXXXXX //~~

~~F. Owner: // XXXXXXXX //~~

~~G. General Contractor (GC): // XXXXXXXX //~~

~~H. Contractor: Systems Contractor; you; successful bidder.~~

1.4 REFERENCES

A. The installation shall comply fully with all governing authorities, laws and ordinances, regulations, codes and standards, including, but not limited to:

1. United States Federal Law:

a. Departments of:

1) Commerce, Consolidated Federal Regulations (CFR), Title 15 - Under the Information Technology Management Reform Act (Public Law 104-106), the Secretary of Commerce approves standards and guidelines that are developed by the:

a) Chapter II, National Institute of Standards Technology (NIST - formerly the National Bureau of Standards). Under Section 5131 of the Information Technology Management Reform Act of 1996 and the Federal Information Security Management Act of 2002 (Public Law 107-347), NIST develops

- Federal Information Processing Standards Publication (FIPS) 140-2—Security Requirements for Cryptographic Modules.
- b) Chapter XXIII, National Telecommunications and Information Administration (NTIA - aka 'Red Book') Chapter 7.8 / 9; CFR, Title 47 Federal communications Commission (FCC) Part 15, Radio Frequency Restriction of Use and Compliance in "Safety of Life" Functions & Locations.
- 2) FCC - Communications Act of 1934, as amended, CFR, Title 47 - Telecommunications, in addition to Part 15 - Restrictions of use for Part 15 listed Radio Equipment in Safety of Life / Emergency Functions / Equipment/ Locations (also see CFR, Title 15 - Department of Commerce, Chapter XXIII - NTIA):
 - a) Part 15 - Restrictions of use for Part 15 listed Radio Equipment in Safety of Life / Emergency Functions / Equipment/Locations.
 - b) Part 58 - Television Broadcast Service.
 - c) Part 90 - Rules and Regulations, Appendix C.
- 3) Health, (Public Law 96-88), CFR, Title 42, Chapter IV Health & Human Services, CFR, Title 46, Subpart 1395(a)(b) JCAHO "a hospital that meets JCAHO accreditation is deemed to meet the Medicare conditions of Participation by meeting Federal Directives:"
 - a) All guidelines for Life, Personal and Public Safety; and, Essential and Emergency Communications.
- 4) Labor, CFR, Title 29, Part 1910, Chapter XVII - Occupational Safety and Health Administration (OSHA), Occupational Safety and Health Standard:
 - a) Subpart 7 - Definition and requirements (for a NRTL - 15 Laboratory's, for complete list, contact (http://www.osha.gov/dts/otpca/nrtl/faq_nrtl.html):
 - 1) UL:
 - a) 44-02 - Standard for Thermoset-Insulated Wires and Cables.
 - b) 65 - Standard for Wired Cabinets.
 - c) 83-03 - Standard for Thermoplastic-Insulated Wires and Cables.

- d) 467-01 - Standard for Electrical Grounding and Bonding Equipment
- e) 468 - Standard for Grounding and Bonding Equipment.
- f) 486A-01 - Standard for Wire Connectors and Soldering Lugs for Use with Copper Conductors
- g) 486C-02 - Standard for Splicing Wire Connectors.
- h) 486D-02 - Standard for Insulated Wire Connector Systems for Underground Use or in Damp or Wet Locations.
- i) 486E-00 - Standard for Equipment Wiring Terminals for Use with Aluminum and/or Copper Conductors.
- j) 493-01 - Standard for Thermoplastic-Insulated Underground Feeder and Branch Circuit Cable.
- k) 514B-02 - Standard for Fittings for Cable and Conduit.
- l) 1069 - Hospital Signaling and Nurse Call Equipment.
- m) 1449 - Standard for Transient Voltage Surge Suppressors.
- n) 1479-03 - Standard for Fire Tests of Through-Penetration Fire Stops.
- o) 1666 - Standard for Wire/Cable Vertical (Riser) Tray Flame Tests.
- p) 1863 - Standard for Safety, Communications Circuits Accessories.
- q) 2024 - Standard for Optical Fiber Raceways.
- r) 60950-1/2 - Information Technology Equipment - Safety.
- 2) Canadian Standards Association (CSA): same tests as for UL.
- 3) Communications Certifications Laboratory (CCL): same tests as for UL.
- 4) Intertek Testing Services NA, Inc. (ITSNA formerly Edison Testing Laboratory [ETL]): same tests as for UL.
- b) Subpart 35 - Compliance with NFPA 101 - Life Safety Code.
- c) Subpart 36 - Design and construction requirements for exit routes.
- d) Subpart 268 - Telecommunications.

- e) Subpart 305 - Wiring methods, components, and equipment for general use.
- 5) Department of Transportation, CFR, Title 49 (Public Law 89-670), Part 1, Subpart C - Federal Aviation Administration (FAA):
 - a) Standards AC 110/460-ID & AC 707 / 460-2E - Advisory Circulars for Construction of Antenna Towers.
 - b) Forms 7450 and 7460-2 - Antenna Construction Registration.
- 6) Veterans Affairs (Public Law No. 100-527), CFR, Title 38, Volumes I & II:
 - a) Office of Telecommunications:
 - 1) Handbook 6100 - Telecommunications.
 - a) Spectrum Management FCC & NTIA Radio Frequency Compliance and Licensing Program.
 - b) Special Communications Proof of Performance Testing, VACO Compliance and Life Safety Certification(s).
 - b) Office of Cyber and Information Security (OCIS):
 - 1) Handbook 6500 - Information Security Program.
 - 2) Wireless and Handheld Device Security Guideline Version 3.2, August 15, 2005.
 - c) VA's National Center for Patient Safety - Veterans Health Administration Warning System, Failure of Medical Alarm Systems using Paging Technology to Notify Clinical Staff, July 2004.
 - d) VA's Center for Engineering Occupational Safety and Health, concurrence with warning identified in VA Directive 7700.
 - e) Office of Construction and Facilities Management (CFM):
 - 1) Master Construction Specifications (PG-18-1).
 - 2) Standard Detail and CAD Standards (PG-18-4).
 - 3) Equipment Guide List (PG-18-5).
 - 4) Electrical Design Manual for VA Facilities (PG 18-10), Articles 7 & 8.
 - 5) Minimum Requirements of A/E Submissions (PG 18-15):
 - a) Volume B, Major New Facilities, Major Additions; and Major Renovations, Article VI, Paragraph B.
 - b) Volume C - Minor and NRM Projects, Article III, Paragraph S.

- c) Volume E - Request for Proposals Design/Build
Projects, Article II, Paragraph F.
- 6) Mission Critical Facilities Design Manual (Final Draft -
2007).
- 7) Life Safety Protected Design Manual (Final Draft -
2007).
- 8) Solicitation for Offerors (SFO) for Lease Based Clinics
- (05-2009).
- b. Federal Specifications (Fed. Specs.):
 - 1) A-A-59544-00 - Cable and Wire, Electrical (Power, Fixed
Installation).
- 2. National Codes:
 - a. American Institute of Architects (AIA): Guidelines for Healthcare
Facilities.
 - b. American National Standards Institute/Electronic Industries
Association/Telecommunications Industry Association
(ANSI/EIA/TIA):
 - 1) 568-B - Commercial Building Telecommunications Wiring
Standards:
 - a) B-1 - General Requirements.
 - b) B-2 - Balanced twisted-pair cable systems.
 - c) B-3 - Fiber optic cable systems.
 - 2) 569 - Commercial Building Standard for Telecommunications
Pathways and Spaces.
 - 3) 606 - Administration Standard for the Telecommunications
Infrastructure of Communications Buildings.
 - 4) 607 - Commercial Building Grounding and Bonding Requirements
for Telecommunications.
 - 5) REC 127-49 - Power Supplies.
 - 6) RS 270 - Tools, Crimping, Solderless Wiring Devices,
Recommended Procedures for User Certification.
 - c. American Society of Mechanical Engineers (ASME):
 - 1) Standard 17.4 - Guide for Emergency Personnel.
 - 2) Standard 17.5 - Elevator & Escalator Equipment (prohibition of
installing non-elevator equipment in Elevator Equipment Room /
Mechanical Penthouse).
 - d. American Society of Testing Material (ASTM):

- 1) D2301-04 - Standard Specification for Vinyl Chloride Plastic Pressure Sensitive Electrical Insulating Tape.
- e. Building Industries Communications Services Installation (BICSI):
 - 1) All standards for smart building wiring, connections and devices for commercial and medical facilities.
 - 2) Structured Building Cable Topologies.
 - 3) In consort with ANSI/EIA/TIA.
- f. Institute of Electrical and Electronics Engineers (IEEE):
 - 1) SO/TR 21730:2007 - Use of mobile wireless communication and computing technology in healthcare facilities - Recommendations for electromagnetic compatibility (management of unintentional electromagnetic interference) with medical devices.
 - 2) 0739-5175/08/©2008 IEEE - Medical Grade - Mission Critical - Wireless Networks.
 - 3) C62.41 - Surge Voltages in Low-Voltage AC Power Circuits.
- g. NFPA:
 - 1) 70 - National Electrical Code (current date of issue) - Articles 517, 645 & 800.
 - 2) 75 - Standard for Protection of Electronic Computer Data-Processing Equipment.
 - 3) 77 - Recommended Practice on Static Electricity.
 - 4) 99 - Healthcare Facilities.
 - 5) 101 - Life Safety Code.
3. State Hospital Code(s).
4. Local Town, City and/or County Codes.
5. Accreditation Organization(s):
 - a. Joint Commission on Accreditation of Hospitals Organization (JCAHO) - Section VI, Part 3a - Operating Features.

1.5 QUALIFICATIONS

- A. The OEM shall have had experience with three (3) or more installations of Nurse Call systems of comparable size and interfacing complexity with regards to type and design as specified herein. Each of these installations shall have performed satisfactorily for at least one (1) year after final acceptance by the user. Include the names, locations and point of contact for these installations as a part of the submittal.

- B. The Contractor shall submit certified documentation that they have been an authorized distributor and service organization for the OEM for a minimum of three (3) years. The Contractor shall be authorized by the OEM to pass thru the OEM's warranty of the installed equipment to VA. In addition, the OEM and Contractor shall accept complete responsibility for the design, installation, certification, operation, and physical support for the System. This documentation, along with the System Contractor and OEM certifications must be provided in writing as part of the Contractor's Technical submittal.
- C. The Contractor's Communications Technicians assigned to the System shall be fully trained, qualified, and certified by the OEM on the engineering, installation, operation, and testing of the System. The Contractor shall provide formal written evidence of current OEM certification(s) for the installer(s) as a part of the submittal or to the RE before being allowed to commence work on the System.
- D. The Contractor shall display all applicable national, state and local licenses.
- E. The Contractor shall submit copy (s) of Certificate of successful completion of OEM's installation/training school for installing technicians of the System's Nurse Call and/or Code Blue equipment being proposed.

1.6 CODES AND PERMITS

- A. Provide all necessary permits and schedule all inspections as identified in the contract's milestone chart, so that the system is proof of performance tested, certified and approved by VA and ready for operation on a date directed by the Owner.
- B. The contractor is responsible to adhere to all codes described herein and associated contractual, state and local codes.

1.7 SCHEDULING

- A. After the award of contract, the Contractor shall prepare a detailed schedule (aka milestone chart) using "Microsoft Project" software or equivalent. The Contractor Project Schedule (CPS) shall indicate detailed activities for the projected life of the project. The CPS shall consist of detailed activities and their restraining relationships. It will also detail manpower usage throughout the project.

- B. It is the responsibility of the Contractor to coordinate all work with the other trades for scheduling, rough-in, and finishing all work specified. The owner will not be liable for any additional costs due to missed dates or poor coordination of the supplying contractor with other trades.

1.8 REVIEW OF CONTRACT DRAWINGS AND EQUIPMENT DATA SUBMITTALS (AKA TECHNICAL SUBMITTAL[S])

(Note: The Contractor is encouraged, but not required, to submit separate technical submittal(s) outlining alternate technical approach(s) to the system requirements stated here-in as long as each alternate technical document(s) is complete, separate, and submitted in precisely the same manner as outlined herein. VA will review and rate each received alternate submittal, which follows this requirement, in exactly the same procedure as outlined herein. Partial, add-on, or addenda type alternates will not be accepted or reviewed.)

- A. Submit at one time within 10 days of contract awarding, drawings and product data on all proposed equipment and system. Check for compliance with contract documents and certify compliance with Contractor's "APPROVED" stamp and signature.
- B. Support all submittals with descriptive materials, i.e., catalog sheets, product data sheets, diagrams, and charts published by the manufacturer. These materials shall show conformance to specification and drawing requirements.
- C. Where multiple products are listed on a single cut-sheet, circle or highlight the one that you propose to use. Provide a complete and through equipment list of equipment expected to be installed in the system, with spares, as a part of the submittal. Special Communications (TVE-0050P3B) will not review any submittal that does not have this list.
- D. Provide four (4) copies to the PM for technical review. The PM will provide a copy to the offices identified in Paragraph 1.3.C & D, at a minimum for compliance review as described herein where each responsible individual(s) shall respond to the PM within 10 days of receipt of their acceptance or rejection of the submittal(s).
- E. Provide interconnection methods, conduit (where not already installed), junction boxes (J-Boxes), cable, interface fixtures and equipment lists for the: ENR(s) (aka DMARC), TER, TCR, MCR, MCOR, PCR, ECR, Stacked Telecommunications Rooms (STR), Nurses Stations (NS), Head End Room

(HER), Head End Cabinet (HEC), Head End Interface Cabinet (HEIC) and approved TCO locations TIP interface distribution layout drawing, as they are to be installed and interconnected to teach other (REFER TO APPENDIX B - SUGGESTED TELECOMMUNI-CAITONS ONE LINE TOPOLOGY pull-out drawing).

- F. Equipment technical literature detailing the electrical and technical characteristics of each item of equipment to be furnished.
- G. Engineering drawings of the System, showing calculated of expected signal levels at the headend input and output, each input and output distribution point, and signal level at each telecommunications outlet.
- H. Surveys Required as a Part of The Technical Submittal:

1. The Contractor shall provide the following System surveys that depict various system features and capacities required in addition to the on-site survey requirements described herein (see Specification Paragraph 2.4.3). Each survey shall be in writing and contain the following information (the formats are suggestions and may be used for the initial Technical Submittal Survey requirements), as a minimum:

a. Nurse Call Cable System Design Plan:

- 1) An OEM and contractor designed functioning Nurse Call System cable plan **to populate the entire TIP empty conduit/pathway distribution systems provided as a part of Specification 27 11 00** shall be provided as a part of the technical proposal. A specific functioning Nurse Call: cable, interfaces, J-boxes and back boxes shall coincide with the total growth items as described herein. It is the Contractor's responsibility to provide the Systems' entire Nurse Call cable and accessory requirements and engineer a functioning Nurse Call distribution system and equipment requirement plan of the following paragraph(s), at a minimum:

2) The required Nurse Call ~~and/or Code Blue~~ Equipment Locations:

<u>EQUIPPED ITEM</u>	<u>CAPACITY</u>	<u>GROWTH</u>
Master Stations		
Dome Lights		
Room		
Corridor		

<u>EQUIPPED ITEM</u>	<u>CAPACITY</u>	<u>GROWTH</u>
Other		
Patient Stations		
Single		
Dual		
Isolation		
Other		
Emergency Stations		
Bath		
Toilet		
Isolation		
Other		
Staff Stations		
Duty Stations		
Code Blue		
Patient Locations		
Surgical Recovery Locations		
Medical Recovery Locations		
ICU Locations		
SICU		
MICU		
CCU		
Other		
Emergency Room Locations		
Other		
Supervisory Locations		
Nurse Stations		
On-Call Rooms		
Other		
Remote Locations		
Telephone Operator's Room		
Police Control Room		
Other		
Radio Paging Access (when pre-approved by TVE-0050P3B)		

<u>EQUIPPED ITEM</u>	<u>CAPACITY</u>	<u>GROWTH</u>
Audio Paging Access (when pre-approved by TVE-0050P3B)		
Wireless Access (when pre-approved by TVE-0050P3B)		
Maintenance/Programming Console		
Location(s)		
Central Control Cabinet/Equipment		
Location		
Power Supply(s)		
UPS(s)		

3) The required Nurse Call and/or Code Blue Cable Plant/Connections:

The Contractor shall clearly and fully indicate this category for each item identified herein as a part of the technical submittal. For this purpose, the following definitions and sample connections are provided to detail the system's capability:

<u>EQUIPPED ITEM</u>	<u>CAPACITY</u>	<u>GROWTH</u>
Central Control Cabinet/Equipment		
Location		
Power Supply(s)		
UPS(s)		
Essential Electrical Power Panel(s)		
Other		
Cable Plant		
Supply to Locations Identified in Paragraph 1.8.H.1.a.2)		
Remote Locations		
Telephone Operator Room		
Police Control Room		
Other		
Maintenance/Program Console		
Location(s)		
Other		
LAN (Local Facility) Access/Equipment/Location (when pre-		

<u>EQUIPPED ITEM</u>	<u>CAPACITY</u>	<u>GROWTH</u>
approved by TVE-0050P3B)		
Wireless Access/Equipment/Location (when pre-approved by TVE-0050P3B)		
PA Access/Equipment/Location (when pre- approved by TVE-0050P3B)		
Other		

1.9 PROJECT RECORD DOCUMENTS (AS BUILTS)

- A. Throughout progress of the Work, maintain an accurate record of changes in Contract Documents. Upon completion of Work, transfer recorded changes to a set of Project Record Documents.
- B. The floorplans shall be marked in pen to include the following:
 - 1. Each device specific locations with UL labels affixed.
 - 2. Conduit locations.
 - 3. Each interface and equipment specific location.
 - 4. Head-end equipment and specific location.
 - 5. Wiring diagram.
 - 6. Labeling and administration documentation.
 - 7. Warranty certificate.
 - 8. System test results.

1.10 WARRANTIES / GUARANTY

- A. The Contractor shall warrant the installation to be free from defect in material and workmanship for a period of two (2) years from the date of acceptance of the project by the owner. The Contractor shall agree to remedy covered defects within four (4) hours of notification of major failures or within twenty-four (24) hours of notification for individual station related problems.
- B. The Contractor shall agree to grantee the system according to the guidelines outlined in Article 4 herein.

1.11 USE OF THE SITE

- A. Use of the site shall be at the GC's direction.
- B. Coordinate with the GC for lay-down areas for product storage and administration areas.
- C. Coordinate work with the GC and their sub-contractors.
- D. Access to buildings wherein the work is performed shall be directed by the GC.

1.12 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft.
- B. Store products in original containers.
- C. Coordinate with the GC for product storage. There may be little or no storage space available on site. Plan to potentially store materials off site.
- D. Do not install damaged products. Remove damaged products from the site and replaced with new product at no cost to the Owner.

1.13 PROJECT CLOSE-OUT

- A. Prior to final inspection and acceptance of the work, remove all debris, rubbish, waste material, tools, construction equipment, machinery and surplus materials from the project site and thoroughly clean your work area.
- B. Before the project closeout date, the Contractor shall submit:
 - 1. OEM Equipment Warranty Certificates.
 - 2. Evidence of compliance with requirements of governing authorities such as the Low Voltage Certificate of Inspection.
 - 3. Project record documents.
 - 4. Instruction manuals and software that is a part of the system.
 - 5. System Guaranty Certificate.
- C. Contractor shall submit written notice that:
 - 1. Contract Documents have been reviewed.
 - 2. Project has been inspected for compliance with contract.
 - 3. Work has been completed in accordance with the contract.

PART 2 - PRODUCTS / FUNCTIONAL REQUIREMENTS

2.0 GENERAL REQUIREMENTS FOR EQUIPMENT AND MATERIALS

- A. Furnish and install a complete and fully functional and operable Nurse Call System for each location shown on the contract drawings and TCOs ~~WHOSE EMPTY CONDUIT SYSTEM WAS PROVIDED AS A PART OF SPECIFICATION 27 11-00.~~
- B. ~~The specific location for each Nurse Call: Central Control Cabinet is // _____, // Power Supply is // _____, // Electrical Supervisor Panel is // _____, // UPS is // _____, // Two (2) Remote Annunciation Consoles is // _____, // Master Station is // _____, // Duty Station is // _____, // Staff Station is // _____, // Emergency Station is // _____, // Dome Light is //~~

~~_____ , // Code Blue Station is // _____ , // and TCOs are //
_____ (list locations here AND indicate like locations on the
contract drawings) //.~~

- ~~EB.~~ Coordinate features and select interface components to form an integrated Nurse Call system. Match components and interconnections between the systems for optimum performance of specified functions.
- ~~EC.~~ Expansion Capability: The Nurse Call equipment interfaces and cables shall be able to increase number of enunciation points in the future by a minimum of 50 percent (%) above those indicated without adding any internal or external components or main trunk cable conductors.
- ~~ED.~~ Equipment: Active electronic type shall use solid-state components, fully rated for continuous duty unless otherwise indicated. Select equipment for normal operation on input power usually supplied between 110 to 130 VAC, 60 Hz supplied from the Facility's Emergency Electrical Power System.
- ~~EF.~~ Meet all FCC requirements regarding equipment listing, low radiation and/or interference of RF signal(s). The system shall be designed to prevent direct pickup of signals from within and outside the building structure.
- ~~G. Weather/Water Proof Equipment: Listed and labeled by an OSHA certified NRTL (i.e. UL) for duty outdoors or in damp locations.~~

2.1 SYSTEM DESCRIPTION

- A. Furnish and install a complete and fully functional and operable Nurse Call and/or Code Blue System **WHOSE EMPTY CONDUIT SYSTEM WAS PROVIDED AS A PART OF SPECIFICATION 27 11 00.**
- B. The Contractor is responsible for interfacing with existing systems; the // PA, // //, MATV // //, RED // //, Patient Bed Service Walls // // and _____ // systems with the System.**
- C. The Contractor shall continually employ interfacing methods that are approved by the OEM and VA. At a minimum, an acceptable interfacing method requires not only a physical and mechanical connection, but also a matching of signal, voltage, and processing levels with regard to signal quality and impedance. The interface point must adhere to all standards described herein for the full separation of ~~Critical Care and Life Safety~~ systems.

- ~~D. The System Contractor shall connect the System ensuring that all NFPA and UL Critical Care and Life Safety Circuit and System separation guidelines are satisfied. The System Contractor is not allowed to make any connections to the Telephone System. VA shall arrange for the interconnection between the // PA // //, MATV // //, RED // //, Patient Bed Service Walls // // and _____ // Systems with the appropriate responsible parties.~~
- ~~E. System hardware shall consist of a **standalone (separate)** nurse call // **Code Blue** // patient communications network comprised of nurse consoles, control stations, staff and duty stations, room and corridor dome lights, pillow speakers/call cords, pull cord and/or emergency push button stations, wiring. And, other options such as, **pocket page interfaces**, computer interfaces, printer interfaces, wireless / telephone network interfaces, and nurse locating system interface **(when specifically approved first by TVE 0050P3B)** and as shown on drawings. All necessary equipment required to meet the intent of these specifications, whether or not enumerated within these specifications, shall be supplied and installed to provide a complete and operating nurse call // **Code Blue** // patient communications network. **It is not acceptable to utilize the telephone cable system for the control and distribution of nurse call (code Blue) signals and equipment.**~~
- FD.** System firmware shall be the product of a reputable firmware OEM of record with a proven history of product reliability and sole control over all source code. Manufacturer shall provide, free of charge, product firmware/software upgrades for a period of two (2) years from date of acceptance by VA for any product feature enhancements. System configuration programming changes shall not require any exchange of parts and shall be capable of being executed remotely via a modem connection **(when specifically approved first by TVE 0050P3B)**.
- GE.** The Nurse Call Head End Equipment shall be located in Telecommunications Room // _____ //. ~~The Nurse Call / Code Blue System may interface the PA system when specifically approved by VA Headquarters T VE 0050P3B during the project approval process prior to contract bidding.~~
- HF.** The System shall utilize microprocessor components for all signaling and programming circuits and functions. Self contained or on

board system program memory shall be non-volatile and protected from erasure from power outages for a minimum of 12 hours.

~~±G.~~ Provide a backup battery or a UPS for the System (including each distribution cabinet/point, CRT and Monitor) to allow normal operation and function (as if there was no AC power failure) in the event of an AC power failure or during input power fluctuations for a minimum of 30 minutes.

~~J.~~ ~~The System is defined as Critical Service and the Code Blue functions is defined as Life Safety/Support by NFPA (re Part 1.1.A) and so evaluated by JCAHCO. Therefore, the system shall have a minimum of two (2) additional remote enunciation points in order to satisfy NFPA's Life Safety Code 101 (the typical secondary locations are Telephone Operators Room, MAS ER Desk, Boiler Plant, etc, AND the primary location is required to be in the SCC Room //_____//.~~

~~1.~~ These two (2) additional remote locations shall be fully manned:

~~a.~~ 24/7/365 for certified Hospital //Clinics// // other _____//.

~~b.~~ As long as other identified VA Medical / Servicing Facilities are open for servicing patients.

~~c.~~ At a minimum, Code Blue Functions shall be provided in all Recovery (Medical and Surgical) Rooms, Intensive Care Units (ICU), Cardiac Care Units (CCU), Step Down Room, Life Support / Monitoring Rooms, Oncology / Radiology Procedure Rooms, Dialysis // and _____ // Areas.

~~d.~~ The minimum remote enunciation locations shall be:

~~1)~~ The Telephone / PBX Operator Room.

~~2)~~ The Police Control / Operations Room.

~~3)~~ Other location(s) that is specifically approved by VA

~~Headquarters TVE — 0050P3B DURING THE PROJECT DEVELOPMENT STAGES AND PRIOR TO EQUIPMENT PURCHASE.~~

~~2.~~ In addition to the two (2) remote locations afore described, the following locations are the minimum required for additional Nurse Call /Code Blue Annunciation:_____

~~a.~~ "On Call" Rooms.

~~b.~~ Each Nurse Master Station.

~~c.~~ Each Staff Station.

~~d.~~ Each Duty Station.

~~// e. _____ . //~~

~~3. The MAXIMUM enunciation time period from placement of the Code Blue Call to enunciation at each remote locations is 10 seconds; and, 15 seconds to the subsequent enunciating media stations (i.e. PA, Radio Paging, Emergency Telephone or Radio Backup, etc.).~~

~~K. Each Code Blue System shall be designed to provide continuous electrical supervision of the complete and entire system (i.e. dome light bulbs [each light will be considered supervised if they use any one or a combination of (UL) approved electrical supervision alternates, as identified in UL 1069, 1992 revision], wires, contact switch connections, circuit boards, data, audio, and communication busses, main and UPS power, etc.). All alarm initiating and signaling circuits shall be supervised for open circuits, short circuits, and system grounds. Main and UPS power circuits shall be supervised for a change in state (i.e. primary to backup, low battery, UPS on line, etc.). When an open, short or ground occurs in any system circuit, an audible and visual fault alarm signal shall be initiated at the nurse control station and all remote locations.~~

~~LH.~~ When the System is approved to connect to a separate communications system (i.e. LAN, WAN, Telephone, Public Address, radio raging, wireless systems, etc) the connection point shall meet the following minimum requirements for each hard wired / wireless connection (note each wireless system connection MUST BE APPROVED PRIOR TO CONTRACT BID BY VA HEADQUARTERS TVE - 0050P3B AND SPECTRUM MANAGEMENT - 0050P2B - hereinafter referred to as SM - 0050P2B):

1. UL 60950-1/2.
2. FIPS 142.
3. FCC Part 15 Listed Radio Equipment restriction compliance approved by SM - 0050P2B.

~~MI.~~ All passive distribution equipment shall meet or exceed -80 dB radiation shielding (aka RFI) shielding specifications and be provided with connectors specified by the OEM.

~~NJ.~~ All equipment face plates utilized in the system shall be stainless steel, anodized aluminum or UL approved cycolac plastic for the areas where provided.

~~OK.~~ Noise filters and surge protectors shall be provided for each equipment interface cabinet, headend cabinet, control console and local and remote amplifier locations to insure protection from input primary

AC power surges and to insure noise glitches are not induced into low voltage data circuits.

PL. Plug-in connectors shall be provided to connect all equipment, except coaxial cables. Coaxial cable distribution points shall use coaxial cable connections recommended by the cable OEM and approved by the system OEM. Base band cable systems shall utilize barrier terminal screw type connectors, at a minimum. As an alternate, crimp type connectors installed with a ratchet type installation tool are acceptable provided the cable dress, pairs, shielding, grounding, connections and labeling are the same as the barrier terminal strip connectors. Tape of any type, wire nuts or solder type connections are unacceptable and will not be approved.

~~R. Audio Level Processing: The control equipment shall consist of audio mixer(s), volume limiter(s) and/or compressor(s), and power amplifier(s) to process, adjust, equalize, isolate, filter, and amplify each audio channel for each sub-zone in the system and distribute them into the System's RF interfacing distribution trunks and amplification circuits. It is acceptable to use identified Telephone System cable pairs designated for Two-Way Radio interface and control use or identified as spare telephone cable pairs by the Facility's Telephone System Contractor. The use of telephone cable to distribute RF signals, carrying system or sub-system AC or DC voltage is not acceptable and will not be approved. Additionally, each control location shall be provided with the equipment required to insure the system can produce its designed audio channel capacity at each speaker identified on the contract drawings. The Contractor shall provide: a spare set of telephone paging modules as recommended by the OEM (as a minimum provide one spare module for each installed module); one spare audio power amplifier, one spare audio mixer, one spare audio volume limiter and/or compressor, and one spare audio automatic gain adjusting device, and minimum RF equipment recommended by the OEM.~~

SM. Contractor is responsible for pricing all accessories and miscellaneous equipment required to form a complete and operating system. Unless otherwise noted in this Part, equipment quantities shall be as indicated on the drawings.

~~R. System Performance:~~

- ~~1. At a minimum, each distribution, interconnection, interface, terminating point and TCO shall be capable of supporting the Facility's Nurse Call and/or Code Blue System voice and data service as follows:~~
 - ~~a. Shall be compliant with and not degrade the operating parameters of the Public Switched Telephone Network (PSTN) and the Federal Telecommunications System (FTS) at each PSTN and FTS interface (if attachment is permitted by TVE 0050P3B), interconnection and TCO terminating locations detailed on the contract drawings.~~
 - ~~b. The System shall provide the following minimum operational functions:~~
 - ~~1) Code Blue calls shall be cancelable at the calling station only. The nurse call master station (s) that a managing Code Blue functions shall not have the ability to cancel Code Blue calls.~~
 - ~~2) Each Code Blue system shall be able to receive audio calls from all bedside stations simultaneously.~~
 - ~~3) Calls placed from any Code Blue station shall generate Code Blue emergency type audible and visual signals at each associated nurse control and duty station, respective dome lights and all local and remote annunciator panels. Calls placed from a bedside station shall generate emergency type visual signals at the bedside station and associated dome light(s) in addition to the previous stated stations and panels.~~
 - ~~4) Activating the silencing device at any location, while a Code Blue call or system fault is occurring shall mute the audible signals at the alarm location.~~
 - ~~a) The audible alarm shall regenerate at the end of the selected time out period until the call or fault is corrected.~~
 - ~~b) The visual signals shall continue until the call is canceled and/or a fault is corrected. When the fault is corrected, all signals generated by the fault shall automatically cease, returning the System to a standby status.~~

~~c) Audible signals shall be regenerated in any local or remote annunciator panel that is in the silence mode, in the event an additional Code Blue call is placed in any Code Blue system.~~

~~d) The additional Code Blue call shall also generate visual signals at all annunciators to identify the location of the call.~~

~~2N.~~ Each System Nurse Call location shall generate a minimum of distinct calls:

a. Routine: single flashing dome lights & master station color and audio tone,

b. Staff Assist: rapid flashing dome lights & master station color and audio tone,

~~c. Emergency: Red flashing dome lights & master station color and audio tone,~~

~~d. Code Blue (if equipped): Blue flashing dome lights and master station color and audio tone,~~

ec. Each generated call shall be cancelable at ONLY the originating location,

~~f. Staff Locator: Green Flashing dome lights & master station color and audio tone, and~~

~~//gd. _____: _____~~Flashing dome lights & master station color and audio tone. ~~//~~

2.3 MANUFACTURERS

- A. The products specified shall be **Hill-Rom NaviCare** new, FCC and UL Listed, labeled and produced by OEM manufacturer of record. An OEM of record shall be defined as a company whose main occupation is the manufacture for sale of the items of equipment supplied and which:
1. Maintains a stock of replacement parts for the item submitted,
 2. Maintains engineering drawings, specifications, and operating manuals for the items submitted, and
 3. Has published and distributed descriptive literature and equipment specifications on the items of equipment submitted at least 30 days prior to the Invitation for Bid.
- B. Specifications contained herein as set forth in this document detail the salient operating and performance characteristics of equipment in order for VA to distinguish acceptable items of equipment from

unacceptable items of equipment. When an item of equipment is offered or furnished for which there is a specification contained herein, the item of equipment offered or furnished shall meet or exceed the specification for that item of equipment.

C. Equipment Standards and Testing:

1. The System has been defined herein as connected to systems identified as Critical Service performing various Emergency and Life Support Functions. Therefore, at a minimum, the system shall conform to all aforementioned National and/or Local Life Safety Codes (which ever are the more stringent), NFPA, NEC, this specification, JCAHCO Life Safety Accreditation requirements, and the OEM recommendations, instructions, and guidelines.
2. All supplies and materials shall be listed, labeled or certified by UL or a NRTL where such standards have been established for the supplies, materials or equipment.
3. The provided equipment required by the System design and approved technical submittal must conform with each UL standard in effect for the equipment, as of the date of the technical submittal (or the date when the RE approved system equipment necessary to be replaced) was technically reviewed and approved by VA. Where a UL standard is in existence for equipment to be used in completion of this contract, the equipment must bear the approved UL seal.
4. Each item of electronic equipment to be provided under this contract must bear the approved UL seal or the seal of the testing laboratory that warrants the equipment has been tested in accordance with, and conforms to the specified standards. The placement of the UL Seal shall be a permanent part of the electronic equipment that is not capable of being transportable from one equipment item to another.

2.4 ~~PRODUCTS~~ **PRODUCTS**

A. General.

1. Contractor is responsible for pricing all accessories and miscellaneous equipment required to form a complete and operating system. The equipment quantities provided herein shall be as indicated on the drawings with the exception of the indicated spare equipment.
2. Contractor Furnished Equipment List (CFEs):

a. The Contractor is required to provide a list of the CFE equipment to be furnished. The quantity, make and model number of each item is required. Select the required equipment items quantities that will satisfy the needs of the system as described herein and with the OEM's concurrence applied to the list(s), in writing.

~~— CONTRACTOR NOTE: Select the required equipment items quantities that will satisfy the needs of the system and edit between the // — // . Do not delete equipment items that are not required — place a "0" in the appropriate Item location. The two color coded sections for the Mental Health and Blind Rehabilitation Units are provided for use when these units are a part of the project. If these units are not a part of the project — retain each unit's heading and place "0" in the respective "as required" column and delete the remaining system items.~~

<u>Item</u>	<u>Quantity</u>	<u>Unit</u>
1.	//As required//	Interface Panel(s)
1.a	//As required//	Electrical Supervision Trouble Enunciator
1.a.1	//As required//	Equipment Back Box(s)
1.b	//As required//	Telephone
1.c	//As required//	Public Address
1.d	//As required//	Radio Paging / Equipment
1.e	//As required//	Wireless / Equipment
1.f.	//As required//	Radio Pager / Equipment
1.g	//As required//	Wireless / Equipment
1.f	//As required//	Personal Communicator / Equipment
2.	//As required//	Lightning Arrestor
3.	//As required//	Head End Equipment/Locations
3.a	//As required//	Cabinet(s)
3.a.1	//As required//	AC Power Conditioner & Filter
3.a.2	//As required//	AC Power Strip
3.a.3	//As required//	UPS
3.a.4	//As required//	Interconnecting Wire/Cables
3.a.5	//As required//	Wire / Cable Connector(s)
3.a.6	//As required//	Wire / Cable Terminator(s)
3.b	//As required//	Wire Management System
3.b	//As required//	Head End Function(s)
3.b.1	//As required//	H7 Interface
3.b.2	//As required//	Nurse Locator
3.b.3	//As required//	Staff Locator
4.	//As required//	Master Station(s)
4.a	//As required//	Nurse Locator
4.b	//As required//	Staff Locator
5.	//As required//	Distribution System(s)
5.a	//As required//	Staff Station

5.a.1	//As required//	Equipment Back Box(s)
5.b	//As required//	Duty Station
5.b.1	//As required//	Equipment Back Box(s)
5.c	//As required//	Code Blue Station
5.c.1	//As required//	Equipment Back Box(s)
5.c.2	2 (MIN)	Remote Station(s)
5.d	//As required//	Patient Station(s)
5.d.1	//As required//	Equipment Back Box(s)
5.d.2	//As required//	Bed Interface(s)
5.d.3	//As required//	Pillow Speaker
5.d.4	//As required//	Push Button Cordset
5.d.5	//As required//	Dummy Plugs
5.d.6	//As required//	Bed Integrated Control
5.d.7	//As required//	Lighting Interface Module
5.d.8	//As required//	TV Control Interface
5.d.9	//As required//	TV Control Jack
5.d.10	//As required//	TV Interconnection Cables
5.d.11	//As required//	HDTV Coaxial
5.d.12	//As required//	HDTV/Nurses Call Interface/ Control
5.d.13	//As required//	Auxiliary Mounting Interface
5.e	//As required//	Emergency Station(s)
5.e.1	//As required//	Equipment Back Box(s)
5.e.2	//As required//	Toilet Emergency Station (waterproof)
5.e.3	//As required//	Shower Emergency Station (waterproof)
5.e.4	//As required//	Lavatory Emergency Station (waterproof)
5.f.	//As required//	Room Dome Light
5.f.1	//As required//	Equipment Back Box(s)
5.g	//As required//	Other Dome Light(s)
5.g.1	//As required//	Equipment Back Box(s)
5.g.2	//As required//	Corridor Dome Light
5.g.3	//As required//	Intersectional Dome Light
5.h	//As required//	System Cable(s)
5.h.1	//As required//	Coaxial
5.h.2	//As required//	System Pin
5.h.3	//As required//	Audio
5.h.4	//As required//	Control
5.h.5	//As required//	Video
5.i	//As required//	System Connector(s)
5.i.1	//As required//	Coaxial
5.i.2	//As required//	System Pin
5.i.2	//As required//	Audio
5.i.3	//As required//	Control
5.i.4	//As required//	Video
5.j	//As required//	Wire Management Required as described herein
//6.	//As required//	Mental Health Unit
6.a	//As required//	Head End Function(s)
6.a.1	//As required//	H7 Interface
6.a.2	//As required//	Nurse Locator
6.a.3	//As required//	Staff Locator

6.b.	//As required//	Master Station(s)
6.b.1	//As required//	Nurse Locator
6.b.2	//As required//	Staff Locator
6.c	//As required//	Distribution System(s)
6.c.1	//As required//	Staff Station
6.c.1.a	//As required//	Equipment Back Box(s)
6.c.2	//As required//	Duty Station
6.c.2.a	//As required//	Equipment Back Box(s)
6.c.3	//As required//	Patient Station(s)
6.c.3.a	//As required//	Equipment Back Box(s)\
6.c.4	//As required//	Security Room(s)
6.c.4.a	//As required//	Security Station(s)
6.c.4.b	//As required//	Equipment Back Box(s)\
6.c.4.c	//As required//	Overhead Speaker/Microphone
6.c.4.d	//As required//	Equipment Back Box(s)\
6.c.4.e	//As required//	TV Surveillance System
6.c.4.f	//As required//	Equipment Back Box(s)\
6.c.4.g	//As required//	TV Interconnection Cables
6.c.4.h	//As required//	Audio Interconnection Cables
6.c.5	//As required//	Emergency Station(s)
6.c.5.a	//As required//	Equipment Back Box(s)
6.c.5.b	//As required//	Toilet Emergency Station (waterproof)
6.c.5.c	//As required//	Shower Emergency Station (waterproof)
6.c.5.d	//As required//	Lavatory Emergency Station (waterproof)
6.c.6	//As required//	Room Dome Light
6.c.7	//As required//	Other Dome Light(s)
6.c.7.a	//As required//	Equipment Back Box(s)
6.c.7.b	//As required//	Corridor Dome Light
6.c.7.c	//As required//	Intersectional Dome Light
6.c.8	//As required//	System Cable(s)
6.c.8.a	//As required//	Coaxial
6.c.8.b	//As required//	System Pin
6.c.8.c	//As required//	Audio
6.c.8.d	//As required//	Control
6.c.8.e	//As required//	Video
6.c.9	//As required//	System Connector(s)
6.c.9.a	//As required//	Coaxial
6.c.9.b	//As required//	System Pin
6.c.9.c	//As required//	Audio
6.c.9.d	//As required//	Control
6.c.9.e	//As required//	Video
6.c.9.f	//As required//	Wire Management Required as described herein//
//7	//As required//	Blind Rehabilitation Unit
7.a	//As required//	Head End Function(s)
7.a.1	//As required//	H7 Interface
7.a.2	//As required//	Nurse Locator
7.a.3	//As required//	Staff Locator
7.b.	//As required//	Master Station(s)
7.b.1	//As required//	Nurse Locator
7.b.2	//As required//	Staff Locator
7.c	//As required//	Distribution System(s)

7.e.1	//As required//	Staff Station
7.e.1.a	//As required//	Equipment Back Box(s)
7.e.2	//As required//	Duty Station
7.e.2.a	//As required//	Equipment Back Box(s)
7.e.3	//As required//	Patient Station(s)
7.e.3.a	//As required//	Equipment Back Box(s)\
7.e.4	//As required//	Emergency Station(s)
7.e.4.a	//As required//	Equipment Back Box(s)
7.e.4.b	//As required//	Toilet Emergency Station (waterproof)
7.e.4.c	//As required//	Shower Emergency Station (waterproof)
7.e.4.d	//As required//	Lavatory Emergency Station (waterproof)
7.e.5	//As required//	Room Dome Light
7.e.5.a	//As required//	Equipment Back Box(s)
7.e.6	//As required//	Other Dome Light(s)
7.e.6.a	//As required//	Equipment Back Box(s)
7.e.6.b	//As required//	Corridor Dome Light
7.e.6.c	//As required//	Intersectional Dome Light
7.e.7	//As required//	System Cable(s)
7.e.7.a	//As required//	Coaxial
7.e.7.b	//As required//	System Pin
7.e.7.c	//As required//	Audio
7.e.7.d	//As required//	Control
7.e.7.e	//As required//	Video
7.e.8	//As required//	System Connector(s)
7.e.8.a	//As required//	Coaxial
7.e.8.b	//As required//	System Pin
7.e.8.c	//As required//	Audio
7.e.8.d	//As required//	Control
7.e.8.e	//As required//	Video
7.e.9	//As required//	Wire Management Required as described herein//
//8.	//As required//	Center for the Aging (aka Nursing Home Care Unit)
8.a	//As required//	Head End Function(s)
8.a.1	//As required//	H7 Interface
8.a.2	//As required//	Nurse Locator
8.a.3	//As required//	Staff Locator
8.b.	//As required//	Master Station(s)
8.b.1	//As required//	Nurse Locator
8.b.2	//As required//	Staff Locator
8.c	//As required//	Distribution System(s)
8.c.1	//As required//	Staff Station
8.c.1.a	//As required//	Equipment Back Box(s)
8.c.2	//As required//	Duty Station
8.c.2.a	//As required//	Equipment Back Box(s)
8.c.3	//As required//	Patient Station(s)
8.c.3.a	//As required//	Equipment Back Box(s)\
8.c.4	//As required//	Security Room(s)
8.c.4.a	//As required//	Security Station(s)
8.c.4.b	//As required//	Equipment Back Box(s)\
8.c.4.c	//As required//	Overhead Speaker/Microphone
8.c.4.d	//As required//	Equipment Back Box(s)\

8.c.4.e	//As required//	TV Surveillance System
8.c.4.f	//As required//	Equipment Back Box(s)\
8.c.4.g	//As required//	TV Interconnection Cables
8.c.4.h	//As required//	Audio Interconnection Cables
8.c.5	//As required//	Emergency Station(s)
8.c.5.a	//As required//	Equipment Back Box(s)
8.c.5.b	//As required//	Toilet Emergency Station (waterproof)
8.c.5.c	//As required//	Shower Emergency Station (waterproof)
8.c.5.d	//As required//	Lavatory Emergency Station (waterproof)
8.c.6	//As required//	Room Dome Light
8.c.7	//As required//	Other Dome Light(s)
8.c.7.a	//As required//	Equipment Back Box(s)
8.c.7.b	//As required//	Corridor Dome Light
8.c.7.c	//As required//	Intersectional Dome Light
8.c.8	//As required//	System Cable(s)
8.c.8.a	//As required//	Coaxial
8.c.8.b	//As required//	System Pin
8.c.8.c	//As required//	Audio
8.c.8.d	//As required//	Control
8.c.8.e	//As required//	Video
8.c.9	//As required//	System Connector(s)
8.c.9.a	//As required//	Coaxial
8.c.9.b	//As required//	System Pin
8.c.9.c	//As required//	Audio
8.c.9.d	//As required//	Control
8.c.9.e	//As required//	Video
8.c.9.f	//As required//	Wire Management Required as described herein//
//9.	As required//	Oncology, Radiology, Dialysis, Units (These units are treated the same as Blind Rehabilitation Unit EXCEPT it does contains a CODE BLUE Function. If these units are provided as a part of the project, AT A MINIMUM — DUPLI-CATE THE BLINE REHABILITATION UNIT'S EQUIPMETN LISTE AND EDIT AND RENUMBER ACCORD-INGLY)//
10.		On Hand Spares Provide a separate system spares list as indicated in each equipment description.

B. NS Room(s):

Refer to CFM Physical Security Manual (07-2007) for VA Facilities, Chapters 9.3 & 1) and PG 18-10, EDM, Chapters 7- Table 7-1, 8 & Appendix B, Telecommunications One Line Topology for specific Room and TIP Connection Requirements.

C. TER, SCC, PCR, STR, HER Rooms and Equipment:

Refer to CFM Physical Security Manual (07-2007) for VA Facilities, Chapters 9.3 & 1) and PG 18-10, EDM, Chapters 7- Table 7-1, 8 & Appendix B, Telecommunications One Line Topology for specific Room and TIP Connection Requirements.

D. Telecommunications Room(s) (TR):

1. Locate the Nurse Call and/or Code Blue floor distribution equipment as required by system design and OEM direction. Provide secured and lockable cabinet/rack(s) as required.

2. Head-End Equipment:

a. Provide all required power supplies, communications hubs, network switches, intelligent controllers and other devices necessary to form a complete system. Head-end components may be rack mounted or wall mounted in an enclosed metal enclosure.

b. Provide the head end equipment in the closest Telecommunications Room where the System is installed.

c. Provide the System UPS inside the cabinet or in a separate cabinet adjacent to the head end cabinet that shall maintain a minimum of 30 minute battery back-up to all system components.

d. Equipment Cabinet: Comply with TIA/EIA-310-D. Lockable, ventilated metal cabinet houses terminal strips, power supplies, amplifiers, system volume control, and other switching and control devices required for conversation channels and control functions. See Paragraph 2.5.E for the Cabinet's minimum internal items that are in addition to the installed System equipment.

e. Vertical Equipment Rack, Wall Mounted (to be included inside of the Equipment Cabinet) containing the following minimum items:

1) 36" (28RU) internal rack space, welded steel construction, minimum 20" usable depth, adjustable front mounting rails.

2) Install the following products in rack provided by same manufacturer or as specified:

a) Security screws w/ nylon isolation bushings.

b) Textured blank panels.

c) Custom mounts for components without rack mount kits.

d) Security covers.

- e) Internal system ground copper buss (may be substituted with a bare #0 AWG copper wire or equivalent size copper mesh strip connected to ONLY THE FACILITY'S SIGNAL GROUNDING SYSTEM.
- f) Power Sequencer- rack-mounted power conditioner and (provide as-needed) delayed sequencer(s) with (2) unswitched outlets each and contact closure control inputs. Connect the conditioner to one of the dual duplex outlets.
- g) Two (2) each 120VAC @ 20A dual duplex outlets, connected via conduit to the nearest Electrical Service Panel that is supplied by the Facility's Essential Electrical System.
- h) One (1) each 120VAC @ 15A Power Distribution Strip(s). Connect each strip to the unstitched outlet on the power conditioner.

3. HL7 Interface:

- a. The system may support downloading and updating of patient data from the hospital admission system (or other database) via the HL7 standard. The data only has to travel one way, i.e. from the admission system to the nurse-call system.
- b. Coordinate with the Owner the exact fields that will be populated from the admissions system in the nurse-call system.
- c. The Facility's LAN/WAN is not allowed for Nurses Call/Code Blue main wiring / function that must be a "stand alone primary cable infrastructure" as described herein.
- d. Connections to the VA LAN/WAN for functional or operable conditions will be allowed ONLY when the LAN/WAN system has been demonstrated and NFPA (at a minimum by TVE-0050P3B) Certified meeting Life Safety Standards.
- e. Provide one (1) spare HL Interface unit.

~~//4. Wireless:~~

~~a. Radio Paging Equipment / Systems~~

- ~~1) The nurse call/code blue system shall have the ability to interface ONLY with VA Certified and Licensed radio paging system (FCC Part 15 listed pagers and transmitters are not allowed for "Safety of Life" functions or installed in those specific areas VA Headquarters TVE 0050PB2 and SM~~

~~0050PB2 are the ONLY approving authorities for this function) and must have the following minimum system features:~~

- ~~a) Ability to pass through location information (such as a room number) and call type as well as other text messages simultaneously to shift supervisor identified staff members~~
- ~~b) System shall allow the operator to select staff members by name and pager number and to select a message consisting of a room number and a condition code (aka priority level). Operator may also choose to type in a unique alpha numeric text message (the text message shall meet or exceed all HIPA and VA OCIS Communications Security Guidelines for the transmission of Patient or Staff Specific information [aka PII] — VA Headquarters TVE — 0050P2B is the approving authority for this function) into the system to be read by the holder of the pager unit.~~
- ~~c) While a patient station is connected to the nurse's master station, the system shall allow the operator to automatically page the staff member assigned to that room. An alternate staff member may be selected for paging purposes in place of the primary staff member. The System must allow an alternate staff member to be paged when the primary staff member is unable to respond to patient's needs within a specified period of time. The System must have the ability to assign any bed to any pager or pager group, and to assign an unlimited amount of pagers to any patient bed.~~
- ~~d) System shall have the ability to send all code blue calls to staff members by predetermined group (as required) automatically by simply pressing one "Code Blue" button. Pager shall indicate room number of code call, and state "Code Blue" in plain English format on pagers (FCC Part 15 listed pagers are not allowed to be use as "Safety of Life" functions or those specific locations — VA Headquarters TVE — 0050P2B is the approving authority for this requirement).~~

~~2) When pagers are approved, provide a minimum of ten (10) spare pagers with one spare pager for each 10 issued.//~~

~~//5. Personal Wireless Communicator~~

- ~~a. The System will only be allowed to connect to the personal wireless communications system, pass text data and provide a 2-way communication between the Telephone Interface and the personal wireless communicator as long as it is not a FCC Part 15 listed device(s), meets or exceeds UL 60950-1/2, meets OCIS Guide Lines for FIPS 140-2 certification and the using staff shows an extensive training program along with recertification(s) according to the Facility Emergency Plan concerning HIPA requirements.~~
 - ~~b. VA Headquarters TVE 0050P3B and SM 0050P2B are the approving authority for this requirement.~~
 - ~~c. When communicators are approved, provide a minimum of ten (10) spare communicators for each 10 communicators issued.//~~
- ~~//6. Other Wireless Equipment / Systems~~
- ~~a. Each proposed wireless system and/or equipment to be connected to or be a part of the System, each shall meet the minimum requirements outlines in Paragraph 2.7.A.~~
 - ~~b. Contact TVE 0050P3B and SM 0050P2B for specific required PRE approvals (full or conditional) as described herein.~~
 - ~~c. When approved, TVE 0050P3B and SM 0050P2B will provide the spare equipment requirements.~~
 - ~~d. When other wireless components are approved, provide ten (10) components with one spare components for each 10 issued.//~~

F. TIP Cable Systems:

Connect the system to the TIP system provided as a part of Speciation Section 27 15 00. Provide additional TIP equipment, interfaces and connections as required by System design. Provide secured pathway(s) and lockable cabinet/rack(s) as required.

G. Interface Equipment:

~~1. TCR:~~

~~a. Code Blue Annunciation Station:~~

- ~~1) The Code Blue Remote Annunciation Station shall be located in the Telephone Operators Room, Police Control Center // or _____ //.~~
- ~~2) The Annunciation Station shall be connected to the System via hard wire connection(s) that shall contain all the electrical~~

~~supervisory tone signals, visual bulbs, read out panel to indicate the location of the Code and system troubles.~~

~~3) The System shall not be connected to the Telephone system unless specifically APPROVED BY VA HEADQUARTERS (0050P3B) and (0050P2B) PRIOR TO CONTRACT BID.~~

~~4) The Annunciation Station shall be installed in a location directly viewable and the readout is completely readable from the Public Address Microphone Control Console.~~

~~5) Provide one (1) spare panel.~~

~~b. Electrical Supervision Trouble Annunciator Panel:~~

~~1) The Electrical Supervision Trouble Annunciation Panel shall be located in the Telephone Operators Room, Police Control Center, associate Nurses Station(s) // and _____ //.~~

~~2) The panel(s) shall be compatible with the generated electrical and/or electronic supervising signals to continuously monitor the operating condition for the System head-end processing equipment, master stations, staff stations, patient stations, duty stations, audio power amplifier(s), UPS, power supplies, dome lights and interconnecting trunks. The panels shall generate an audible and visual signal when the System's supervising system detects a system and equipment trouble or trunk line is malfunctioning.~~

~~3) Provide one (1) spare panel.~~

~~2. Hospital Bed Interface (s):~~

~~a. Provide a multi pin receptacle for bed connection.~~

~~b. Connect cable from the multi pin receptacle to the nurse call system, so that alarms, such as bed exit, shall be monitored by the nurse call system.~~

~~c. Connect cable from the multi pin receptacle to the nurse call system, so that the bedside control buttons, such as nurse call, and television controls are functional and monitored.~~

~~d. The hospital uses the following beds:~~

~~//1) Hill Rohm//~~

~~//2) Stryker//~~

~~//3) Other//~~

~~e. Provide one (1) spare interface for each ten (10) interfaces installed.~~

- ~~3. Nurse (aka Staff) Locator Interface:~~
- ~~a. The System must be capable of performing nurse locator functions.~~
 - ~~b. The System must be capable of performing staff locator functions~~
 - ~~c. These functions may be combined into one operation.~~
 - ~~d. Provide two (2) spare interfaces.~~
- ~~4. Lighting Interface Module:~~
- ~~a. Provide an interface module for the pillow speakers to control up to 2 lights. Coordinate with the electrical contractor the exact voltage requirements.~~
 - ~~b. Provide one (1) spare module for each ten (10) modules installed.~~
- ~~5. Pillow Speaker Interfaces:~~
- ~~a. See functional requirements herein.~~
 - ~~b. Provide // (1) // // (2)// pillow speaker for each patient station.~~
 - ~~c. Provide one (1) spare pillow speaker for each twenty (20) speakers installed.~~
- ~~6. TV Remote Control Interface:~~
- ~~a. The pillow speaker shall have the following TV control capability:~~
 - ~~1) Play the TV audio through the pillow speaker.~~
 - ~~2) Change channels up and down.~~
 - ~~3) Increase and decrease the volume.~~
 - ~~4) TV audio mute.~~
 - ~~5) UL Certified for direct patient contact.~~
 - ~~b. Provide one (1) spare interface for each 20 interfaces installed.~~
- ~~7. TV Control Jack and Wiring:~~
- ~~a. Provide connection from the pillow speaker to the TV location. Terminate wire on a jack in the TV low voltage faceplate. Coordinate faceplate opening with the cabling contractor. Coordinate jack type with the TV (typically it is a ¼" jack, but verify prior to installation).~~
 - ~~b. Provide patch cord from the TV control jack to the TV.~~
 - ~~c. Provide one (1) spare complete assembly for each twenty (20) assemblies installed.~~
- ~~//8. Additional Functions / Interfaces:~~
- ~~The nurse call system may perform _____
additional services/ functions when specifically approved by TVE~~

~~0050P3B during the project design phases and prior to the bid process. //~~

~~//9~~1. TER

a. Paging adaptor (When connections are specifically approved by TVE 0050P3B):

1) The Contractor shall coordinate the installation of the paging adapter(s) designed for use with the Facility's telephone system with the Facility Telephone Contractor or local telephone company.

2) The Contractor shall provide and install a paging adapter(s) for each zone and sub zone. The paging adapter(s) shall be accessible by dialing a telephone number provided by the Facility's Telephone Contractor. The Paging Adapter shall:

a) Monitor each audio input and output on the unit.

b) Be provided with an electrical supervision panel to provide both audio and visual trouble alarms.

c) Be provided as part of the headend equipment and shall be located in the Telephone Switch Room.

d) Be provide with Executive Paging Override of all routine paging calls in progress or being accessed to allow system "all call" (aka global) and radio paging calls ~~designated as Code One Blue) functions.~~

e) Be capable of internal time out capability.

f) Function completely with the interface module.

g) Provide one spare adapter.

3) Time Out Device:

A time out device/capability shall be provided to prevent system "hang-up" due to an off-hook telephone. The device shall be able to be preset from 30 seconds to two (2) minutes. Its function shall not interfere with or override the required "all call" (aka global) operational capability.//

H. Call Initiation, Annunciation and Response:

1. Light and Tones:

a Calls may be initiated through:

~~1) Patient station.~~

~~2~~1) Staff station.

~~3) Code Blue station.~~

~~42) Toilet Emergency Station pull cord / push button.~~

~~5) Shower Emergency Station pull cord.~~

~~6) Bed Pillow speaker.~~

~~7) Bed Push button cordset.~~

~~8) Hospital Bed Integrated controls.~~

b Once a call is initiated, it must be annunciated at the following locations:

1) The Corridor, Intersectional and Room dome light associated with the initiating device.

2) A local master control station indicating the call location and priority.

~~3) Each duty station.~~

~~4) Each staff station.~~

53) Each remote location.

e4) All calls must be displayed until they are cleared by the nursing staff **ONLY** from the initiating device location.

2. Voice:

a Calls may be initiated through:

~~1) Patient station.~~

21) Staff station.

~~3) Code Blue station.~~

42) Toilet Emergency pull cord / push button station.

~~5) Shower Emergency pull cord station.~~

~~6) Pillow speaker.~~

~~7) Push button cordset.~~

~~8) Integrated bed controls.~~

93) Master Station.

~~//10. Mental Health (aka Psychiatric) Unit. //~~

~~//11. Blind Rehabilitation Unit. //~~

b. Once a call is initiated, it must be annunciated at the following locations:

1) The Corridor, Intersectional and Room dome light associated with the initiating device.

2) A master station indicating the call location and priority.

3) Any duty stations associated with the unit.

4) Any staff Stations associated with the unit.

5) Each remote location.

- c. All calls must be displayed until they are cleared by the nursing staff **ONLY** from the initiating device location.
3. Provide two-way voice communication between a master station and ~~patient, staff, duty~~ and each of the two (2) remote stations.
 4. Failure of voice intercom portion of system shall not interfere with visual and audible signal systems.
 5. All calls must be displayed on the master station until they are cleared by the nursing staff at **ONLY** the originating station. If multiple calls are received at the master station within a short period of time, they shall be stacked based on priority and wait time. If there are more calls than the master station screen can display at one time (four [4] minimum), the system must provide a simple scrolling feature. The nurse must be able to answer any call in any order at the master station. The nurse must also be able to forward calls to staff members. If a call is not answered within a programmable time period, then the system must forward the call to appropriate back-up staff identified by each shift supervisor in a manner technically approved by VA Headquarters 0050P3B.

~~//6. Radio pager (within the restrictions identified herein) //~~

~~//7. Wireless personal communicator (within the restrictions identified herein) //~~

~~I. Auxiliary Alarm Monitoring:~~

- ~~1. Each patient station must have the ability to connect a separate and isolated auxiliary alarm to it such as an infusion pump or data tracking / recording device (patient life support units ARE NOT allowed to be connected to these units **UNLESS APPROVED BY TVE - 0050P3B DURING THE PROJECT DEVELOPMENT PHASE AS DESCRIBED HEREIN.** The System must support naming the device that is being monitored as well as display its alarms at the master station and via the room / corridor dome light(s).~~
- ~~2. Provide // (2) // alarm jacks at each patient station.~~
- ~~3. The above requirements may **ONLY** be allowed when the system has been approved by VA Headquarters TVE - 0050P3B and TVE - 0050P2B and concurred by the appropriate Medical Service(s) indicates it meets the minimum guidelines and requirements of Paragraph 2.8.A.~~

JI. Patient and Staff Assignment:

1. System may provide for transfer of one or more individual or groups of stations from one master station to another without mechanical switches or additional wiring of the stations. The transfer may be initiated manually by the nurse or automatically at certain times of the day.
2. The Facility's LAN/WAN IS NOT ALLOWED for Nurses Call/Code Blue main wiring which must be a "stand alone primary cable infrastructure."
Connections to the VA LAN/WAN will be allowed ONLY when the LAN/WAN system has been demonstrated and certified by TVE - 0050P3B meeting the minimum guidelines and requirements of the Life Safety Code.

JK. Reports:

1. The system's generated reports logging all calls, alarms, response time, bed, and staff assignments may be allowed to transmit these reports to a central archiving entity.
2. Reports function shall be limited by passwords and security tier level access, so that only supervisors may access it when desired.
3. Provide instructions to the owner on how to enable/disable the reporting functions.
4. The Facility's LAN/WAN IS NOT ALLOWED for Nurses Call/~~Code Blue~~ main wiring that must be a "stand alone primary cable infrastructure."
Connections to the VA LAN/WAN will be allowed ONLY when the system has been demonstrated and certified by 0050P2B meeting the minimum guidelines and requirements of the Life Safety Code.

KL. System/Management Software:

1. Provide and install system/management software on minimum of three (3) owner-provided computers.
 - a. The management software shall at a minimum provide all historical reporting features of the system as well as real-time monitoring of events.
 - b. The system software shall at a minimum provide the system's operating and functioning parameters and script. The OEM shall provide VA with access to the software's script writing and functions.
2. Provide two (2) spare CD's with the software installed and operable.
3. Rights in Data: VA shall have the right to all script and programming language of system management software. If commercial off the shelf (COTS) or a memorandum of understanding (MOU) is

required for follow-on maintenance, the Contractor is required to accomplish the COTS Survey document and the RE is required to accomplish the COTS Acquisition document supplied in Part 5 Attachments herein.

LM. System Functional Station:

1. Master Control:

a. Simple Tone and Light:

- 1) A visual / aural (tone only) system shall be provided, protected and located in the Day Hospital, ~~Mental Health & Blind Rehabilitation Areas, OPC where surgery or procedures are not performed and // _____ //~~. The System shall include a push-button emergency station (~~pull cord in Day Hospital and pushbutton in Mental Health & Blind Rehabilitation areas~~) with an associated corridor dome light ~~in each dressing room (OPC) and toilet (OPC, Day Hospital, Mental Health, Blind Rehabilitation and // _____ //)~~ and ~~// _____~~ **in the _____** ~~//~~.
- 2) The visual ~~/ aural (tone only)~~ system shall also include a power supply and a visual / aural (tone only) display panel in the respective OPC receptionist / secretary's office and the Day Hospital ~~// _____ //~~ area and as shown on the drawings. The visual / tone display panel shall generate audible and visual emergency signals to indicate the location of a placed call.
- 3) The Visual Display Panel shall be a digital readout touch screen to visually announce the location of incoming calls placed in the System including room and bed number and priority of the call. Identify each calling station with an individual display, ~~including separate displays for each patient sharing a dual bedside station. If a digital readout touch screen standard is not required or approved by the Facility during the project design phase, an alpha numeric scheme shall be provided that identifies the: ward, room and bed (i.e. Ward 2a, Room 201, Bed A (or 1) shall read 2A201A or 2A201 1. Equivalent readouts are acceptable as long as TVE 0050P3B and the Facility approve the readout).~~

- a) Calls placed at emergency stations located in toilets ~~and baths inside bedrooms~~ shall be displayed for the bed closest to the nurse control station. ~~Beds in multi-bed bedrooms shall be identified in a clock wise pattern upon entering the bedroom.~~
- b) It shall display a minimum of four incoming calls. Additional placed calls shall be stored in order of placement and priority.
- 4) The visual / aural (tone only) system shall be installed according to the same Procedures, guidelines and standards outlined for a regular Nurse Call System for emergency ~~NOT CODE BLUE OPERATION.~~
- 5) Speakerphone and handset communication.
- 6) Provide one (1) spare station for each ten (1) stations installed.
- b. Touch Screen:
 - 1) Provide a touch screen master station with 15" minimum monitor size.
 - 2) The master station shall have a full control capability over staff assignment to patients and beds as well as pagers and wireless personal communication devices (when specifically approved by 0050P3B on a case by case basis).
 - 3) Speakerphone and handset communication.
 - 4) Provide one (1) spare station for each ten (1) stations installed.
2. Staff:
 - a. Light and Tine Only.
 - b. Voice Communications Enabled.
 - c. Provide one (1) spare station for each twenty (20) stations installed.
- ~~3. Duty:
 - a. ~~Light and Tine Only.~~
 - b. ~~Voice Communications Enabled.~~
 - c. ~~Provide one (1) spare station for each twenty (20) stations installed.~~~~
- ~~4. Patient:
 - a. ~~Single & Dual:~~~~

- ~~1) Provide each patient station with the following minimum
— Feature.~~
 - ~~a) Call button.~~
 - ~~b) Call answered button.~~
 - ~~c) Pillow speaker jack.~~
 - ~~d) Auxiliary alarm monitoring jack.~~
 - ~~e) Hospital bed interface jack (when specially approved by TVE
— 0050P3B).~~
 - ~~f) Provide one (1) spare station for each twenty (20) stations
installed.~~

NM. Distribution System: Refer to Specification Sections 27 11 00, Structured TIP Communications Cables; 27 11 00, TIP Communications Interface and Equipment Rooms Fittings and 27 15 00, HORIZONTAL and Vertical TIP Communications Cabling for additional specific TIP wire and cable standards and installation requirements used to install the Facility's TIP network.

1. In addition to the TIP provided under the aforementioned Specification Sections, the contractor shall provide the following additional TIP installation and testing requirements, provide the following minimum additional System TIP requirements, cables & interconnections:
 - a. Each wire and cable used in the System shall be specifically OEM certified by tags on each reel and recommended and approved for installation in the Facility.
 - b. The Contractor shall provide the RE a 610 mm (2 foot) sample of each wire and/or cable actually employed in the System **and each** certification tag for approval before continuing with the installation as described herein.
 - c. Fiberoptic Cables: Refer to Specification Section 27 15 00, Horizontal and Vertical TIP Communications Cabling; Paragraph 2.4.C12.d. Fiberoptic Cables - for minimum technical standards and requirements for additional System cables.
 - d. Copper Cables: Refer to Specification Section 27 15 00, Horizontal and Vertical TIP Communications Cabling; Paragraph 2.4.C12.c. Copper Cables - for minimum technical standards and requirements for additional System voice and data cables.
 - e. Line Level Audio and Microphone Cable:

- 1) Line level audio and microphone cable for inside racks and conduit.
- 2) Shielded, twisted pair Minimum 22AWG, stranded conductors and 24AWG drain wire with overall jacket.
- f. Speaker Level Audio (70.7Volt RMS):
 - 1) For use with 70.7V speaker circuits.
 - 2) 18AWG stranded pair, minimum.
- g. All cabling shall be //plenum// or //riser (UL-1666)// rated.
- h. Provide one (1) spare 1,000 foot roll of approved System (not microphone) cable only.
2. Raceways, Back Boxes and conduit:
 - a. In addition to the Raceways, Equipment Room Fittings provided under Specification Sections 27 15 00 TIP Communication Room Fittings and 27 15 00 - TIP Communications Horizontal and Vertical Cabling, provide the following additional TIP raceway and fittings:
 - b. Each raceway that is open top, shall be: UL certified for telecommunications systems, partitioned with metal partitions in order to comply with NEC Parts 517 & 800 to "mechanically separate telecommunications systems of different service, protect the installed cables from falling out when vertically mounted and allow junction boxes to be attached to the side to interface "drop" type conduit cable feeds.
 - c. Intercommunication System cable infrastructure: EMT or in J-hooks above accessible ceilings, 24 inches on center.
 - d. Junction boxes shall be not less than 2-1/2 inches deep and 6 inches wide by 6 inches long.
 - e. Flexible metal conduit is prohibited unless specifically approved by 0050P3B.
 - f. System Conduit:
 - 1) The PA system is NFPA listed as Emergency / Public Safety Communication System which requires the entire system to be installed in a separate conduit system.
 - 2) The use of centralized mechanically partitioned wireways may be used to augment main distribution conduit on a case by case basis when specifically approved by VA Headquarters (0050P3B).
 - 3) Conduit Sleeves:

- a) The AE has made a good effort to identify where conduit sleeves through full-height and fire rated walls on the drawings, and has instructed the electrician to provide the sleeves as shown on the drawings.
- b) While the sleeves shown on the drawings will be provided by others, the contractor is responsible for installing conduit sleeves and fire-proofing where necessary. It is often the case, that due to field conditions, the nurse-call cable may have to be installed through an alternate route. Any conduit sleeves required due to field conditions or those omitted by the engineer shall be provided by the cabling contractor.

g. Device Back Boxes:

- 1) Furnish to the electrical contractor all back boxes required for the PA system devices.
- 2) The electrical contractor shall install the back boxes as well as the system conduit. Coordinate the delivery of the back boxes with the construction schedule.

3. UPS:

- a. Provide a backup battery or a UPS for the System to allow normal operation and function (as if there was no AC power failure) in the event of an AC power failure or during input power fluctuations for a minimum of 30 minutes.
- b. As an alternate solution, the telephone system UPS may be utilized to meet this requirement at the headend location, as long as this function is specifically approved by the Telephone Contractor and the RE.
- c. The Nurse Call Contractor shall not make any attachments or connection to the telephone system until specifically directed to do so, in writing, by the RE.
- d. Provide UPS for all active system components including but not limited to:
 - 1) System Amplifiers.
 - 2) Microphone Consoles.
 - 3) Telephone Interface Units.
 - 4) TER, TR & Headend Equipment Rack(s).

~~0. Patient Bedside Prefabricated Units (PBPU):~~

- ~~1. Where PBPU's exist in the Facility; the Contractor shall identify the "gang box" location on the PBPU designated for installation of the telephone jack. This location shall here in after be identified as the unit's TCO. The Contractor shall be responsible for obtaining written approval and specific instructions from the PBPU OEM regarding the necessary disassembly and reassembly of each PBPU to the extent necessary to pull wire from above the TIP ceiling junction box to the PBPU's reserved gang box for the unit's TCO. A Contractor provided stainless steel cover plate approved for use by the PBPU OEM and Facility IRM Chief shall finish out the jack installation.~~
- ~~2. Under no circumstances shall the Contractor proceed with the PBPU installations without the written approval of the PBPU OEM and the specific instructions regarding the attachment to or modifying of the PBPU. The RE shall be available to assist the Contractor in obtaining approvals and instructions in a timely manner as related to the project's time constraints.~~
- ~~3. It is the responsibility of the Contractor to maintain the UL integrity of each PBPU. If the Contractor violates that integrity, it shall be the responsibility of the Contractor to obtain on site UL re-certification of the violated PBPU at the direction of the RE and at the Contractor's expense.~~

PO. Installation Kit:

1. General: The kit shall be provided that, at a minimum, includes all connectors and terminals, labeling systems, audio spade lugs, barrier strips, punch blocks or wire wrap terminals, heat shrink tubing, cable ties, solder, hangers, clamps, bolts, conduit, cable duct, and/or cable tray, etc., required to accomplish a neat and secure installation. All wires shall terminate in a spade lug and barrier strip, wire wrap terminal or punch block. Unfinished or unlabeled wire connections shall not be allowed. Turn over to the RE all unused and partially opened installation kit boxes, coaxial, fiberoptic, and twisted pair cable reels, conduit, cable tray, and/or cable duct bundles, wire rolls, physical installation hardware. The following are the minimum required installation sub-kits:
 2. System Grounding:

- a. The grounding kit shall include all cable and installation hardware required. All radio equipment shall be connected to earth ground via internal building wiring, according to the NEC.
- b. This includes, but is not limited to:
 - 1) Fiberoptic Optic Cable Armor/External Braid
 - 2) Coaxial Cable Shields.
 - 3) Control Cable Shields.
 - 4) Data Cable Shields.
 - 5) Equipment Racks.
 - 6) Equipment Cabinets.
 - 7) Conduits.
 - 8) Cable Duct.
 - 9) Cable Trays.
 - 10) Interduct
 - 11) Power Panels.
 - 12) Connector Panels.
 - 15) Grounding Blocks.
3. Fiberoptic Cable: The fiberoptic cable kit shall include all fiberoptic connectors, cable tying straps, interduct, heat shrink tubing, hangers, clamps, etc. required to accomplish a neat and secure installation.
4. Coaxial Cable: The coaxial cable kit shall include all coaxial connectors, cable tying straps, heat shrink tubing, hangers, clamps, etc., required to accomplish a neat and secure installation.
5. Wire and Cable: The wire and cable kit shall include all connectors and terminals, audio spade lugs, barrier straps, punch blocks, wire wrap strips, heat shrink tubing, tie wraps, solder, hangers, clamps, labels etc., required to accomplish a neat and orderly installation.
6. Conduit, Cable Duct, and Cable Tray: The kit shall include all conduit, duct, trays, junction boxes, back boxes, cover plates, feed through nipples, hangers, clamps, other hardware required to accomplish a neat and secure conduit, cable duct, and/or cable tray installation in accordance with the NEC and this document.
7. Equipment Interface: The equipment kit shall include any item or quantity of equipment, cable, mounting hardware and materials needed to interface the systems with the identified sub-system(s) according to the OEM requirements and this document.

8. Labels: The labeling kit shall include any item or quantity of labels, tools, stencils, and materials needed to completely and correctly label each subsystem according to the OEM requirements, as-installed drawings, and this document.

9. Documentation: The documentation kit shall include any item or quantity of items, computer discs, as installed drawings, equipment, maintenance, and operation manuals, and OEM materials needed to completely and correctly provide the system documentation as required by this document and explained herein.

// ~~Q. MENTAL HEALTH (aka PSYCHIATRIC) UNIT~~ when a Mental Health Unit is to be provided as a part of the project, provide each unit as follows:-

~~1. EMERGENCY STATION:-~~

- ~~a. A push button emergency station shall be provided in each toilet stall and each shower/bath facility in Mental Health Units. Shower emergency stations shall be installed inside the shower stall at the shower head end. They shall be installed approximately a minimum of 18 inches from the showerhead itself and at a maximum of 72 inches above the finished floor. Each station inside shower and toilet areas shall be equipped with a rubber gasket between the faceplate and wall or be rated by UL as waterproof. The gasket shall cover and water seal the entire back box opening and not extend beyond the sides of the associated faceplate by ¼" MAX. If the wall is tile or other uneven type material the gasket and associated faceplate shall be provided to completely seal the opening and uneven material surface.~~
- ~~b. Fasten each emergency station faceplate to the back boxes with tamperproof screws.~~

~~2. SECURITY ROOMS:-~~

- ~~a. Provide Security rooms in a Mental Health Unit with an emergency wall station containing a key activated switch. Provide four (4) emergency pushbutton stations and a four inch flush mounted ceiling microphone/speaker.~~
- ~~b. Mount all equipment with tamperproof screws.~~
- ~~c. Activating the switch shall energize each emergency station in the security room.~~
- ~~d. Selection of the security room station at the nurse control station shall permit two way voice communication within the room~~

~~and nurse control station, through the ceiling
microphone/speaker.~~

~~e. Pressing the push button on any security room emergency station
shall generate emergency visual signals in the corridor dome
light and emergency audible and visual signals at the nurse
control station.~~

~~f. Provide six (6) keys for each Mental Health Unit.~~

~~3. PATIENT STATION:~~

~~a. Provide a patient station with pushbutton, microphone/speaker.~~

~~b. Mount all equipment with tamperproof screws.~~

~~c. Selection of the patient room station at the nurse control
station shall permit two way voice communication within the room
and nurse control station, through the ceiling
microphone/speaker.~~

~~d. Pressing the push button on any patient room station shall
generate visual signals in the corridor dome light and routine
audible and visual signals at the nurse control station.~~

~~e. The patient wall station shall be equipment with a method
(aka separate push button) to initiate an emergency call in the
room and corridor dome lights and nurse call station.~~

~~4. NURSE CONTROL (aka MASTER) STATION — provide a station as described
herein. //~~

~~// R. BLIND REHABILITATION UNIT when a Blind Rehabilitation Unit is to
be provided as a part of the project, provide each unit as follows with
TVE 0050P3B reviewed and approved units designed specifically for
service and functions in this type of unit (aka brail, audible and like
recognition):~~

~~1. EMERGENCY STATION:~~

~~a. A push button emergency station shall be provided in each toilet
stall and each shower/bath facility in Psychiatric Units. Shower
emergency stations shall be installed inside the shower stall at
the shower head end. They shall be installed approximately a
minimum of 18 inches from the showerhead itself and at a maximum
of 72 inches above the finished floor. Each station inside
shower and toilet areas shall be equipped with a rubber gasket
between the faceplate and wall or be rated by UL as waterproof.
The gasket shall cover and water seal the entire back box opening~~

~~and not extend beyond the sides of the associated faceplate by ¼" MAX. If the wall is tile or other uneven type material the gasket and associated faceplate shall be provided to completely seal the opening and uneven material surface.~~

- ~~b. Fasten each emergency station faceplate to the back boxes with tamperproof screws.~~
 - ~~c. Pressing the push button on any emergency station shall generate visual signals in the room & corridor dome light(s) and emergency audible and visual signals at the nurse control station.~~
- ~~2. PATIENT STATION:~~

- ~~a. Provide a patient station with pushbutton, microphone/speaker.~~
- ~~b. Mount all equipment with tamperproof screws.~~
- ~~c. Selection of the patient room station at the nurse control station shall permit two way voice communication within the room and nurse control station, through the patient wall microphone/speaker.~~
- ~~d. Pressing the push button on any patient wall station shall generate visual signals in the Room & corridor dome light(s) and routine audible and visual signals at the nurse control station.~~
- ~~e. The patient wall station shall be equipment with a method (aka separate push button) to initiate an emergency call in the room and corridor dome lights and nurse call station.~~

~~3. NURSE CONTROL (aka MASTER) STATION — provide a station as described herein. //~~

~~// P. — ONCOLOGY, RADIOLOGY, DIALYSIS UNITS — when a these Units are to be provided as a part of the project, provide each unit as follows with TVE 0050P3B reviewed and approved units designed specifically for service and functions in this type of unit (aka brail, audible and like recognition:~~

~~1. CODE BLUE — provide a Code Blue System as described herein.~~

~~2. EMERGENCY STATION:~~

- ~~a. A push button emergency station shall be provided in each toilet stall and each shower/bath facility in Psychiatric Units. Shower emergency stations shall be installed inside the shower stall at the shower head end. They shall be installed approximately a minimum of 18 inches from the showerhead itself and at a maximum of 72 inches above the finished floor. Each station inside~~

~~shower and toilet areas shall be equipped with a rubber gasket between the faceplate and wall or be rated by UL as waterproof. The gasket shall cover and water seal the entire back box opening and not extend beyond the sides of the associated faceplate by 1/4" MAX. If the wall is tile or other uneven type material the gasket and associated faceplate shall be provided to completely seal the opening and uneven material surface.~~

- ~~b. Fasten each emergency station faceplate to the back boxes with tamperproof screws.~~
- ~~c. Pressing the push button on any emergency station shall generate visual signals in the room & corridor dome light(s) and emergency audible and visual signals at the nurse control station.~~

~~3. PATIENT STATION:~~

- ~~a. Provide a patient station with pushbutton, microphone/speaker.~~
- ~~b. Mount all equipment with tamperproof screws.~~
- ~~c. Selection of the patient room station at the nurse control station shall permit two way voice communication within the room and nurse control station, through the patient wall microphone/speaker.~~
- ~~d. Pressing the push button on any patient wall station shall generate visual signals in the Room & corridor dome light(s) and routine audible and visual signals at the nurse control station.~~
- ~~e. The patient wall station shall be equipment with a method (aka separate push button) to initiate an emergency call in the room and corridor dome lights and nurse call station.~~

- ~~4. NURSE CONTROL (aka MASTER) STATION — provide a station as described herein. //~~

PART 3 - EXECUTION

3.1 PROJECT MANAGEMENT

- A. Assign a single project manager to this project who will serve as the point of contact for the Owner, the General Contractor, and the Engineer.
- B. The Contractor shall be proactive in scheduling work at the hospital, specifically the Contractor will initiate and maintain discussion with the general contractor regarding the schedule for ceiling cover up and install cables to meet that schedule.

- C. Contact the Office of Telecommunications, Special Communications Team (0050P2B) at (301) 734-0350 to have a VA Certified Telecommunications COTR assigned to the project for telecommunications review, equipment and system approval and co-ordination with VA's Spectrum Management and OCIS Teams.

3.2 COORDINATION WITH OTHER TRADES

- A. Coordinate with the cabling contractor the location of the TV faceplate and the faceplate opening for the nurse call TV control jack.
- B. Coordinate with the cabling contractor the location of ~~TIP~~**all** equipment ~~in the TER, TCR, PCR, SCC, ECR, STRs, NSS, and TCOs in order to connect to the TIP cable network that was installed as a part of Section Specification 27 11 00. Contact the RE immediately, in writing, if additional location(s) are discovered to be activated that was not previously provided.~~
- C. Before beginning work, verify the location, quantity, size and access for the following:
 - 1. Isolated ground AC power circuits provided for systems.
 - 2. Primary, emergency and extra auxiliary AC power generator requirements.
 - 3. Junction boxes, wall boxes, wire troughs, conduit stubs and other related infrastructure for the systems.
 - 4. System components installed by others.
 - 5. Overhead supports and rigging hardware installed by others.
- D. Immediately notify the Owner, GC and Consultant(s) in writing of any discrepancies.

3.3 NEEDS ASSESSMENT

Provide a one-on-one meeting with the particular nursing manager of each unit affected by the installation of the new nurse call/code blue system. Review the floor plan drawing, educate the nursing manager with the functions of the equipment that is being provided and gather details specific to the individual units; coverage and priorities of calls; staffing patterns; and other pertinent details that will affect system programming and training.

3.4 INSTALLATION

- A. General:
 - 1. Execute work in accordance with National, State and local codes, regulations and ordinances.

2. Install work neatly, plumb and square and in a manner consistent with standard industry practice. Carefully protect work from dust, paint and moisture as dictated by site conditions. The Contractor will be fully responsible for protection of his work during the construction phase up until final acceptance by the Owner.
3. Install equipment according to OEM's recommendations. Provide any hardware, adaptors, brackets, rack mount kits or other accessories recommended by OEM for correct assembly and installation.
4. Secure equipment firmly in place, including receptacles, speakers, equipment racks, system cables, etc.
 - a. All supports, mounts, fasteners, attachments and attachment points shall support their loads with a safety factor of at least 5:1.
 - b. Do not impose the weight of equipment or fixtures on supports provided for other trades or systems.
 - c. Any suspended equipment or associated hardware must be certified by the OEM for overhead suspension.
 - d. The Contractor is responsible for means and methods in the design, fabrication, installation and certification of any supports, mounts, fasteners and attachments.
5. Finishes for any exposed work such as plates, racks, panels, speakers, etc. shall be approved by the Architect, Owner and TVE 0050P3B.
6. Coordinate cover plates with field conditions. Size and install cover plates as necessary to hide joints between back boxes and surrounding wall. Where cover plates are not fitted with connectors, provide grommeted holes in size and quantity required. Do not allow cable to leave or enter boxes without cover plates installed.
7. Active electronic component equipment shall consist of solid state components, be rated for continuous duty service, comply with the requirements of FCC standards for telephone and data equipment, systems, and service.
8. Color code all distribution wiring to conform to the Nurse Call Industry Standard, EIA/TIA, and this document, whichever is the more stringent. At a minimum, all equipment, cable duct and/or conduit, enclosures, wiring, terminals, and cables shall be clearly and

- permanently labeled according to and using the provided record drawings, to facilitate installation and maintenance.
9. Connect the System's primary input AC power to the Facility' Critical Branch of the Emergency AC power distribution system as shown on the plans or if not shown on the plans consult with RE regarding a suitable circuit location prior to bidding.
 10. Product Delivery, Storage and Handling:
 - a. Delivery: Deliver materials to the job site in OEM's original unopened containers, clearly labeled with the OEM's name and equipment catalog numbers, model and serial identification numbers. The RE may inventory the cable, patch panels, and related equipment.
 - b. Storage and Handling: Store and protect equipment in a manner, which will preclude damage as directed by the RE.
 11. Where TCOs are installed adjacent to each other, install one outlet for each instrument.
 - ~~12. Equipment installed outdoors shall be weatherproof or installed in weatherproof enclosures with hinged doors and locks with two keys.~~
- B. Equipment Racks/Cabinets:
1. Fill unused equipment mounting spaces with blank panels or vent panels. Match color to equipment racks/cabinets.
 2. Provide security covers for all devices not requiring routine operator control.
 3. Provide vent panels and cooling fans as required for the operation of equipment within the OEM' specified temperature limits. Provide adequate ventilation space between equipment for cooling. Follow manufacturer's recommendations regarding ventilation space between amplifiers.
 4. Provide insulated connections of the electrical raceway to equipment racks.
 5. Provide continuous raceway/conduit with no more than 40% fill between wire troughs and equipment racks/cabinets for all non-plenum-rated cable. Ensure each system is mechanically separated from each other in the wireway.

6. Ensure a minimum of 36 inches around each cabinet and/or rack to comply with OSHA Safety Standards. Cabinets and/or Racks installed side by side - the 36" rule applies to around the entire assembly
- C. Distribution Frames.
1. A new stand-alone (i.e., self supporting, free standing) PA rack/frame may be provided in each TR to interconnect the TCR, PCR, SCC, NS, STRs & ECRs. Rack/frames shall be wired in accordance with industry standards and shall employ "latest state-of-the-art" modular cross-connect devices. The PA riser cable shall be sized to satisfy all voice/digital requirements plus not less than 50% spare (growth) capacity in each TR which includes a fiber optic backbone.
 2. The frames/racks shall be connected to the TER/MCR system ground.
- D. Wiring Practice - in addition to the MANDATORY infrastructure requirements outlined in VA Construction Specifications 27 10 00 - TIP Structured Communications Cabling, 27 11 00 - TIP Communications Rooms Fittings and 27 15 00 - TIP Horizontal and Vertical Communicators Cabling, the following additional practices shall be adhered too:
1. Comply with requirements for raceways and boxes specified in Division 26 Section "Raceway and Boxes for Electrical Systems."
 2. Execute all wiring in strict adherence to the National Electrical Code, applicable local building codes and standard industry practices.
 3. Wiring shall be classified according to the following low voltage signal types:
 - a. Balanced microphone level audio (below -20dBm) or Balanced line level audio (-20dBm to +30dBm)
 - b. 70V audio speaker level audio.
 - c. Low voltage DC control or power (less than 48VDC)
 4. Where raceway is to be EMT (conduit), wiring of differing classifications shall be run in separate conduit. Where raceway is to be an enclosure (rack, tray, wire trough, utility box) wiring of differing classifications which share the same enclosure shall be mechanically partitioned and separated by at least four (4) inches. Where Wiring of differing classifications must cross, they shall cross perpendicular to one another.

5. Do not splice wiring anywhere along the entire length of the run. Make sure cables are fully insulated and shielded from each other and from the raceway for the entire length of the run.
6. Do not pull wire through any enclosure where a change of raceway alignment or direction occurs. Do not bend wires to less than radius recommended by manufacturer.
7. Replace the entire length of the run of any wire or cable that is damaged or abraided during installation. There are no acceptable methods of repairing damaged or abraided wiring.
8. Use wire pulling lubricants and pulling tensions as recommended by the OEM.
9. Use grommets around cut-outs and knock-outs where conduit or chase nipples are not installed.
10. Do not use tape-based or glue-based cable anchors.
11. Ground shields and drain wires to the Facility's signal ground system as indicated by the drawings.
12. Field wiring entering equipment racks shall be terminated as follows:
 - a. Provide OEM directed service loops at harness break-outs and at plates, panels and equipment. Loops should be sufficient to allow plates, panels and equipment to be removed for service and inspection.
 - b. Line level and speaker level wiring may be terminated inside the equipment rack using specified terminal blocks (see "Products.") Provide 15% spare terminals inside each rack. Microphone level wiring may only be terminated at the equipment served.
 - c. If specified terminal blocks are not designed for rack mounting, utilize $\frac{3}{4}$ " plywood or $\frac{1}{8}$ " thick aluminum plates/blank panels as a mounting surface. Do not mount on the bottom of the rack.
 - d. Employ permanent strain relief for any cable with an outside diameter of 1" or greater.
13. Use only balanced audio circuits unless noted otherwise directed and indicated on the drawings.
14. Make all connections as follows:
 - a. Make all connections using rosin-core solder or mechanical connectors appropriate to the application.

- b. For crimp-type connections, use only tools that are specified by the manufacturer for the application.
 - c. Use only insulated spade lugs on screw terminals. Spade lugs shall be sized to fit the wire gauge. Do not exceed two lugs per terminal.
 - d. Wire nuts, electrical tape or "Scotch Lock" connections are not acceptable for any application.
15. Noise filters and surge protectors shall be provided for each equipment interface cabinet, switch equipment cabinet, control console, local, and remote active equipment locations to ensure protection from input primary AC power surges and noise glitches are not induced into low Voltage data circuits.
16. Wires or cables **previously approved** to be installed outside of conduit, cable trays, wireways, cable duct, etc:
- a Only when specifically authorized as described herein, will wires or cables be identified and approved to be installed outside of conduit. The wire or cable runs shall be UL rated plenum and OEM certified for use in air plenums.
 - b Wires and cables shall be hidden, protected, fastened and tied at 600 mm (24 in.) intervals, maximum, as described herein to building structure.
 - c Closer wire or cable fastening intervals may be required to prevents sagging, maintain clearance above suspended ceilings, remove unsightly wiring and cabling from view and discourage tampering and vandalism. Wire or cable runs, not provided in conduit, that penetrate outside building walls, supporting walls, and two hour fire barriers shall be sleeved and sealed with an approved fire retardant sealant.
 - d Wire or cable runs to system components installed in walls (i.e.: volume attenuators, circuit controllers, signal, or data outlets, etc.) may, when specifically authorized by the RE, be fished through hollow spaces in walls and shall be certified for use in air plenum areas.
 - e Completely test all of the cables after installation and replace any defective cables.
 - f Wires or cables that are installed outside of buildings shall be in conduit, secured to solid building structures. If specifically

approved, on a case by case basis, to be run outside of conduit, the wires or cables shall be installed, as described herein. The bundled wires or cables must: Be tied at not less than 460 mm (18 in.) intervals to a solid building structure; have ultra violet protection and be totally waterproof (including all connections). The laying of wires or cables directly on roof tops, ladders, drooping down walls, walkways, floors, etc. is not allowed and will not be approved.

- E. Cable Installation - Cable Installation - In addition to the **MANDATORY** infrastructure requirements outlined in VA Construction Specifications 27 10 00 - Structured TIP Communications Cabling, 27 11 00 - TIP Communications Rooms and Fittings and 27 15 00 - TIP Communications Horizontal and Vertical Cabling and the following additional practices shall be adhered to:
1. Support cable on maximum 2'-0" centers. Acceptable means of cable support are cable tray, j-hooks, and bridal rings. Velcro wrap cable bundles loosely to the means of support with plenum rated Velcro straps. Plastic tie wraps are not acceptable as a means to bundle cables.
 2. Run cables parallel to walls.
 3. Install maximum of 10 cables in a single row of J-hooks. Provide necessary rows of J-hooks as required by the number of cables.
 4. Do not lay cables on top of light fixtures, ceiling tiles, mechanical equipment, or ductwork. Maintain at least 2'-0" clearance from all shielded electrical apparatus.
 5. All cables shall be tested after the total installation is fully complete. All test results are to be documented. All cables shall pass acceptable test requirements and levels. Contractor shall remedy any cabling problems or defects in order to pass or comply with testing. This includes the re-pull of new cable as required at no additional cost to the Owner.
 6. Ends of cables shall be properly terminated on both ends per industry and OEM's recommendations.
 7. Provide proper temporary protection of cable after pulling is complete before final dressing and terminations are complete. Do not leave cable lying on floor. Bundle and tie wrap up off of the floor until you are ready to terminate.

8. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at outlets and terminals.
 9. Splices, Taps, and Terminations: Arrange on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Cables may not be spliced.
 10. Bundle, lace, and train conductors to terminal points without exceeding OEM's limitations on bending radii. Install lacing bars and distribution spools.
 11. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used.
 12. Cable shall not be run through structural members or be in contact with pipes, ducts, or other potentially damaging items.
 13. Separation of Wires: (REFER TO RACEWAY INSTALLATION) Separate speaker-microphone, line-level, speaker-level, and power wiring runs. Install in separate raceways or, where exposed or in same enclosure, separate conductors at least 12 inches apart for speaker microphones and adjacent parallel power and telephone wiring. Separate other intercommunication equipment conductors as recommended by equipment manufacturer.
 14. Serve all cables as follows:
 - a. Cover the end of the overall jacket with a 1" (minimum) length of transparent heat-shrink tubing. Cut unused insulated conductors 2" (minimum) past the heat-shrink, fold back over jacket and secure with cable-tie. Cut unused shield/drain wires 2" (minimum) past the Heatshrink and serve as indicated below.
 - b. Cover shield/drain wires with heat-shrink tubing extending back to the overall jacket. Extend tubing ¼" past the end of unused wires, fold back over jacket and secure with cable tie.
 - c. For each solder-type connection, cover the bare wire and solder connection with heat-shrink tubing.
- F. Labeling: Provide labeling in accordance with ANSI/EIA/TIA-606-A. All lettering for Nurse Call ~~and/or Code Blue~~ circuits shall be stenciled using ~~// laser printers // // thermal ink transfer process // //~~ ~~--~~.
1. Cable and Wires (Hereinafter referred to as "Cable"): Cables shall be labeled at both ends in accordance with ANSI/EIA/TIA-606-A.

- Labels shall be permanent in contrasting colors. Cables shall be identified according to the System "Record Wiring Diagrams."
2. Equipment: System equipment shall be permanently labeled with contrasting plastic laminate or Bakelite material. System equipment shall be labeled on the face of the unit corresponding to its source.
 - a. Clearly, consistently, logically and permanently mark switches, connectors, jacks, relays, receptacles and electronic and other equipment.
 - b. Engrave and paint fill all receptacle panels using 1/8" (minimum) high lettering and contrasting paint.
 - c. For rack-mounted equipment, use engraved Lamacoid labels with white 1/8" (minimum) high lettering on black background. Label the front and back of all rack-mounted equipment.
 3. Conduit, Cable Duct, and/or Cable Tray: The Contractor shall label all conduit, duct and tray, including utilized GFE, with permanent marking devices or spray painted stenciling a minimum of 3 meters (10 ft.) identifying it as the System. In addition, each enclosure shall be labeled according to this standard.
 4. Termination Hardware: The Contractor shall label TCOs and patch panel connections using color coded labels with identifiers in accordance with ANSI/EIA/TIA-606-A and the "Record Wiring Diagrams."
 5. Where multiple pieces of equipment reside in the same rack group, clearly and logically label each indicating to which room, channel, receptacle location, etc. they correspond.
 6. Permanently label cables at each end, including intra-rack connections. Labels shall be covered by the same, transparent heat-shrink tubing covering the end of the overall jacket. Alternatively, computer generated labels of the type which include a clear protective wrap may be used.
 7. Contractor's name shall appear no more than once on each continuous set of racks. The Contractor's name shall not appear on wall plates or portable equipment.
 8. Ensure each OEM supplied item of equipment has appropriate UL Labels / Marks for the service the equipment is performed permanently attached / marked to a non-removal board in the unit. **EQUIPMENT INSTALLED NOT BEARING THESE UL MARKS WILL NOT BE ALLOWED TO BE A**

PART OF THE SYSTEM. THE CONTRACTOR SHALL BEAR ALL COSTS REQUIRED TO PROVIDE REPLACEMENT EQUIPMENT WITH APPROVED UL MARKS.

G. Conduit and Signal Ducts: When the Contractor and/or OEM determines additional system conduits and/or signal ducts are required in order to meet the system minimum performance standards outlined herein, the contractor shall provide these items as follows:

1. Conduit:

- a. The Contractor shall employ the latest installation practices and materials. The Contractor shall provide conduit, junction boxes, connectors, sleeves, weather heads, pitch pockets, and associated sealing materials not specifically identified in this document as GFE. Conduit penetrations of walls, ceilings, floors, interstitial space, fire barriers, etc., shall be sleeved and sealed.
- b. All cables shall be installed in separate conduit and/or signal ducts (exception from the separate conduit requirement to allow Nurse Call and/or Code Blue cables to be installed in partitioned cable tray with voice cables may be granted in writing by the RE if requested). Conduits shall be provided in accordance with Section 27 05 33, RACEWAYS AND BOXES FOR COMMUNICATIONS SYSTEMS, and NEC Articles 517 for Critical Care and 800 for Communications systems, at a minimum.
- c. When metal, plastic covered, etc., flexible cable protective armor or systems are specifically authorized to be provided for use in the System, their installation guidelines and standards shall be as specified herein, Section 27 05 33, RACEWAYS AND BOXES FOR COMMUNICATIONS SYSTEMS, and the NEC.
- d. When "interduct" flexible cable protective systems is specifically authorized to be provided for use in the System, it's installation guidelines and standards shall be as the specified herein, Section 27 05 33, RACEWAYS AND BOXES FOR COMMUNICATIONS SYSTEMS, and the NEC.
- e. Conduit fill (including GFE approved to be used in the system) shall not exceed 40%. Each conduit end shall be equipped with a protective insulator or sleeve to cover the conduit end, connection nut or clamp, to protect the wire or cable during installation and remaining in the conduit. Electrical power

conduit shall be installed in accordance with the NEC. AC power conduit shall be run separate from signal conduit.

~~f. _____ Ensure that Critical Care Nurse Call and/or Code Blue //, and _____ // Systems (as identified by NEC Section 517) are completely separated and protected from all other systems.~~

2. Signal Duct, Cable Duct, or Cable Tray:

- a. The Contractor shall use GFE signal duct, cable duct, and/or cable tray, when identified and approved by the RE.
- b. Approved signal and/or cable duct shall be a minimum size of 100 mm x 100 mm (4 in. X 4 in.) inside diameter with removable tops or sides, as appropriate. Protective sleeves, guides or barriers are required on all sharp corners, openings, anchors, bolts or screw ends, junction, interface and connection points.
- c. Approved cable tray shall be fully covered, mechanically and physically partitioned for multiple electronic circuit use, and be UL certified and labeled for use with telecommunication circuits and/or systems. The RE shall approve width and height dimensions.
- d. All cable junctions and taps shall be accessible. Provide an 8" X 8" X 4" (minimum) junction box attached to the cable duct or raceway for installation of distribution system passive equipment. Ensure all equipment and tap junctions are accessible

3.5 PROTECTION OF NETWORK DEVICES

- A. Contractor shall protect network devices during unpacking and installation by wearing manufacturer approved electrostatic discharge (ESD) wrist straps tied to chassis ground. The wrist strap shall meet OSHA requirements for prevention of electrical shock, should technician come in contact with high voltage.

3.6 CUTTING, CLEANING AND PATCHING

- A. It shall be the responsibility of the contractor to keep their work area clear of debris and clean area daily at completion of work.
- B. It shall be the responsibility of the contractor to patch and paint any wall or surface that has been disturbed by the execution of this work.
- C. The Contractor shall be responsible for providing any additional cutting, drilling, fitting or patching required that is not indicated as provided by others to complete the Work or to make its parts fit together properly.

- D. The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or separate contractors by cutting, patching or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter such construction by the Owner or a separate contractor except with written consent of the Owner and of such separate contractor; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the Owner or a separate Contractor the Contractor's consent to cutting or otherwise altering the Work.
- E. Where coring of existing (previously installed) concrete is specified or required, including coring indicated under unit prices, the location of such coring shall be clearly identified in the field and the location shall be approved by the Project Manager prior to commencement of coring work.

3.7 FIREPROOFING

- A. Where Nurse Call ~~and/or Code Blue wires~~, cables and conduit penetrate fire rated walls, floors and ceilings, fireproof the opening.
- B. Provide conduit sleeves (if not already provided by electrical contractor) for cables that penetrate fire rated walls and Telecommunications Rooms floors and ceilings. After the cabling installation is complete, install fire proofing material in and around all conduit sleeves and openings. Install fire proofing material thoroughly and neatly. Seal all floor and ceiling penetrations.
- C. Use only materials and methods that preserve the integrity of the fire stopping system and its rating.
- D. Install fireproofing where low voltage cables are installed in the same manholes with high voltage cables; also cover the low voltage cables with arc proof and fireproof tape.
- E. Use approved fireproofing tape of the same type as used for the high voltage cables, and apply the tape in a single layer, one-half lapped or as recommended by the manufacturer. Install the tape with the coated side towards the cable and extend it not less than 25 mm (one inch) into each duct.
- F. Secure the tape in place by a random wrap of glass cloth tape.

3.8 GROUNDING

- A. Ground Nurse Call ~~and/or Code Blue~~ cable shields and equipment to eliminate shock hazard and to minimize ground loops, commonmode returns, noise pickup, cross talk, and other impairments as specified in CFM Division 27, Section 27 05 26 - Grounding and Bonding for Communications Systems.
- B. Facility Signal Ground Terminal: Locate at main room or area signal ground within the room (i.e. head end and telecommunications rooms) or area(s) and indicate each signal ground location on the drawings.
- C. Extend the signal ground to inside each equipment cabinet and/or rack. Ensure each cabinet and/or rack installed item of equipment is connected to the extended signal ground. Isolate the signal ground from power and major equipment grounding systems.
- D. When required, install grounding electrodes as specified in CFM Division 26, Section 26 05 26 -Grounding and Bonding for Electrical Systems.
- E. Do not use "3rd or 4th" wire internal electrical system conductors for communications signal ground.
- F. Do not connect the signal ground to the building's external lightning protection system.
- G. Do Not "mix grounds" of different systems.
- H. Insure grounds of different systems are installed as to not violate OSHA Safety and NEC installation requirements for protection of personnel.

PART 4 - TESTING / GUARANTY / TRAINING

4.0 SYSTEM LISTING

The Nurses Call System is NFPA listed as an "Emergency" Communication system. ~~Where Code Blue signals are transmitted, that listing is elevated to "Life Support/Safety."~~ Therefore, the following testing and guaranty provisions are the minimum to be performed and provided by the contractor and Warranted by the OEM.

4.1 PROOF OF PERFORMANCE TESTING

- A. Intermediate Testing:
 1. After completion of 30 - 40% of the installation of a head end cabinet(s) ~~//and interconnection to the corresponding System Patient Head Wall Units~~ // and equipment, ~~one~~ master stations, local and remote stations, treatment rooms, and prior to any further work,

this portion of the system must be pretested, inspected, and certified. Each item of installed equipment shall be checked to ensure appropriate UL Listing and Certification Labels are affixed as required by NFPA -Life Safety Code 101-3.2 (a) & (b), UL Nurse Call Standard 1069 and JCHCO evaluation guidelines, and proper installation practices are followed. The intermediate test shall include a full operational test.

2. All inspections and tests shall be conducted by an OEM-certified contractor representative and witnessed by TVE-0050P3B if there is no local Government Representative that processes OEM and VA approved Credentials to inspect and certify the system. The results of the inspection will be officially recorded by the Government Representative and maintained on file by the RE, until completion of the entire project. The results will be compared to the Acceptance Test results. An identical inspection may be conducted between the 65 - 75% of the system construction phase, at the direction of the RE.

B. Pretesting:

1. Upon completing installation of the Nurse Call ~~and/or Code Blue~~ System, the Contractor shall align, balance, and completely pretest the entire system under full operating conditions.
2. Pretesting Procedure:
 - a. During the System Pretest the Contractor shall verify (utilizing approved test equipment) that the System is fully operational and meets all the System performance requirements of this standard.
 - b. The Contractor shall pretest and verify that all PSM System functions and specification requirements are met and operational, no unwanted aural effects, such as signal distortion, noise pulses, glitches, audio hum, poling noise, etc. are present. At a minimum, each of the following locations shall be fully pretested:
 - 1) Central Control Cabinets.
 - 2) Nurse Control Stations.
 - a) Master Stations
 - ~~b) Patient Stations~~
 - ~~c) Staff Stations~~
 - db)** Emergency Stations

- ~~e) Code Blue Stations~~
- 3) Dome Lights.
 - a) ~~Patient~~ Exam Rooms
 - b) Corridors
 - ~~e) Intersectional~~
- 4) ~~STRs~~
- 5) ~~Local and Remote Enunciation Panels (code blue).~~
- 6) Electrical Supervision Panels/Functions/locations.
- 7) All Networked locations.
- 8) ~~System interface locations (i.e. wireless, PA, telephone, etc.).~~
- 9) System trouble reporting.
- 10) System electrical supervision.
- 11) UPS operation.
- 12) Primary / Emergency AC Power Requirements
- 13) ~~Extra Auxiliary Generator Requirements.~~
- 14) ~~NSS.~~

3. The Contractor shall provide four (4) copies of the recorded system pretest measurements and the written certification that the System is ready for the formal acceptance test shall be submitted to the RE.

C. Acceptance Test:

1. After the Nurse Call ~~and/or Code Blue~~ System has been pretested and the Contractor has submitted the pretest results and certification to the RE, then the Contractor shall schedule an acceptance test date and give the RE 15 working days written notice prior to the date the acceptance test is expected to begin. The System shall be tested in the presence of a TVE 0050P3B and OEM certified representatives. The System shall be tested utilizing the approved test equipment to certify proof of performance and Life Safety / Critical Service compliance. The tests shall verify that the total System meets all the requirements of this specification. The notification of the acceptance test shall include the expected length (in time) of the test.
2. The acceptance test shall be performed on a "go-no-go" basis. Only those operator adjustments required to show proof of performance shall be allowed. The test shall demonstrate and verify that the

installed System does comply with all requirements of this specification under operating conditions. The System shall be rated as either acceptable or unacceptable at the conclusion of the test. Failure of any part of the System that precludes completion of system testing, and which cannot be repaired in four (4) hours, shall be cause for terminating the acceptance test of the System. Repeated failures that result in a cumulative time of eight (8) hours to affect repairs shall cause the entire System to be declared unacceptable.

3. Retesting of the entire System shall be rescheduled at the convenience of the Government and costs borne by the Contractor at the direction of the SRE.

D. Acceptance Test Procedure:

1. Physical and Mechanical Inspection:

- a. The TVE 0050P3B Representative will tour all major areas where the Nurse Call and/or Code Blue System and all sub-systems are completely and properly installed to insure they are operationally ready for proof of performance testing. A system inventory including available spare parts will be taken at this time. Each item of installed equipment shall be checked to ensure appropriate UL certification labels are affixed.
- b. The System diagrams, record drawings, equipment manuals, TIP Auto CAD Disks, intermediate, and pretest results shall be formally inventoried and reviewed.
- c. Failure of the System to meet the installation requirements of this specification shall be grounds for terminating all testing.

2. Operational Test:

- a. After the Physical and Mechanical Inspection, the central terminating and nurse call master control equipment shall be checked to verify that it meets all performance requirements outlined herein. A spectrum analyzer and sound level meter may be utilized to accomplish this requirement.
- b. Following the central equipment test, a pillow speaker (or on board speaker) shall be connected to the central terminating and nurse call master control equipment's output tap to ensure there are no signal distortions such as intermodulation, data noise, popping sounds, erratic system functions, on any function.

- c. The distribution system shall be checked at each interface, junction, and distribution point, first, middle, and last intersectional, room, and bed dome light in each leg to verify that the nurse call distribution system meets all system performance standards.
 - ~~d. Each MATV outlet that is controlled by a nurse call pillow speaker shall be functionally tested at the same time utilizing the Contractor's approved hospital grade HDTV receiver and TV remote control cable.~~
 - ~~e. The RED system and volume stepper switches shall be checked to insure proper operation of the pillow speaker, the volume stepper and the RED system (if installed).~~
 - fd.** Additionally, each installed emergency, ~~patient,~~ staff, duty, panic station, intersectional, room, and bed dome light, power supply, code one, and remote annunciator panels shall be checked insuring they meet the requirements of this specification.
 - ge.** Once these tests have been completed, each installed sub-system function shall be tested as a unified, functioning and fully operating system. The typical functions are: nurse follower, three levels of emergency signaling (i.e. flashing red emergency, flashing white patient emergency, flashing white or combination lights for staff emergency, separate flashing code blue), minimum of 10 minutes of UPS operation, memory saving, minimum of ten station audio paging, canceling emergency calls at each originating station only, and storage and prioritizing of calls.
 - hf.** Individual Item Test: The TVE 0050P3B Representative will select individual items of equipment for detailed proof of performance testing until 100% of the System has been tested and found to meet the contents of this specification. Each item shall meet or exceed the minimum requirements of this document.
3. Test Conclusion:
- a. At the conclusion of the Acceptance Test, using the generated punch list (or discrepancy list) the VA and the Contractor shall jointly agree to the results of the test, and reschedule testing on deficiencies and shortages with the RE. Any retesting to

comply with these specifications will be done at the Contractor's expense.

- b. If the System is declared unacceptable without conditions, all rescheduled testing expenses will be borne by the Contractor.
- E. Acceptable Test Equipment: The test equipment shall furnished by the Contractor shall have a calibration tag of an acceptable calibration service dated not more than 12 months prior to the test. As part of the submittal, a test equipment list shall be furnished that includes the make and model number of the following type of equipment as a minimum:
1. Spectrum Analyzer.
 2. Signal Level Meter.
 3. Volt-Ohm Meter.
 4. Sound Pressure Level (SPL) Meter.
 5. Oscilloscope.
 - ~~6. Pillow Speaker Test Set (Pillow Speaker with appropriate load and cross connections in lieu of the set is acceptable).~~
 76. Patient Push Button Cord Test Set.
 - ~~8. Patient Bed with connecting multiple conductor cord.~~

4.2 WARRANTY

- A. Comply with FAR 52.246-21, except that warranty shall be as follows:
- B. Contractor's Responsibility:
 1. The Contractor shall warranty that all provided material and equipment will be free from defects, workmanship and will remain so for a period of one year from date of final acceptance of the System by the VA. The Contractor shall provide OEM's equipment warranty documents, to the RE (or Facility Contracting Officer if the Facility has taken possession of the building), that certifies each item of equipment installed conforms to OEM published specifications.
 2. The Contractor's maintenance personnel shall have the ability to contact the Contractor and OEM for emergency maintenance and logistic assistance, remote diagnostic testing, and assistance in resolving technical problems at any time. This contact capability shall be provided by the Contractor and OEM at no additional cost to the VA.
 3. All Contractor maintenance and supervisor personnel shall be fully qualified by the OEM and must provide two (2) copies of current and

qualified OEM training certificates and OEM certification upon request.

4. Additionally, the Contractor shall accomplish the following minimum requirements during the two year guaranty period:
 - a. Response Time during the Two Year Guaranty Period:
 - 1) The RE (or Facility Contracting Officer if the system has been turned over to the Facility) is the Contractor's ONLY OFFICIAL reporting and contact official for nurse call system trouble calls, during the guaranty period.
 - 2) A standard work week is considered 8:00 A.M. to 5:00 P.M. or as designated by the RE (or Facility Contracting Officer), Monday through Friday exclusive of Federal Holidays.
 - 3) The Contractor shall respond and correct on-site trouble calls, during the standard work week to:
 - a) A routine trouble call within one (1) working day of its report. A routine trouble is considered a trouble which causes a pillow speaker or cordset, one (1) master nurse control station, patient station, emergency station, or dome light to be inoperable.
 - b) Routine trouble calls in critical emergency health care facilities (i.e., cardiac arrest, intensive care units, etc.) shall also be deemed as an emergency trouble call. The RE (or Facility Contracting Officer) shall notify the Contractor of this type of trouble call.
 - c) An emergency trouble call within four hours of its report. An emergency trouble is considered a trouble which causes a sub-system (ward), distribution point, terminal cabinet, or code one system to be inoperable at anytime.
 - 4) If a Nurse Call ~~and/or Code Blue/~~ component failure cannot be corrected within four (4) hours (exclusive of the standard work time limits), the Contractor shall be responsible for providing alternate nurse call equipment. The alternate equipment/system shall be operational within a maximum of 20 hours after the four (4) hour trouble shooting time and restore the effected location operation to meet the System performance standards. If any sub-system or major system trouble cannot be corrected within one working day, the

Contractor shall furnish and install compatible substitute equipment returning the System or sub-system to full operational capability, as described herein, until repairs are complete.

b. Required On-Site Visits during the Two Year Guaranty Period

- 1) The Contractor shall visit, on-site, for a minimum of eight (8) hours, once every 12 weeks, during the guaranty period, to perform system preventive maintenance, equipment cleaning, and operational adjustments to maintain the System according the descriptions identified in this document.
- 2) The Contractor shall arrange all Facility visits with the RE (or Facility Contracting Officer) prior to performing the required maintenance visits.
- 3) Preventive maintenance shall be performed by the Contractor in accordance with the OEM's recommended practice and service intervals during non-busy time agreed to by the RE (or Facility Contracting Officer) and Contractor.
- 4) The preventive maintenance schedule, functions and reports shall be provided to and approved by the RE (or Facility Contracting Officer).
- 5) The Contractor shall provide the RE (or Facility Contracting Officer) a type written report itemizing each deficiency found and the corrective action performed during each required visit or official reported trouble call. The Contractor shall provide the RE with sample copies of these reports for review and approval at the beginning of the Acceptance Test. The following reports are the minimum required:
 - a) The Contractor shall provide a monthly summary all equipment and sub-systems serviced during this warranty period to RE (or Facility Contracting Officer) by the fifth (5th) working day after the end of each month. The report shall clearly and concisely describe the services rendered, parts replaced and repairs performed. The report shall prescribe anticipated future needs of the equipment and systems for preventive and predictive maintenance.
 - b) The Contractor shall maintain a separate log entry for each item of equipment and each sub-system of the System. The

log shall list dates and times of all scheduled, routine, and emergency calls. Each emergency call shall be described with details of the nature and causes of emergency steps taken to rectify the situation and specific recommendations to avoid such conditions in the future.

6) The RE (or Facility Contracting Officer) shall convey to the Facility Engineering Officer, two (2) copies of actual reports for evaluation.

a) The RE (or Facility Contracting Officer) shall ensure a copy of these reports is entered into the System's official acquisition documents.

b) The Facility Chief Engineer shall ensure a copy of these reports is entered into the System's official technical record documents.

C. Work Not Included: Maintenance and repair service shall not include the performance of any work due to improper use; accidents; other vendor, contractor, or owner tampering or negligence, for which the Contractor is not directly responsible and does not control. The Contractor shall immediately notify the RE or Facility Contracting Officer in writing upon the discovery of these incidents. The RE or Facility Contracting Officer will investigate all reported incidents and render

4.3 TRAINING

A. Provide thorough training of all nursing staff assigned to those nursing units receiving new networked nurse/patient communications equipment. This training shall be developed and implemented to address two different types of staff. Floor nurses/staff shall receive training from their perspective, and likewise, unit secretaries (or any person whose specific responsibilities include answering patient calls and dispatching staff) shall receive operational training from their perspective. A separate training room will be set up that allows this type of individualized training utilizing in-service training unit, prior to cut over of the new system.

B. Provide the following minimum training times and durations:

1. ~~48~~12 hours prior to opening for nursing staff (in 8-hour increments) - split evenly over 3 weeks and day and night shifts. Coordinate schedule with Owner.

2. ~~32~~ hours during the opening week for nursing staff - both day and night shifts.

3. ~~24~~ hours for supervisors and system administrators.

~~5.0 ATTACHMENTS~~

~~A. The following items are required as a part of the system:~~

~~1. COTS Documents:~~

~~a.~~

CHECKLIST FOR SOFTWARE LICENSING AGREEMENTS
 (For use in commercial item acquisition [COTS] conforming to – FAR Part 12)

The Government may not be able to accept standard commercial licensing agreement without modification; <u>you must</u> negotiate terms and conditions so it is consistent with the FAR and the VAAR.		
Is the license (check all that apply):	Yes	No
Exclusive		
Non-exclusive		
Perpetual		
Limited term		
If limited term, state the period (months or years):		
If limited term, is there an automatic renewal provision?		
CPU based		
If CPU based, state number of machines and whether simultaneous use is permitted:		
Site license		
If site license, state the site/location:		
Network license		
Other basis (e.g., # of users, # of transactions, etc.) (state specifics)		
Applicable to only the current version (doesn't apply to future versions)		
Software maintenance included at no extra cost		
Allow for office relocation or transfer		
Allow copying for backup or archival purpose		
Allow no cost copy at disaster recovery site		
Restricted on Use: (see note below)		
Restricted on the processing of data by or for user's subsidiaries and affiliates		
Restricted on processing of third party data (or use in service bureau)		
Restricted on network use		
Restricted on site and equipment limitations		
Restricted on number of users (e.g., cannot exceed _____ # of users)		

Terms and Conditions that may need to be negotiated:	Yes	No
Does the license prohibit use of the software outside of the Government? If yes, this needs to be deleted/modified if other Government contractors need access to the software (as GFP) to fulfill obligations of their own contracts.		
Does license state that the software is Year 2000 compliant or include a Year 2000 warranty? If no, must ensure it is compliant per FAR 39 or include a Y2K warranty.		
Does the license state that it provides no warranties or guarantees of any kind? If yes, need to determine whether additional warranty would be in the best interest of the Government.		
Does the license warrant that the software does not contain any code (e.g., virus) that will disable the software, and if such code exists, that Licensor agrees to indemnify the licensee (user) for all damages suffered as a result of such code? If no, need to negotiate for such warranty.		
Does the license allow access to source code? If no, negotiate for access if software will be modified or customized for the Government's needs or if the Government intends to maintain the software itself.		
Does the license require Licensor to deposit source code in escrow account? If no and source code is needed, consider negotiating for this provision, and state what "release conditions" are.		
Does the license allow the Government to hold the rights to customized code and to the data that the software manipulates? If no, negotiate for the rights if the Government (customer) requires them.		
Does the license authorize us to copy user manuals for internal purposes? If no, negotiate for authorization if multiple copies must be made for our internal use or ensure that the vendor supplies adequate number of copies. May also negotiate for updated manuals at periodic intervals, e.g., with each major update.		
Does the license state that licensee modifications to the software void all warranties? If yes, ensure that the vendor still warrants the unmodified portions.		
Does the license include clauses that prohibit needed uses of software, restrict the use of output from the software, or inappropriately burden the operation of the computer facilities? If yes, need to negotiate better terms and conditions.		
Is the dispute clause in the license consistent with FAR 52.233-1, Disputes Clause? If no, then need to modify license to be consistent with FAR.		
Does the default clause in the license allow for the Government to terminate for convenience or for cause, consistent with FAR 52.212-4(l) or FAR 52.212-4(m)? If no, then need to modify license to be consistent with FAR Part 12 (not FAR Part 49).		

b.

SOLICITATION/CONTRACT/ORDER FOR COMMERCIAL ITEMS			1. REQUISITION NUMBER		PAGE 1 OF
OFFEROR TO COMPLETE BLOCKS 12, 17, 23, 24, & 30					7
2. CONTRACT NO.	3. AWARD/EFFECTIVE DATE DATE SEE BLOCK 31C	4. ORDER NUMBER	5. SOLICITATION NO.		6. SOLICITATION ISSUE DATE
7. FOR SOLICITATION INFORMATION	a. NAME		b. TELEPHONE NUMBER (No collect calls)		8. OFFER DUE DATE/ LOCAL TIME
9. ISSUED BY:	CODE	10. THIS ACQUISITION IS <input type="checkbox"/> UNRESTRICTED <input type="checkbox"/> SETASIDE: 100% FOR <input type="checkbox"/> SMALL BUSINESS <input type="checkbox"/> HUBZONE SMALL BUSINESS <input type="checkbox"/> 8(A) NAICS: 541511 SIZE STANDARD:		11. DELIVERY FOR FOB DESTINATION UNLESS BLOCK IS MARKED <input type="checkbox"/> SEE SCHEDULE <input type="checkbox"/> 13a. THIS CONTRACT IS A RATED ORDER UNDER DPAS (15 CFR 700) 13b. RATING	12. DISCOUNT TERMS
15. DELIVER TO	CODE	16. ADMINISTERED BY		CODE	
		See #9 above			
17a. CONTRACTOR/ CODE	OFFEROR	FACILITY CODE	18a. PAYMENT WILL BE MADE BY UNITED STATES OF AMERICA Department of Veterans Affairs FMS P.O. Box 149971 Austin, TX 78714 8971		
TELEPHONE NO: 703.246.0392					
<input type="checkbox"/> 17b. CHECK IF REMITTANCE IS DIFFERENT AND PUT SUCH ADDRESS IN OFFER			18b. SUBMIT INVOICES TO ADDRESS SHOWN IN BLOCK 18a. UNLESS BLOCK BELOW IS CHECKED <input checked="" type="checkbox"/> SEE ADDENDUM		

19. ITEM NO.	20. SCHEDULE OF SUPPLIES/SERVICES	21. QUANTI TY	22. UNI T	23. UNIT PRICE	24. AMOUNT
	See page 2 Use Reverse and/or (Attach Additional Sheets as Necessary)				
25. ACCOUNTING AND APPROPRIATION DATA				26. TOTAL AWARD AMOUNT (For Govt. Use Only)	

~~27a.~~ SOLICITATION INCORPORATES BY REFERENCE FAR 52.212 1, 52.212 4, FAR 52.212 3 AND 52.212 5 ARE ATTACHED. ~~ADDENDA~~ ARE NOT ATTACHED.

~~27b.~~ CONTRACT/PURCHASE ORDER INCORPORATES BY REFERENCE FAR 52.212 4, 52.227 14, 52.227 16, and 52.227 19. ~~ADDENDA~~ ARE ATTACHED. ARE NOT ATTACHED.

~~28.~~ CONTRACTOR IS REQUIRED TO SIGN THIS DOCUMENT AND RETURN 1 COPIES TO ISSUING OFFICE. CONTRACTOR AGREES TO FURNISH AND DELIVER ALL ITEMS SET FORTH OR OTHERWISE IDENTIFIED ABOVE AND ON ANY ADDITIONAL SHEETS SUBJECT TO THE TERMS AND CONDITIONS SPECIFIED HEREIN.

~~29.~~ AWARD OF CONTRACT: REF. _____ OFFER DATED _____. YOUR OFFER ON SOLICITATION (BLOCK 5), INCLUDING ANY ADDITIONS OR CHANGES WHICH ARE SET FORTH HEREIN, IS ACCEPTED AS TO ITEMS:

~~30a.~~ SIGNATURE OF OFFEROR/CONTRACTOR

~~31a.~~ UNITED STATES OF AMERICA (SIGNATURE OF CONTRACTING OFFICER)

30b. NAME AND TITLE OF SIGNER (Type or Print)	30c. DATE SIGNED	31b. NAME OF CONTRACTING OFFICER (Type or Print) Contracting Officer	31c. DATE SIGNED
---	-----------------------------	--	-----------------------------

~~AUTHORIZED FOR LOCAL REPRODUCTION PREVIOUS EDITION IS NOT USABLE~~ COMPUTER GENERATED **STANDARD FORM 1449** (REV. 4/2002) Prescribed By GSA FAR (48CFR) 53.212

19. ITEM NO.	20. SCHEDULE OF SUPPLIES/SERVICES	21. QUANTI TY	22. UNI T	23. UNIT PRICE	24. AMOUNT
---------------------------------------	--	--	--	---	-------------------------------------

~~This Contract is Firm Fixed Price (FFP). The Contractor is required to provide the software, software license, and software maintenance services for the computer software identified below. Distribution of maintenance copies shall be accomplished by using an appropriate magnetic, electronic or printed media. Software maintenance includes periodic updates, enhancements and corrections to the software, and reasonable technical support, all of which are customarily provided by the Contractor to its customers.~~

~~The name of the software is: Word 2008
License Type: Perpetual or Term????
Software Manufacturer: Microsoft~~

Governing Law. ~~Federal law and regulations, including the Federal Acquisition Regulations ("FAR"), shall govern this Contract or Order (Contract/Order). Commercial license agreements may be made a part of this Contract/Order but only if both parties expressly make them an addendum. If the commercial license agreement is not made an addendum, it shall not apply, govern, be a part of or have any effect whatsoever on this Contract/Order; this includes, but is not limited to, any agreement embedded in the computer software (clickwrap) or any agreement that is otherwise delivered with or provided to the Government with the commercial computer software or documentation (shrinkwrap), or any other license agreement otherwise referred to in any document. If a commercial license agreement is made an addendum, only those provisions addressing data rights regarding the Government's use, duplication and disclosure of data (e.g., restricted computer software) are included and made a part of this Contract/Order, and only to the extent that those provisions are not duplicative or inconsistent with Federal law, Federal regulation or the incorporated FAR clauses; those provisions in the commercial license agreement that do not address data rights regarding the Government's use, duplication and disclosure of data shall not be included or made a part of the Contract/Order. Federal law and regulation, including without limitation, the Contract Disputes Act (41 U.S.C. §601-613), the Anti-Deficiency Act (31 U.S.C. §1341 et seq.), the Competition in Contracting Act (41 U.S.C. §251, et seq), the Prompt Payment Act (31 U.S.C. §3901, et seq.) and FAR clauses 52.212-4, 52.227-14, 52.227-19 shall supersede, control and render ineffective any inconsistent, conflicting or duplicative provision in any commercial license agreement. In the event of conflict between this clause and any provision in the Contract/Order or the commercial license agreement or elsewhere, the terms of this clause shall prevail. Claims of patent or copyright infringement brought against the Government as a party shall be defended by the U.S. Department of Justice (DOJ). 28 U.S.C. § 516. At the discretion of DOJ, the Contractor may be allowed reasonable participation in the defense of the litigation. Any additional changes to the Contract/Order must be made by contract modification (Standard Form 30). Nothing in this Contract/Order or any commercial license~~

1	Microsoft Word 2008 Software License, Part No. 9891-7069. Software may be installed on four separate personal computers and be used by any VA employee or support service contractor. Licenses are perpetual.	4	EA	\$10,000.00	\$40,000.00
2	12 months of Standard Microsoft Word Software Maintenance and Technical Support Services for the software being acquired under CLIN 1; Part No. 9891-7069.	4	EA	\$2,500.00	\$10,000.00
	Total				\$50,000.00

32a. QUANTITY IN COLUMN 21 HAS BEEN
 RECEIVED INSPECTED ACCEPTED, AND CONFORMS TO THE CONTRACT,
 EXCEPT AS NOTED*

32b. SIGNATURE OF AUTHORIZED GOVT. REPRESENTATIVE	32c. DATE	32d. PRINTED NAME AND TITLE OF AUTHORIZED GOVERNMENT REPRESENTATIVE
32e. MAILING ADDRESS OF AUTHORIZED GOVERNMENT REPRESENTATIVE		32f. TELEPHONE NO. OF AUTHORIZED GOVERNMENT REPRESENTATIVE

32g. E-MAIL OF AUTHORIZED GOVERNMENT REPRESENTATIVE

33. SHIP NUMBER	34. VOUCHER NUMBER	35. AMOUNT VERIFIED CORRECT FOR	36. PAYMENT <input type="checkbox"/> COMPLETE <input type="checkbox"/> PARTIAL <input type="checkbox"/> FINAL	37. CHECK NUMBER
-----------------	--------------------	------------------------------------	--	------------------

PARTIAL
 FINAL

38. S/R ACCOUNT NUMBER	39. S/R VOUCHER NUMBER	40. PAID BY
------------------------	------------------------	-------------

41a. I CERTIFY THIS ACCOUNT IS CORRECT AND PROPER FOR PAYMENT	42a. RECEIVED BY (Print)
41b. SIGNATURE AND TITLE OF CERTIFYING OFFICER	42b. RECEIVED AT (Location)
41c. DATE	42c. DATE REC'D (YY/MM/DD)
	42d. TOTAL CONTAINERS

STANDARD FORM
 1449 (REV. 4/2002) BACK

ADDENDUM A ADDITIONAL TERMS AND CONDITIONS FOR CONTRACT # _____ OR
 ORDER# _____

A.1 Federal Acquisition Regulation (FAR) Incorporated by Reference. The Contractor agrees to comply with the following FAR clauses, which the Contracting Officer has indicated as being incorporated in this Contract/Order by reference, to implement provisions of law or executive orders applicable to acquisitions of this nature, to implement department policy or to clarify the Government's requirement. Copies of clauses in full text will be provided on request. FAR Clauses can be viewed at <http://www.arnet.gov/far/>.

- 1) ~~FAR 52.212-4, Contract Terms and Conditions Commercial Items (Oct 2003)~~
- 2) ~~FAR 52.227-14, Rights in Data General (Dec 2007), Alt III~~
- 3) ~~FAR 52.227-16, Additional Data Requirements (Jun 1987)~~
- 4) ~~FAR 52.227-19, Commercial Computer Software License (Dec 2007)~~

~~**A.2 Contracting Officer's Authority.** The Contracting Officer is the only person authorized to make or approve any changes in any of the requirements of this Contract, and notwithstanding any provisions contained elsewhere in this Contract/Order, the said authority remains solely within the Contracting Officer. In the event the Contractor makes any changes at the direction of any person other than the Contracting Officer, the changes will be considered to have been made without authority and no adjustment will be made in the contract price to cover any increase in costs incurred as a result thereof.~~

~~**A.3 VAAR 852.270-1 Representatives of Contracting Officers (APR 1984).** The Contracting Officer reserves the right to designate representatives to act for him/her in furnishing technical guidance and advice or generally supervise the work to be performed under this Contract/Order. Such designation will be in writing and will define the scope and limitations of the designee's authority. A copy of the designation shall be furnished the Contractor.~~

~~**A.4 VAAR 852.270-4 Commercial Advertising (NOV 1984).** The Contractor will not advertise the award of this Contract/Order in his/her commercial advertising in such a manner as to state or imply that the Department of Veterans Affairs endorses a product, project or commercial line of endeavor.~~

~~**A.5 VAAR 852.237-70 Contractor Responsibilities (APR 1984)** The Contractor shall obtain all necessary licenses and/or permits required to perform this work. He/she shall take all reasonable precautions necessary to protect persons and property from injury or damage during the performance of the Contract/Order. He/she shall be responsible for any injury to himself/herself, his/her employees, as well as for any damage to personal or public property that occurs during the performance of the Contract/Order that is caused by his/her employees fault or negligence, and shall maintain personal liability and property damage insurance having coverage for a limit as required by the laws of the state where services are performed. Further, it is agreed that any negligence of the Government, its officers, agents, servants and employees, shall not be the responsibility of the Contractor hereunder with the regard to any claims, loss, damage, injury, and liability resulting there from.~~

~~**A.6 Indemnification.** The Contractor shall save and hold harmless and indemnify the Government against any and all liability claims, and cost of whatsoever kind and nature for injury to or death of any person or persons and for loss or damage to any Contractor property or property owned by a third party occurring in connection with or in any way incident to or arising out of the occupancy, use service, operation, or performance of work under the terms of the Contract/Order, resulting in whole or in part from the acts or omissions of the Contractor, any subcontractor, or any employee, agent, or representative of the Contractor or subcontractor.~~

~~**A.7 Government's Liability.** The Government shall not be liable for any injury to the Contractor's personnel or damage to the Contractor's property~~

~~unless such injury or damage is due to negligence on the part of the Government and is recoverable under the Federal Torts Claims Act, or pursuant to other Federal statutory authority.~~

~~A.10 Uniform Computer Information Transaction Act (UCITA). UCITA is not applicable to the Contract/Order.~~

~~A.11 Software License and Software Maintenance Subscription and Technical Support.~~

~~(1) Definitions.~~

- ~~(a) Licensee. The term "licensee" shall mean the U.S. Department of Veterans Affairs ("VA") and is synonymous with "Government."~~
- ~~(a) Licensor. The term "licensor" shall mean the software manufacturer of the computer software being acquired. The term "Contractor" is the company identified in Block 17a on the SF1449. If the Contractor is a reseller and not the Licensor, the Contractor remains responsible for performance under this Contract.~~
- ~~(b) Software. The term "software" shall mean the licensed computer software product(s) cited in the Schedule of Supplies (Page 2).~~
- ~~(c) Maintenance. The term "maintenance" is the process of enhancing and optimizing software, as well as remedying defects. It shall include all new fixes, patches, releases, updates, versions and upgrades, as further defined below.~~
- ~~(d) Technical Support. The term "technical support" refers to the range of services providing assistance for the software via the telephone, email, a website or otherwise.~~
- ~~(e) Release or Update. The term "release" or "update" are terms that refer to a revision of software that contains defect corrections, minor enhancements or improvements of the software's functionality. This is usually designated by a change in the number to the right of the decimal point (e.g., from Version 5.3 to 5.4). An example of an update is the addition of new hardware.~~
- ~~(f) Version or Upgrade. The term "version" or "upgrade" are terms that refer to a revision of software that contains new or improved functionality. This is usually designated by a change in the number to the left of the decimal point (e.g., from Version 5.4 to 6).~~

~~(2) License. Grant of License and Term.~~

- ~~(a) See also Addendum B.~~
- ~~(a) Unless otherwise stated in the Schedule of Supplies/Services, the software license provided to the Government is a perpetual, nonexclusive license to use the software.~~
- ~~(b) The license authorizes the Government to use the software in processing data for other federal agencies.~~
- ~~(c) If the licensed software requires a password (or license key) to be operational, it shall be delivered with the software media and have no expiration date.~~
- ~~(d) If the Government decides to outsource or contract its services, the Government may allow the outsourcer to use the licensed software solely to provide the services on its behalf. The~~

~~outsourcer shall be bound by the provisions of this Contract relating to the use of the software.~~

- ~~(e) If the software is for use in a networked environment, as may be reflected by the number of servers or users described in the Contract/Order, the license grant provided by the Contractor includes the Government's use of the software in such environment.~~
- ~~(f) Any dispute regarding the license grant or usage limitations shall be resolved in accordance with the Disputes Clause incorporated in FAR 52.212-4(d).~~
- ~~(g) If the Government purchases additional licenses, the terms and conditions for those additional licenses (including technical support and upgrade subscription) shall be the same as agreed to in this Contract/Order, unless negotiated otherwise by mutual agreement of the parties.~~
- ~~(h) The licensed software contains critical product functionality that meets the minimum needs of the Government and is the basis for the Government's procurement of the software; consequently, the Contractor agrees that the Government has the right to successor products at no additional cost when functionality is later unbundled from the product licensed herein and bundled into a new or different product, provided the Government is current on maintenance.~~
- ~~(i) If the Contractor is a reseller for the computer software being acquired under this Contract/Order, it is permissible for the actual software manufacturer (Licensor) to deliver the software directly to the Government.~~
- ~~(j) All limitations of software usage are expressly stated in the SF 1449 and Addendum A and Addendum B.~~

~~(3) Software Maintenance Subscription and Technical Support.~~

- ~~(a) See also Addendum B.~~
- ~~(a) Software maintenance and technical support are included at the agreed upon price. However, if additional charges are assessed during the maintenance and technical support period as a result of negotiated changes in the license (e.g., CPU upgrades), the fee shall be by mutual agreement of the parties and any dispute thereof shall be resolved in accordance with the Disputes Clause incorporated herein at FAR 52.212-4(g).~~
- ~~(b) If the Government desires to continue software maintenance and support beyond the period identified in this Contract/Order, the Government will issue a separate contract or order to renew annual maintenance and technical support. Conversely, if an order or contract to renew software maintenance and technical support is not received, no assumption by the Contractor shall be made that it has been renewed. It shall not be automatically renewed.~~
- ~~(c) Unless otherwise agreed, for any new additional software that may be licensed, the Contractor shall provide for software maintenance and technical support for the first year of the license at no additional cost.~~
- ~~(d) Unless otherwise agreed, the Contractor shall provide VA with software maintenance, which includes periodic updates, upgrades, enhancements and corrections to the software, and reasonable technical support, all of which are customarily provided by the~~

- ~~Contractor to its customers so as to cause the software to perform according to its specifications, documentation or demonstrated claims.~~
- ~~(e) Any telephone support provided by Contractor shall be at no additional cost.~~
 - ~~(f) All technical support services will be provided in a timely manner in accordance with the Contractor's customary practice. However, prolonged delay in resolving software problems will be noted in the Government's various past performance records on the Contractor (e.g., www.ppirs.gov).~~
 - ~~(g) If the Government allows the maintenance and/or technical support to lapse and subsequently wishes to reinstate maintenance and technical support, any reinstatement fee charged shall not exceed the amounts that would have been charged if the Government had not allowed it to lapse.~~

~~**A.12 Disabling Software Code.** The Government requires delivery of computer software that does not contain any code that will, upon the occurrence or the nonoccurrence of any event, disable the software. Such code includes but is not limited to a computer virus, restrictive key, node lock, time out or other function, whether implemented by electronic, mechanical, or other means, which limits or hinders the use or access to any computer software based on residency on a specific hardware configuration, frequency of duration of use, or other limiting criteria. If any such code is present, the Contractor agrees to indemnify the Government for all damages suffered as a result of a disabling caused by such code, and the Contractor agrees to remove such code upon the Government's request at no extra cost to the Government. Inability of the Contractor to remove the disabling software code will be considered an inexcusable delay and a material breach of contract, and the Government may exercise its right to terminate for cause. In addition, the Government is permitted to remove the code as it deems appropriate and charge the Contractor for consideration for the time and effort in removing the code.~~

~~**A.13 Disaster Recovery Clause.** Government hereby certifies to Contractor that it has a bona fide disaster plan with respect to the computer software programs used in its operations. The Contract/Order authorizes the Government's operation to maintain a second copy of software on tape for use at loading at sites that are not live (e.g. subscription based disaster recovery services) for the sole purpose of duplicating or mirroring the software environment of the "primary" licenses at the designated licensed site and as described herein. Additionally, use of the software at the contingency sites must not include general access or any processing for program development or production. Contractor shall permit operation and testing of all licensed programs at the contingency sites as designated by the Government without prior approval and at no additional cost to the Government solely for the purpose of maintaining or implementing disaster recovery readiness including continuity of business operations. CPU's, MIPS or MSU's at these contingency sites are excluded from the total CPU's, MIPS or MSU's count included elsewhere in the Contract/Order and are not separately billable. Activation of operations at a contingency site shall be at Government's discretion. Government is authorized to install all software at the contingency sites for testing, problem resolution purposes, and to ensure there will be no operational delays in association with transition of workload from the designated licensed site to the contingency sites. Use of the software at the contingency sites in the event of a disaster shall~~

~~continue until such time as normal processing can be resumed at the "primary" site regardless of the duration required. Nothing in the Contract/Order diminishes the Government's rights in accordance with the data rights clause(s). Any license keys, codes, or passwords required by the Contractor in order to use the software at the contingency sites shall be provided to the Government within 10 days of the Government's request.~~

~~**A.14 NOTICE OF THE FEDERAL ACCESSIBILITY LAW AFFECTING ALL ELECTRONIC AND INFORMATION TECHNOLOGY PROCUREMENTS (SECTION 508)**~~

~~On August 7, 1998, Section 508 of the Rehabilitation Act of 1973 was amended to require that when Federal departments or agencies develop, procure, maintain, or use Electronic and Information Technology, that they shall ensure it allows Federal employees with disabilities to have access to and use of information and data that is comparable to the access to and use of information and data by other Federal employees.~~

~~Section 508 required the Architectural and Transportation Barriers Compliance Board (Access Board) to publish standards setting forth a definition of electronic and information technology and the technical and functional criteria for such technology to comply with Section 508. These standards have been developed were published with an effective date of December 21, 2000. Federal departments and agencies must develop all Electronic and Information Technology requirements to comply with the standards found in 36 CFR 1194 .__*_ in performing this contract. (Fill in Section Number and Title)~~

~~**ADDENDUM B - STATEMENT OF WORK FOR CONTRACT # _____ or ORDER# _____**~~

~~**B.1 License.** BROADLY DESCRIBE COMPUTING ENVIRONMENT AND HOW VA INTENDS TO USE THE SOFTWARE, HOW ITS LICENSED, WHAT THE SOFTWARE IS EXPECTED TO DO, ETC. TO GET YOU STARTED: The Department of Veterans Affairs (VA) has a need for the computer software identified on the Schedule of Supplies/Services (page 2) (software media and license) and software support services. The software will be installed **onto multiple servers** at the ITAC in Austin Texas for support/training/staging of the _____ Project. These are processor based licenses that allow for unlimited users utilizing the processor(s). Contractor shall grant the Government the necessary license to accommodate this need. VA may move the software to any other location or hardware at any time.~~

~~**B.2 Maintenance.** The Contractor will provide software maintenance services, which includes periodic updates, enhancements and corrections to the software, and reasonable technical support, all of which are customarily provided by the Contractor to its customers so as to cause the software to perform according to its specifications, documentation or demonstrated claims. **Add detailed, specific maintenance and support information here.** The Contractor will distribute maintenance updates or releases by using an appropriate magnetic, electronic, or printed media to the address in Block 15 of page one, but to the attention of **Joe Smith**. Alternatively, the Contractor may offer access to maintenance copies through its website. All maintenance services will be provided in a timely manner in accordance with the Contractor's customary practice. However, prolonged delay in resolving~~

Manhattan VAMC Bldg. 1 - 9th Floor Renovations
Manhattan Veteran's Affairs Medical Center
New York, New York

Revised: September 9, 2013
Addendum No. 2

~~software problems will be noted in the Government's various past performance records on the Contractor (e.g., www.ppirs.gov).~~

~~2. MOU~~

Department of
Veterans Affairs

Memorandum

Date: (Current Date)

From: Department of Veterans Affairs
Office of Telecommunications (005OP)
Spectrum Management (005OP2H3 – Room 047))
Telecommunications Voice Engineering (005OP2H2)
810 Vermont Avenue, NW
Washington, DC 20420

Subj: Memorandum of Understanding (MOU) for Non - VA Licensed Wireless Operations

To: Facility Director (00)
(Address)
(Address)

1. The following circumstances are the minimum necessary for conditional use of Wireless Equipment / System (s) in VA Owned or Leased Facilities (here-in after referred to as 'the Facility'). ~~VA Headquarters OI&T's (005) Spectrum Management (005OP2H3), Telecommunications Voice Engineering, Special Communications (TVE - 005OP2H2) and Office of Cyber Security (OCIS – 0050P2) are the responsible entities insuring conformity of each requirement:~~
 - a. Each item of equipment or system whose Radio Frequency (RF) equipment is listed under Consolidated Federal Regulations (CFR), Title 47 – Federal Communications Commission (FCC), Part 15, Chapter 7, *Use of Non Licensed Devices* must be installed and operated in a manner consistent with Part 15's "*Safety of Life*" restrictions. This information is re-emphasized in CFR, Title 15 – Department of Commerce, Under the Information Technology Management Reform Act (Public Law 104-106), National Telecommunications Information Administration (NTIA) *Manual of Regulations and Procedures for Federal Radio Frequency Management* (aka 'The Red Book').
 - b. FCC Part 15 listed RF devices **shall not** be Installed or used in areas where "*Safety of Life*" functions / operations are accomplished or where a 'Code Blue' enunciation may occur. A list of the minimum areas affected by this statement is provided as Attachment One.
 - c. If external or internal interference is detected and cannot be corrected, **the FCC Part 15 Listed RF Equipment affected must be turned off until corrections and/or substitutions can be made.** Contact VA's Office of Spectrum Management (OSM – 005OP2H3), 202 461-5301 for specific conditional approval(s) concerning this issue.

~~3. Risk Assessment~~

~~Department of
Veterans Affairs~~

Memorandum

~~Date: (current date)~~

~~From: Director (XXXXX)
Address
Address
Address~~

~~Subj: VA Headquarters (VACO) Memorandum of Understanding (MOU) for
Federal Communications Commission (FCC) Part 15 Listed "Non Regulated
Equipment Wireless Operations"~~

~~To: Department of Veterans Affairs
Office of Telecommunications (0050P)
Spectrum Management (0050P2H3)
Telecommunications Voice Engineering (0050P2H2)
1335 East West Highway, 3rd Floor
Silver Spring, Maryland 20420~~

~~1. We have received the subject VACO MOU (signed copy attached), and
are pleased to provide the following information and comments for your
review that includes our risks and risk mitigation factors that
prompted our Facility's decision:~~

~~a. RISK ASSESSMENT AND MITIGATION:~~

~~(1) Background:~~

~~(a) (name) VAMC (here in after referred to as "the
Facility") has used (OEM Mdl Nr@) for over 10 years to allow nurses
in the telemetry studio to communicate with nurses at the patients'
bedside. This communication medium is a vital patient safety tool
that allows for rapid response to the development of a potentially
fatal arrhythmia such as ventricular tachycardia. The only
information the telemetry technician states on the phone is "bed 109 2
Smith has an alarm for XXXXX." Last four is never communicated. In
terms of the pager we have limited the information on the pager to
sector, bed number and last name. We must include the last name as
occasionally the patients are moved without the knowledge of the
telemetry technician, if we were to have a patient mix up the page
must contain the last name for safety reasons. Facility Management
Services (FMS) has restricted paging access to the telemetry system
only. Because pager access is restricted, only an administrator from
Technology and Information Management (TIM) or FMS can troubleshoot a
pager malfunction.~~

VAMC (City), (State ZIP Code), Unregulated FCC Equipment Use, Risk Assessment and Mitigation, Page Two

~~(b) Because the phones are used 24x7 and have exceeded their life expectancy, many of them have begun to fail which creates a need to purchase newer models that will continue to insure system integrity.~~

~~(c) Our Facility has been prevented from purchasing replacement phones because VACO now has updated security and Information Technology (IT) connection controls along with continuing FCC Part 15 restrictions (described in the attached MOU) on devices of which these wireless phones are but one example. These updated security and connection controls are in place to address risks related life safety, information security, personal privacy and IT system integrity. The FCC restrictions continue to warn against the use of "non-regulated radio / wireless based equipment in safety of life locations and functions." Of note, these controls are intended to prevent use of these devices in areas especially where a code blue announcement might occur, yet our devices have been used in such areas for over 10 years and so far has not prevented a code blue announcement from happening.~~

~~(d) Because the Facility does not have a near term alternative to the current wireless phones, it now faces a set of competing risks. On the one hand are the risks of privacy, connection and interference or security breach(s) that are behind the controls in place for these devices. On the other hand are risks to patient safety if the current phones were to fail and telemetry nurses would lose the ability to rapidly communicate with nurses at the bedside. Our Facility does have a Life Safety approved Nurses Call / Code Blue hardwired system that is installed in those affected areas as the primary Code Blue Enunciation media.~~

~~(2) SECURITY:~~

~~(a) NEC provides a proprietary scrambling algorithm that is applied to handset registration / authentication and all communications. Every time a (OEM Mdl Nr@) user enters a designated area within the systems' coverage; an automatic user authentication process is performed to confirm the device is authorized for service on the system. This information is scrambled using a proprietary coding scheme to prevent duplication. All voice conversations are also scrambled to enhance security.~~

~~(b) The (OEM Mdl Nr@) has several built in security features in each of the wireless handsets are administered through the Facility's Telephone Private Branch Exchange (PBX) administration tool; therefore, the PBX Administrator has full control over the (OEM Mdl Nr@) wireless phones, if one gets lost or stolen it can be disabled immediately. Because of this feature you cannot purchase a similar wireless phone and have it work on our network. These phones have a 50 ft radius from the Zone radio frequency (RF) transceiver; they can only be used within the hospital as there is no handoff via other cellular networks.~~

~~(c) These items are not NIST FIPS compliant; but based on the aforementioned facts, we feel patient / staff privacy and HIPAA instructions have been and will continue to be met.~~

~~(d) Our Facility will work with (OEM) and VACO's Office of Cyber Security (Name and Phone Nr) to secure the appropriate NIST FIPS certifications will allow VA to issue a Official Approvals from the onset in the IT equipment / system procurement process.~~

~~VAMC (City), (State ZIP Code), Unregulated FCC Equipment Use, Risk Assessment and Mitigation, Page Three~~

~~(3) RADIO FREQUENCY (RF) INTERFERENCE:~~

~~(a) (OEM) engineers provided us with extensive information on the potential for RF along with electromagnetic (EM) interference to medical equipment within our Facility from the (OEM System) Wireless radio transceivers.~~

~~1) Field Experience: Since introduction of the (OEM System) Wireless product in 1996, NEC has installed this system at many health care institutions across the spectrum of medical departments. In all this time there have been zero reports of either suspected or actual RF and EM interference. This includes the experience using these devices at Portland VAMC and our continued testing documentation is available for review if requested.~~

~~2) Potential interference called Near Field Coupling: In these cases, an EM field emanating from one device may cause another device within its field area to malfunction. Typically the distances for these fields are less than six (6) inches. In attempts to mitigate these sources of interference, standards have been put in place, namely IEC 60601. This standard calls for devices susceptible to interference to provide shielding against fields of up to three (3) Volts per Meter. In contrast, the (OEM System) wireless products are classified under the FCC Part 15 rules as Class B unlicensed devices, and as such must meet very tight restrictions regarding field emissions of a maximum of from 100 to 500 micro (μ) Volts per Meter across the band of RFs from 30 Hz to 18 GHz. Thus, any medical device even marginally meeting the IEC Standard has not had problems with any near field emissions.~~

~~3) Potential phenomenon known as Far Field Induced RFI should be considered when studying RF and EM interference sources. In this case, a part of the device subject to interference (e.g., a wire, probe, or the casing itself) can inadvertently act as a receiving antenna for a signal transmitted from another device within close proximity (within 6 to 18 inches, depending on the source power levels). To realize this type of interference, the source transmitter power must be fairly strong to conduct through the inefficient nature of the unintended antenna of the receiving device, and the material acting as the antenna must be of a shape and length that matches or is a near multiple of the wavelength of the transmitted RF signal. Finally, this unintentional antenna must not have the typical shielding between it and the subject device's electronics, which if~~

~~present would prevent such a received signal from causing interference. In the case of the (OEM System) Wireless transmission, which operates between 1,920 MHz and 1,930 MHz, a probe or such piece of any medical device measuring at about six (6) inches would match the wavelength of the RF carrier, and if not properly shielded from the units electronics may indeed conduct the RF energy within. However, even in this case, one must consider the power level at the so-called antenna receiving the signal. The average output of the (OEM Mdl Nr@) handset is approximately 10 mili (m) Watts when in use. This very low power, even further reduced by the distance between any handset in use and the subject receiving equipment, considered along with the high loss of the "antenna", results in a very low probability of actual interference. These facts, along with the standard procedures of your engineering department's efforts to check the medical equipment for such shielding and filtering defects, should mitigate this potential source.~~

~~4) Potential interference between intentional radiators operating in the RF band. Known as either in band or out-of-band interference, these are cases where a transmitter broadcasts a signal of significant power at the other device's receiver to either overload the receiving radio or mix with the subject's transmitted signal to cause an interfered signal to be received. In band interference~~
~~VAMC (City), (State - ZIP Code), Unregulated FCC Equipment Use, Risk Assessment and Mitigation, Page Four~~

~~in the Unlicensed PCS band of which the (OEM System) Wireless system operates is prevented by the FCC rules requiring our equipment to monitor the carrier on which a device intends to transmit on before doing so, so as to sense any current use by another device. If such a signal is received during monitoring, we move to another carrier and try again. This protocol has been demonstrated many times within the FCC labs as well as at many industry trade shows where 5 or more vendors with U-PCS devices have operated in booths close to each other without interference. As for out-of-band interference, because of the extremely low power our devices operate with and the very strict out-of-band emission requirements placed upon the U-PCS devices, and the additional factor of a wide separation in the operating frequencies of our system and the typical radio telemetry equipment used in many hospital environments, such interference is very remote and would require extremely close proximity of the two devices.~~

~~5) All of our (OEM Mdl Nr@) are FCC listed and has not interfered with other traffic within the same band. We expect the FCC listed (OEM Mdl Nr@) equipment will perform in the same manner.~~

~~(b) Our Facility will work with (OEM) and VACO's Spectrum Management (0050P2H3) to find a RF band that can be utilized for this operation that will allow VA to issue a formal and Official Radio Use Permit that will negate the "unregulated equipment use" issues.~~

~~(4) CONNECTION TO IT/CABLE NETWORKS:~~

~~(a) Each item or system that attaches to a VA IT Network (telephone or data) must be Department of Commerce's National Recognized Testing Laboratory (NRTL) Underwriters Laboratory (UL) 60950 1/2; Information Technology Equipment - Safety listed and bears UL's mark.~~

~~1) Paragraph 1.1.1; Equipment Covered by this Standard specifically identifies these systems / networks as one affected system.~~

~~2) Paragraph 1.1.2; Additional Requirements further identifies this requirement for electromedical applications with physical connections to the patient be met.~~

~~(b) This requirement is paramount since the Facility's Telephone PABX and associated system is listed by the National Fire Protection Association as Critical Service. Additionally, since it carries our Code Blue Radio and Overhead Audio Paging Signals, VA elevates it to Life Safety Service.~~

~~(c) Presently the (OEM Mdl Nr) wireless phones are UL Listed but does not have the aforementioned specific UL certification. Our Facility is working with (The OEM) in this arena to have them meet or exceed this UL requirement. In the meantime we will abide within the confines outlined in the attached MOU for insuring an approved IT Network / System connection is maintained until the appropriate UL certification has been obtained allowing it to be directly connected to our telephone system.~~

~~b. The Facility Director after careful review of the attached MOU and consultation with the Facility's CIO, (OEM) engineers, Biomedical and NFPA Engineers, ISO, HIPAA / Privacy Officer, Clinical Staff and JACHAO Officials has decided this risk benefit analysis strongly favors purchasing replacement (OEM Mdl Nr) phones.~~

~~VAMC (City), (State - ZIP Code), Unregulated FCC Equipment Use, Risk Assessment and Mitigation, Page Four~~

~~2. Please feel free to contact me concerning the contents of this document.~~

~~DIRECTOR'S NAME IN CAPS~~

~~cc: _____ Office of General Counsel
_____ Office of Telecommunications (05)
_____ VA Enterprise Infrastructure Engineering
_____ Telecommunications Engineering and Design
_____ Office of Cyber Security~~

Manhattan VAMC Bldg. 1 - 9th Floor Renovations
Manhattan Veteran's Affairs Medical Center
New York, New York

Revised: September 9, 2013
Addendum No. 2

Attachment: ~~VACO MOU~~

- - - E N D - - -

SECTION 28 31 00
FIRE DETECTION AND ALARM

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section of the specifications includes the furnishing, installation, and connection of the fire alarm equipment to form a complete coordinated system ready for operation. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, control units, fire safety control devices, power supplies, and wiring as shown on the drawings and specified. The fire alarm system shall not be combined with other systems such as building automation, energy management, security, etc. this specification provides the basis for a campus type fire alarm system with buildings containing voice communications systems for a defend in place occupancy (healthcare).
- B. Fire alarm systems shall comply with requirements of the most recent VA FIRE PROTECTION DESIGN MANUAL and NFPA 72. The design, system layout, document submittal preparation, and supervision of installation and testing shall be provided by a technician that is certified NICET level III or a registered fire protection engineer. The NICET certified technician shall be on site for the supervision and testing of the system. Factory engineers from the equipment manufacturer, thoroughly familiar and knowledgeable with all equipment utilized, shall provide additional technical support at the site as required by the Resident Engineer or his authorized representative. Installers shall have a minimum of 2 years experience installing fire alarm systems.
- C. Building 1 shall have an automatic digitized voice fire alarm signal with emergency manual voice override to notify occupants to evacuate. The digitized voice message shall identify the area of the building (smoke zone) from which the alarm was initiated.
- D. Alarm signals (by device), supervisory signals (by device) and system trouble signals (by device not reporting) shall be distinctly transmitted to the main fire alarm system control unit monitored by police 24/7 and reporting to main annunciator in engineering building.

1.2 SCOPE

- A. Fully addressable fire alarm system on the 9th floor and 10th floor (MER Room only) of existing Building 1.

- B. The new addressable system shall be an extension of the existing Honeywell Notifier System addressable fire alarm system recently installed.
- C. A DGP is located in the existing elevator lobby on the 9th floor core area.
- D. Basic Performance:
 - 1. Alarm and trouble signals from each building fire alarm control panel shall be digitally encoded by UL listed electronic devices onto a multiplexed communication system.
 - 2. Response time between alarm initiation (contact closure) and recording at the main fire alarm control unit (appearance on alphanumeric read out) shall not exceed 5 seconds.
 - 3. The signaling line circuits (SLC) between building fire alarm control units shall be wired Style 7 in accordance with NFPA 72. Isolation shall be provided so that no more than one building can be lost due to a short circuit fault.
 - 4. Initiating device circuits (IDC) shall be wired Style C in accordance with NFPA 72.
 - 5. Signaling line circuits (SLC) within buildings shall be wired Style 4 in accordance with NFPA 72. Individual signaling line circuits shall be limited to covering 22,500 square feet (2,090 square meters) of floor space or 3 floors whichever is less.
 - 6. Notification appliance circuits (NAC) shall be wired Style Y in accordance with NFPA 72.

1.3 RELATED WORK

- A. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES. Requirements for procedures for submittals.
- B. Section 07 84 00 - FIRESTOPPING. Requirements for fire proofing wall penetrations.
- C. Section 08 71 00 - DOOR HARDWARE. For combination Closer-Holder.
- D. Section 21 13 13 - WET-PIPE SPRINKLER SYSTEMS. Requirements for sprinkler systems.
- E. Section 28 05 00 - COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY. Requirements for general requirements that are common to more than one section in Division 28.
- F. Section 28 05 13 - CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY. Requirements for conductors and cables.

- G. Section 28 05 26 - GROUNDING AND BONDING FOR ELECTRONIC SAFETY AND SECURITY. Requirements for grounding of equipment.
- H. Section 28 05 28.33 - CONDUITS AND BACKBOXES FOR ELECTRONIC SAFETY AND SECURITY. Requirements for infrastructure.
- I. Section 28 05 13 - CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY. Requirements for conductors and cables.
- J. Section 28 08 00, COMMISSIONING OF ELECTRONIC SAFETY AND SECURITY SYSTEMS. Requirements for commissioning - systems readiness checklists, and training.
- K. Section 28 13 00, PHYSICAL ACCESS CONTROL SYSTEMS (PACS). Requirements for integration with physical access control system.

1.4 SUBMITTALS

- A. General: Submit 5 copies in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, and Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.
- B. Drawings:
 - 1. Prepare drawings using AutoCAD Release 14 software and include all contractors information. Layering shall be by VA criteria as provided by the Contracting Officer's Technical Representative (COTR). Bid drawing files on AutoCAD will be provided to the Contractor at the pre-construction meeting. The contractor shall be responsible for verifying all critical dimensions shown on the drawings provided by VA.
 - 2. Floor Plans: Provide locations of all devices (with device number at each addressable device corresponding to control unit programming), appliances, panels, equipment, junction/terminal cabinets/boxes, risers, electrical power connections, individual circuits and raceway routing, system zoning; number, size, and type of raceways and conductors in each raceway; conduit fill calculations with cross section area percent fill for each type and size of conductor and raceway. Only those devices connected and incorporated into the final system shall be on these floor plans. Do not show any removed devices on the floor plans. Show all interfaces for all fire safety functions.
 - 3. Riser Diagrams: Provide, for the entire system, the number, size and type of riser raceways and conductors in each riser raceway and number of each type device per floor and zone. Show door holder

interface, elevator control interface, HVAC shutdown interface, fire extinguishing system interface, and all other fire safety interfaces. Show wiring Styles on the riser diagram for all circuits. Provide diagrams both on a per building and campus wide basis.

4. Detailed Wiring Diagrams: Provide for control panels, modules, power supplies, electrical power connections, auxiliary relays and annunciators showing termination identifications, size and type conductors, circuit boards, LED lamps, indicators, adjustable controls, switches, ribbon connectors, wiring harnesses, terminal strips and connectors, spare zones/circuits. Diagrams shall be drawn to a scale sufficient to show spatial relationships between components, enclosures and equipment configuration.
5. Two weeks prior to final inspection, the Contractor shall deliver to the COTR 3 sets of as-built drawings and one set of the as-built drawing computer files (using AutoCAD 2007 or later). As-built drawings (floor plans) shall show all new and/or existing conduit used for the fire alarm system.

C. Manuals:

1. Submit simultaneously with the shop drawings, companion copies of complete maintenance and operating manuals including technical data sheets for all items used in the system, power requirements, device wiring diagrams, dimensions, and information for ordering replacement parts.
 - a. Wiring diagrams shall have their terminals identified to facilitate installation, operation, expansion and maintenance.
 - b. Wiring diagrams shall indicate internal wiring for each item of equipment and the interconnections between the items of equipment.
 - c. Include complete listing of all software used and installation and operation instructions including the input/output matrix chart.
 - d. Provide a clear and concise description of operation that gives, in detail, the information required to properly operate, inspect, test and maintain the equipment and system. Provide all manufacturer's installation limitations including but not limited to circuit length limitations.

- e. Complete listing of all digitized voice messages.
 - f. Provide standby battery calculations under normal operating and alarm modes. Battery calculations shall include the magnets for holding the doors open for one minute.
 - g. Include information indicating who will provide emergency service and perform post contract maintenance.
 - h. Provide a replacement parts list with current prices. Include a list of recommended spare parts, tools, and instruments for testing and maintenance purposes.
 - i. A computerized preventive maintenance schedule for all equipment. The schedule shall be provided on disk in a computer format acceptable to the VAMC and shall describe the protocol for preventive maintenance of all equipment. The schedule shall include the required times for systematic examination, adjustment and cleaning of all equipment. A print out of the schedule shall also be provided in the manual. Provide the disk in a pocket within the manual.
 - j. Furnish manuals in 3 ring loose-leaf binder or manufacturer's standard binder.
 - k. A print out for all devices proposed on each signaling line circuit with spare capacity indicated.
2. Two weeks prior to final inspection, deliver 4 copies of the final updated maintenance and operating manual to the COTR.
 - a. The manual shall be updated to include any information necessitated by the maintenance and operating manual approval.
 - b. Complete "As installed" wiring and schematic diagrams shall be included that shows all items of equipment and their interconnecting wiring. Show all final terminal identifications.
 - c. Complete listing of all programming information, including all control events per device including an updated input/output matrix.
 - d. Certificate of Installation as required by NFPA 72 for each building. The certificate shall identify any variations from the National Fire Alarm Code.
 - e. Certificate from equipment manufacturer assuring compliance with all manufacturers installation requirements and satisfactory system operation.

D. Certifications:

1. Together with the shop drawing submittal, submit the technician's NICET level III fire alarm certification as well as certification from the control unit manufacturer that the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer. Include in the certification the names and addresses of the proposed supervisor of installation and the proposed performer of contract maintenance. Also include the name and title of the manufacturer's representative who makes the certification.
2. Together with the shop drawing submittal, submit a certification from either the control unit manufacturer or the manufacturer of each component (e.g., smoke detector) that the components being furnished are compatible with the control unit.
3. Together with the shop drawing submittal, submit a certification from the major equipment manufacturer that the wiring and connection diagrams meet this specification, UL and NFPA 72 requirements.

1.5 WARRANTY

All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of one (1) year from the date of acceptance of the entire installation by the Contracting Officer.

1.6 GUARANTY PERIOD SERVICES

- A. Complete inspection, testing, maintenance and repair service for the fire alarm system shall be provided by a factory trained authorized representative of the manufacturer of the major equipment for a period of five (5) years from the date of acceptance of the entire installation by the Contracting Officer.
- B. Contractor shall provide all necessary test equipment, parts and labor to perform required inspection, testing, maintenance and repair.
- C. All inspection, testing, maintenance and permanent records required by NFPA 72, and recommended by the equipment manufacturer shall be provided by the contractor. Work shall include operation of sprinkler system alarm and supervisory devices. It shall include all interfaced equipment including but not limited to elevators, HVAC shutdown, and extinguishing systems.

- D. Maintenance and testing shall be performed in accordance with NFPA 72. A computerized preventive maintenance schedule shall be provided and shall describe the protocol for preventive maintenance of equipment. The schedule shall include a systematic examination, adjustment and cleaning of all equipment.
- E. Non-included Work: Repair service shall not include the performance of any work due to improper use, accidents, or negligence for which the contractor is not responsible.
- F. Service and emergency personnel shall report to the Engineering Office or their authorized representative upon arrival at the hospital and again upon the completion of the required work. A copy of the work ticket containing a complete description of the work performed and parts replaced shall be provided to the VA Resident Engineer or his authorized representative.
- G. Emergency Service:
1. Warranty Period Service: Service other than the preventative maintenance, inspection, and testing required by NFPA 72 shall be considered emergency call-back service and covered under the warranty of the installation during the first year of the warranty period, unless the required service is a result of abuse or misuse by the Government. Written notification shall not be required for emergency warranty period service and the contractor shall respond as outlined in the following sections on Normal and Overtime Emergency Call-Back Service. Warranty period service can be required during normal or overtime emergency call-back service time periods at the discretion of the Resident Engineer or his authorized representative.
 2. Normal and overtime emergency call-back service shall consist of an on-site response within 2 hours of notification of a system trouble.
 3. Normal emergency call-back service times are between the hours of 7:30 a.m. and 4:00 p.m., Monday through Friday, exclusive of federal holidays. Service performed during all other times shall be considered to be overtime emergency call-back service. The cost of all normal emergency call-back service for years 2 through 5 shall be included in the cost of this contract.
 4. Overtime emergency call-back service shall be provided for the system when requested by the Government. The cost of the first 40

manhours per year of overtime call-back service during years 2 through 5 of this contract shall be provided under this contract. Payment for overtime emergency call-back service in excess of the 40 man hours per year requirement will be handled through separate purchase orders. The method of calculating overtime emergency call-back hours is based on actual time spent on site and does not include travel time.

- H. The contractor shall maintain a log at each fire alarm control unit. The log shall list the date and time of all examinations and trouble calls, condition of the system, and name of the technician. Each trouble call shall be fully described, including the nature of the trouble, necessary correction performed, and parts replaced.

1.7 APPLICABLE PUBLICATIONS

- A. The publications listed below (including amendments, addenda, revisions, supplements and errata) form a part of this specification to the extent referenced. The publications are referenced in text by the basic designation only and the latest editions of these publications shall be applicable.
- B. National Fire Protection Association (NFPA):
 - NFPA 13Standard for the Installation of Sprinkler Systems, 2010 edition
 - NFPA 14 Standard for the Installation of Standpipes and Hose Systems, 2010 edition
 - NFPA 20 Standard for the Installation of Stationary Pumps for Fire Protection, 2010 edition
 - NFPA 70.....National Electrical Code (NEC), 2010 edition
 - NFPA 72.....National Fire Alarm Code, 2010 edition
 - NFPA 90A.....Standard for the Installation of Air Conditioning and Ventilating Systems, 2009 edition
 - NFPA 101.....Life Safety Code, 2009 edition
- C. Underwriters Laboratories, Inc. (UL): Fire Protection Equipment Directory
- D. Factory Mutual Research Corp (FM): Approval Guide, 2007-2011
- E. American National Standards Institute (ANSI):
 - S3.41.....Audible Emergency Evacuation Signal, 1990 edition, reaffirmed 2008

F. International Code Council, International Building Code (IBC), 2009 edition

PART 2 - PRODUCTS

2.1 EQUIPMENT AND MATERIALS, GENERAL

A. All equipment and components shall be new and the manufacturer's current model. All equipment shall be tested and listed by Underwriters Laboratories, Inc. or Factory Mutual Research Corporation for use as part of a fire alarm system. The authorized representative of the manufacturer of the major equipment shall certify that the installation complies with all manufacturers' requirements and that satisfactory total system operation has been achieved.

2.2 CONDUIT, BOXES, AND WIRE

A. Conduit shall be in accordance with Section 28 05 28.33 CONDUIT AND BACKBOXES FOR ELECTRONIC SAFETY AND SECURITY and as follows:

1. All new conduits shall be installed in accordance with NFPA 70.
2. Conduit fill shall not exceed 40 percent of interior cross sectional area.
3. All new conduits shall be 3/4 inch (19 mm) minimum.

B. Wire:

1. Wiring shall be in accordance with NEC article 760, Section 28 05 13, CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY, and as recommended by the manufacturer of the fire alarm system. All wires shall be color coded. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 18 AWG for initiating device circuits and 14 AWG for notification device circuits.
2. Addressable circuits and wiring used for the multiplex communication loop shall be twisted and shielded.

C. Terminal Boxes, Junction Boxes, and Cabinets:

1. Shall be galvanized steel in accordance with UL requirements.
2. All boxes shall be sized and installed in accordance with NFPA 70.
3. covers shall be repainted red in accordance with Section 09 91 00, PAINTING and shall be identified with white markings as "FA" for junction boxes and as "FIRE ALARM SYSTEM" for cabinets and terminal boxes. Lettering shall be a minimum of 3/4 inch (19 mm) high.

4. Terminal boxes and cabinets shall have a volume 50 percent greater than required by the NFPA 70. Minimum sized wire shall be considered as 14 AWG for calculation purposes.
5. Terminal boxes and cabinets shall have identified pressure type terminal strips and shall be located at the base of each riser. Terminal strips shall be labeled as specified or as approved by the COTR.

2.3 FIRE ALARM CONTROL UNIT

A. General:

1. Building 1 shall be provided with a fire alarm control unit and shall operate as a supervised zoned fire alarm system.
2. Each power source shall be supervised from the other source for loss of power.
3. All circuits shall be monitored for integrity.
4. Visually and audibly annunciate any trouble condition including, but not limited to main power failure, grounds and system wiring derangement.
5. Transmit digital alarm information to the main fire alarm control unit.

B. Enclosure:

1. The control unit shall be housed in a cabinet suitable for both recessed and surface mounting. Cabinet and front shall be corrosion protected, given a rust-resistant prime coat, and manufacturer's standard finish.
2. Cabinet shall contain all necessary relays, terminals, lamps, and legend plates to provide control for the system.

C. Power Supply:

1. The control unit shall derive its normal power from a 120 volt, 60 Hz dedicated supply connected to the emergency power system. Standby power shall be provided by a 24 volt DC battery. The normal power shall be transformed, rectified, coordinated, and interfaced with the standby battery and charger.
2. The door holder power shall be arranged so that momentary or sustained loss of main operating power shall not cause the release of any door.
3. Power supply for smoke detectors shall be taken from the fire alarm control unit.

4. Provide protectors to protect the fire alarm equipment from damage due to lightning or voltage and current transients.
 5. Provide new separate and direct ground lines to the outside to protect the equipment from unwanted grounds.
- D. Circuit Supervision: Each alarm initiating device circuit, signaling line circuit, and notification appliance circuit, shall be supervised against the occurrence of a break or ground fault condition in the field wiring. These conditions shall cause a trouble signal to sound in the control unit until manually silenced by an off switch.
- E. Supervisory Devices: All sprinkler system valves, standpipe control valves, post indicator valves (PIV), and main gate valves shall be supervised for off-normal position. Closing a valve shall sound a supervisory signal at the control unit until silenced by an off switch. The specific location of all closed valves shall be identified at the control unit. Valve operation shall not cause an alarm signal. Low air pressure switches and duct detectors shall be monitored as supervisory signals. The power supply to the elevator shunt trip breaker shall be monitored by the fire alarm system as a supervisory signal.
- F. Trouble Signals:
1. Arrange the trouble signals for automatic reset (non-latching).
 2. System trouble switch off and on lamps shall be visible through the control unit door.
- G. Function Switches: Provide the following switches in addition to any other switches required for the system:
1. Remote Alarm Transmission By-pass Switch: Shall prevent transmission of all signals to the main fire alarm control unit when in the "off" position. A system trouble signal shall be energized when switch is in the off position.
 2. Alarm Off Switch: Shall disconnect power to alarm notification circuits on the local building alarm system. A system trouble signal shall be activated when switch is in the off position.
 3. Trouble Silence Switch: Shall silence the trouble signal whenever the trouble silence switch is operated. This switch shall not reset the trouble signal.
 4. Reset Switch: Shall reset the system after an alarm, provided the initiating device has been reset. The system shall lock in alarm until reset.

5. Lamp Test Switch: A test switch or other approved convenient means shall be provided to test the indicator lamps.
 6. Drill Switch: Shall activate all notification devices without tripping the remote alarm transmitter. This switch is required only for general evacuation systems specified herein.
 7. Door Holder By-Pass Switch: Shall prevent doors from releasing during fire alarm tests. A system trouble alarm shall be energized when switch is in the abnormal position.
 8. Elevator recall By-Pass Switch: Shall prevent the elevators from recalling upon operation of any of the devices installed to perform that function. A system trouble alarm shall be energized when the switch is in the abnormal position.
 9. HVAC/Smoke Damper By-Pass: Provide a means to disable HVAC fans from shutting down and/or smoke dampers from closing upon operation of an initiating device designed to interconnect with these devices.
- H. Remote Transmissions:
1. Provide capability and equipment for transmission of alarm, supervisory and trouble signals to the main fire alarm control unit.
 2. Transmitters shall be compatible with the systems and equipment they are connected to such as timing, operation and other required features.
- I. Remote Control Capability: Each building fire alarm control unit shall be installed and programmed so that each must be reset locally after an alarm, before the main fire alarm control unit can be reset. After the local building fire alarm control unit has been reset, then the all system acknowledge, reset, silence or disabling functions can be operated by the main fire alarm control unit
- J. System Expansion: Design the control units and enclosures so that the system can be expanded in the future (to include the addition of 20 percent more alarm initiating, alarm notification and door holder circuits) without disruption or replacement of the existing control unit and secondary power supply.

2.4 VOICE COMMUNICATION SYSTEM (VCS)

A. General:

1. An emergency voice communication system shall be installed throughout Building 1 9th Floor.

2. Upon receipt of an alarm signal from the building fire alarm system, the VCS shall automatically transmit a pre-recorded fire alarm message throughout the floor in alarm, the floor above, and the floor below.
3. A digitized voice module shall be used to store each prerecorded message.
4. The VCS shall be arranged as a dual channel system capable of transmitting 2 different messages simultaneously.
5. The VCS shall supervise all speaker circuits, control equipment, remote audio control equipment, and amplifiers.

B. Speaker Circuit Control Unit:

1. The speaker circuit control unit shall include switches to manually activate or deactivate speaker circuits grouped by floor in the system.
2. Speaker circuit control switches shall provide on, off, and automatic positions and indications.
3. The speaker circuit control unit shall include visual indication of active or trouble status for each group of speaker circuits in the system.
4. A trouble indication shall be provided if a speaker circuit group is disabled.
5. A lamp test switch shall be provided to test all indicator lamps.
6. A single "all call" switch shall be provided to activate all speaker circuit groups simultaneously.
7. A voice message disconnect switch shall be provided to disconnect automatic digitized voice messages from the system. The system shall be arranged to allow manual voice messages and indicate a system trouble condition when activated.

C. Speaker Circuit Arrangement:

1. Speaker circuits shall be arranged such that there is one speaker circuit per smoke zone.
2. Audio amplifiers and control equipment shall be electrically supervised for normal and abnormal conditions.
3. Speaker circuits shall be either 25 VRMS or 70.7 VRMS with a minimum of 50 percent spare power available.

4. Speaker circuits and control equipment shall be arranged such that loss of any one speaker circuit will not cause the loss of any other speaker circuit in the system.

D. Digitized Voice Module (DVM):

1. The Digitized Voice Module shall provide prerecorded digitized evacuation and instructional messages. The messages shall be professionally recorded and approved by the COTR prior to programming.
2. The DVM shall be configured to automatically output to the desired circuits following a 10-second slow whoop alert tone.
3. Prerecorded magnetic taped messages and tape players are not permitted.
4. The digitized message capacity shall be no less than 15 second in length.
5. The digitized message shall be transmitted 3 times.
6. The DVM shall be supervised for operational status.
7. Failure of the DVM shall result in the transmission of a constant alarm tone.
8. The DVM memory shall have a minimum 50 percent spare capacity after those messages identified in this section are recorded. Multiple DVM's may be used to obtain the required capacity.

E. Audio Amplifiers:

1. Audio Amplifiers shall provide a minimum of 50 Watts at either 25 or 70.7 VRMS output voltage levels.
2. Amplifiers shall be continuously supervised for operational status.
3. Amplifiers shall be configured for either single or dual channel application.
4. Each audio output circuit connection shall be configurable for Style X.
5. A minimum of 50 percent spare output capacity shall be available for each amplifier.

F. Tone Generator(s):

1. Tone Generator(s) shall be capable of providing a distinctive 3-pulse temporal pattern fire alarm signal as well as a slow whoop.
2. Tone Generator(s) shall be continuously supervised for operational status.

2.5 ALARM NOTIFICATION APPLIANCES

A. Speakers:

1. Shall operate on either 25 VRMS or 70.7 VRMS with field selectable output taps from 0.5 to 2.0W and originally installed at the 1/2 watt tap. Speakers shall provide a minimum sound output of 80 dBA at 10 feet (3,000 mm) with the 1/2 watt tap.
2. Frequency response shall be a minimum of 400 HZ to 4,000 HZ.
3. Four inches (100 mm) or 8 inches (200 mm) cone type speakers ceiling mounted with white colored baffles in areas with suspended ceilings and wall mounted in areas without ceilings.

B. Strobes:

1. Xenon flash tube type minimum 15 candela in toilet rooms and 75 candela in all other areas with a flash rate of 1 HZ. Strobes shall be synchronized where required by the National Fire Alarm Code (NFPA 72).
2. Backplate shall be red with 1/2 inch (13 mm) permanent red letters. Lettering to read "Fire", be oriented on the wall or ceiling properly, and be visible from all viewing directions.
3. Each strobe circuit shall have a minimum of 20 percent spare capacity.
4. Strobes may be combined with the audible notification appliances specified herein.

2.6 ALARM INITIATING DEVICES

A. Manual Fire Alarm Stations:

1. Shall be non-breakglass, address reporting type.
2. Station front shall be constructed of a durable material such as cast or extruded metal or high impact plastic. Stations shall be semi-flush type.
3. Stations shall be of single action pull down type with suitable operating instructions provided on front in raised or depressed letters, and clearly labeled "FIRE."
4. Operating handles shall be constructed of a durable material. On operation, the lever shall lock in alarm position and remain so until reset. A key shall be required to gain front access for resetting, or conducting tests and drills.
5. Unless otherwise specified, all exposed parts shall be red in color and have a smooth, hard, durable finish.

B. Smoke Detectors:

1. Smoke detectors shall be photoelectric type and UL listed for use with the fire alarm control unit being furnished.
2. Smoke detectors shall be addressable type complying with applicable UL Standards for system type detectors. Smoke detectors shall be installed in accordance with the manufacturer's recommendations and NFPA 72.
3. Detectors shall have an indication lamp to denote an alarm condition. Provide remote indicator lamps and identification plates where detectors are concealed from view. Locate the remote indicator lamps and identification plates flush mounted on walls so they can be observed from a normal standing position.
4. All spot type and duct type detectors installed shall be of the photoelectric type.
5. Photoelectric detectors shall be factory calibrated and readily field adjustable. The sensitivity of any photoelectric detector shall be factory set at 3.0 plus or minus 0.25 percent obscuration per foot.
6. Detectors shall provide a visual trouble indication if they drift out of sensitivity range or fail internal diagnostics. Detectors shall also provide visual indication of sensitivity level upon testing. Detectors, along with the fire alarm control units shall be UL listed for testing the sensitivity of the detectors.

C. Heat Detectors:

1. Heat detectors shall be of the addressable restorable rate compensated fixed-temperature spot type.
2. Detectors shall have a minimum smooth ceiling rating of 2,500 square feet (230 square meters).
3. Intermediate temperature rated (200 degrees F (93 degrees C)) heat detectors shall be utilized in all areas.

D. Water Flow Switches:

1. Wet pipe water flow switches for sprinkler systems shall be connected to the fire alarm system by way of an address reporting interface device.
2. All new water flow switches shall be of a single manufacturer and series and non-accumulative retard type. See Section 21 10 00, WATER

BASED FIRE SUPPRESSION SYSTEMS for new switches added. Connect all switches shown on the approved shop drawings.

3. All new switches shall have an alarm transmission delay time that is conveniently adjustable from 0 to 60 seconds. Initial settings shall be 30-45 seconds. Timing shall be recorded and documented during testing.

2.7 SUPERVISORY DEVICES

A. Duct Smoke Detectors:

1. Duct smoke detectors shall be provided and connected by way of an address reporting interface device. Detectors shall be provided with an approved duct housing mounted exterior to the duct, and shall have perforated sampling tubes extending across the full width of the duct (wall to wall). Detector placement shall be such that there is uniform airflow in the cross section of the duct.
2. Interlocking with fans shall be provided in accordance with NFPA 90A and as specified hereinafter under Part 3.2, "TYPICAL OPERATION".
3. Provide remote indicator lamps, key test stations and identification nameplates (e.g. "DUCT SMOKE DETECTOR AHU-X") for all duct detectors. Locate key test stations in plain view on walls or ceilings so that they can be observed and operated from a normal standing position.

B. Sprinkler System Supervisory Switches:

1. Each sprinkler system zone control valve shall be equipped with a supervisory switch.
2. Valve supervisory switches shall be connected to the fire alarm system by way of address reporting interface device. See Section 21 10 00, WET-PIPE SPRINKLER SYSTEMS for new switches to be added. Connect tamper switches for all control valves shown on the approved shop drawings.
3. The mechanism shall be contained in a weatherproof die-cast aluminum housing that shall provide a 3/4 inch (19 mm) tapped conduit entrance and incorporate the necessary facilities for attachment to the valves.
4. The entire installed assembly shall be tamper-proof and arranged to cause a switch operation if the housing cover is removed or if the unit is removed from its mounting.

2.8 ADDRESS REPORTING INTERFACE DEVICE

- A. Shall have unique addresses that reports directly to the building fire alarm panel.
- B. Shall be configurable to monitor normally open or normally closed devices for both alarm and trouble conditions.
- C. Shall have terminal designations clearly differentiating between the circuit to which they are reporting from and the device that they are monitoring.
- D. Shall be UL listed for fire alarm use and compatibility with the panel to which they are connected.
- E. Shall be mounted in weatherproof housings if mounted exterior to a building.

2.9 SMOKE BARRIER DOOR CONTROL

- A. Electromagnetic Door Holders:
 - 1. New Door Holders shall be standard wall mounted electromagnetic type. In locations where doors do not come in contact with the wall when in the full open position, an extension post shall be added to the door bracket.
 - 2. Operation shall be by 24 volt DC supplied from a battery located at the fire alarm control unit. Door holders shall be coordinated as to voltage, ampere drain, and voltage drop with the battery, battery charger, wiring and fire alarm system for operation as specified.
- B. A maximum of twelve door holders shall be provided for each circuit. Door holders shall be wired to allow releasing doors by smoke zone.
- C. Door holder control circuits shall be electrically supervised.
- D. Smoke detectors shall not be incorporated as an integral part of door holders.

2.10 UTILITY LOCKS AND KEYS

- A. All key operated test switches, control units, and lockable cabinets shall be provided with a single standardized utility lock and key.
- B. Key-operated manual fire alarm stations shall have a single standardized lock and key separate from the control equipment.
- C. All keys shall be delivered to the COTR.

2.11 SPARE AND REPLACEMENT PARTS

- A. Provide spare and replacement parts as follows:
 - 1. Manual pull stations - 5
 - 2. Heat detectors - 2

3. Fire alarm strobes - 5
 4. Fire alarm speakers - 5
 5. Smoke detectors - 10
 6. Duct smoke detectors with all appurtenances - 1
 7. Sprinkler system water flow switch - 1 of each size
 8. Sprinkler valve tamper switch - 1 of each type
 9. Control equipment utility locksets - 5
 10. Control equipment keys - 10
 11. 2.5 oz containers aerosol smoke - 4
 12. Monitor modules - 3
 13. Control modules - 3
 14. Fire alarm SLC cable (same as installed) - 500 feet (152 m)
- B. Spare and replacement parts shall be in original packaging and submitted to the COTR.
- C. Furnish and install a storage cabinet of sufficient size and suitable for storing spare equipment. Doors shall include a pad locking device. Padlock to be provided by the VA. Location of cabinet to be determined by the COTR.
- D. Provide to the VA, all hardware, software, programming tools, license and documentation necessary to permanently modify the fire alarm system on site. The minimum level of modification includes addition and deletion of devices, circuits, zones and changes to system description, system operation, and digitized evacuation and instructional messages.

2.12 INSTRUCTION CHART

Provide typewritten instruction card mounted behind a Lexan plastic or glass cover in a stainless steel or aluminum frame with a backplate. Install the frame in a conspicuous location observable from each control unit where operations are performed. The card shall show those steps to be taken by an operator when a signal is received under all conditions, normal, alarm, supervisory, and trouble. Provide an additional copy with the binder for the input output matrix for the sequence of operation. The instructions shall be approved by the COTR before being posted.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation shall be in accordance with NFPA 70, 72, 90A, and 101 as shown on the drawings, and as recommended by the major equipment

manufacturer. Fire alarm wiring shall be installed in conduit. All conduit and wire shall be installed in accordance with, Section 28 05 13 CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY, Section 28 05 26 GROUNDING AND BONDING FOR ELECTRONIC SAFETY AND SECURITY, Section 28 05 28.33 CONDUIT AND BACKBOXES FOR ELECTRONIC SAFETY AND SECURITY, and all penetrations of smoke and fire barriers shall be protected as required by Section 07 84 00, FIRESTOPPING.

- B. All conduits, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas.
- C. All new and reused exposed conduits shall be painted in accordance with Section 09 91 00, PAINTING to match surrounding finished areas and red in unfinished areas.
- D. All fire detection and alarm system devices, control units and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas. Exact locations are to be approved by the COTR.
- E. Speakers shall be ceiling mounted and fully recessed in areas with suspended ceilings. Speakers shall be wall mounted and recessed in finished areas without suspended ceilings. Speakers may be surface mounted in unfinished areas.
- F. Strobes shall be flush wall mounted with the bottom of the unit located 80 inches (2,000 mm) above the floor or 6 inches (150 mm) below ceiling, whichever is lower. Locate and mount to maintain a minimum 36 inches (900 mm) clearance from side obstructions.
- G. Manual pull stations shall be installed not less than 42 inches (1,050 mm) or more than 48 inches (1,200 mm) from finished floor to bottom of device and within 60 inches (1,500 mm) of a stairway or an exit door.
- H. Where possible, locate water flow and pressure switches a minimum of 12 inches (300 mm) from a fitting that changes the direction of the flow and a minimum of 36 inches (900 mm) from a valve.
- I. Mount valve tamper switches so as not to interfere with the normal operation of the valve and adjust to operate within 2 revolutions toward the closed position of the valve control, or when the stem has moved no more than 1/5 of the distance from its normal position.
- J. Connect flow and tamper switches installed under Section 21 13 13, WET-PIPE SPRINKLER SYSTEMS.

- K. Connect combination closer-holders installed under Section 08 71 00,
DOOR HARDWARE.

3.2 TYPICAL OPERATION

- A. Activation of any manual pull station, water flow or pressure switch, heat detector, or smoke detector shall cause the following operations to occur:
1. Operate the emergency voice communication system in Building 1. For sprinkler protected buildings, flash strobes continuously only in the zone of alarm.
 2. Continuously sound a temporal pattern general alarm and flash all strobes in the building in alarm until reset at the local fire alarm control unit in Building 1.
 3. Release only the magnetic door holders in the smoke zone on the floor from which alarm was initiated after the alert signal.
 4. Transmit a separate alarm signal, via the main fire alarm control unit to the fire department.
 5. Unlock the electrically locked exit doors within the zone of alarm.
- B. Heat detectors in elevator machine rooms shall, in addition to the above functions, disconnect all power to all elevators served by that machine room after a time delay. The time delay shall be programmed within the fire alarm system programming and be equal to the time it takes for the car to travel from the highest to the lowest level, plus 10 seconds.
- C. Smoke detectors in the primary elevator lobbies of Building 1 where there is Phase I elevator recall shall, in addition to the above functions, return all elevators in the bank to the secondary floor.
- D. Smoke detectors in the remaining elevator lobbies, elevator machine room, or top of hoistway shall, in addition to the above functions, return all elevators in the bank to the primary floor.
- E. Operation of a smoke detector at a corridor door used for automatic closing shall also release only the magnetic door holders on that floor in that smoke zone.
- F. Operation of duct smoke detectors shall cause a system supervisory condition and shut down the ventilation system and close the associated smoke dampers as appropriate.
- G. Operation of any sprinkler system valve supervisory switch shall cause a system supervisory condition.

H. Alarm verification shall not be used for smoke detectors installed for the purpose of early warning.

3.3 TESTS

- A. Provide the service of a NICET level III, competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment to technically supervise and participate during all of the adjustments and tests for the system. Make all adjustments and tests in the presence of the COTR.
- B. When the systems have been completed and prior to the scheduling of the final inspection, furnish testing equipment and perform the following tests in the presence of the COTR. When any defects are detected, make repairs or install replacement components, and repeat the tests until such time that the complete fire alarm systems meets all contract requirements. After the system has passed the initial test and been approved by the COTR, the contractor may request a final inspection.
1. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
 2. Test the insulation on all installed cable and wiring by standard methods as recommended by the equipment manufacturer.
 3. Run water through all flow switches. Check time delay on water flow switches. Submit a report listing all water flow switch operations and their retard time in seconds.
 4. Open each alarm initiating and notification circuit to see if trouble signal actuates.
 5. Ground each alarm initiation and notification circuit and verify response of trouble signals.

3.4 FINAL INSPECTION AND ACCEPTANCE

- A. Prior to final acceptance a minimum 30 day "burn-in" period shall be provided. The purpose shall be to allow equipment to stabilize and potential installation and software problems and equipment malfunctions to be identified and corrected. During this diagnostic period, all system operations and malfunctions shall be recorded. Final acceptance will be made upon successful completion of the "burn-in" period and where the last 14 days is without a system or equipment malfunction.
- B. At the final inspection a factory trained representative of the manufacturer of the major equipment shall repeat the tests in Article

3.3 TESTS and those required by NFPA 72. In addition the representative shall demonstrate that the systems function properly in every respect. The demonstration shall be made in the presence of a VA representative.

3.5 INSTRUCTION

- A. The manufacturer's authorized representative shall provide instruction and training to the VA as follows:
 - 1. Six 1-hour sessions to engineering staff, security police and central attendant personnel for simple operation of the system. Two sessions at the start of installation, 2 sessions at the completion of installation and 2 sessions 3 months after the completion of installation.
 - 2. Four 2-hour sessions to engineering staff for detailed operation of the system. Two sessions at the completion of installation and 2 sessions 3 months after the completion of installation.
 - 3. Three 8-hour sessions to electrical technicians for maintaining, programming, modifying, and repairing the system at the completion of installation and one 8-hour refresher session 3 months after the completion of installation.
- B. The Contractor and/or the Systems Manufacturer's representative shall provide a typewritten "Sequence of Operation" including a trouble shooting guide of the entire system for submittal to the VA. The sequence of operation will be shown for each input in the system in a matrix format and provided in a loose leaf binder. When reading the sequence of operation, the reader will be able to quickly and easily determine what output will occur upon activation of any input in the system. The INPUT/OUTPUT matrix format shall be as shown in Appendix A to NFPA 72.
- C. Furnish the services of a competent instructor for instructing personnel in the programming requirements necessary for system expansion. Such programming shall include addition or deletion of devices, zones, indicating circuits and printer/display text.

PART 4 - SCHEDULES

4.1 SMOKE ZONE DESCRIPTIONS

4.2 DIGITIZED VOICE MESSAGES

- A. Digitized voice messages shall be provided for each smoke zone of the Building. The voice message shall match existing presently digitized voice message configuration within the Building.

B. Refer to Architectural Drawings "Life Safety for Identification of
Smoke Zones."

4.3 LOCATION OF VOICE MESSAGES

Upon receipt of an alarm signal from the building fire alarm system,
the voice communication system shall automatically transmit a 3 second
tone alert and a pre-recorded fire alarm message throughout.

- - - E N D - - -