the provisions of the Electrical drawings and specifications, and are received by the Architect a minimum of 10 days prior to the date established for the receipt of the bid. No substitutions will be considered after the date of the receipt of the bid or contract award unless there is cause for a substitution which complies in every respect to the provisions of the Electrical drawings and specifications, Substitution requests shall be made in accordance with Public Contracts Code (AB2084) revisions as follows:

a. No substitutions are allowed after bid opening.

b. All substitutions must be requested 10 days prior to bid opening date.

c. Final addendum naming approved substitutions of materials/equipment must be issued 3 days prior to bid date.

E. Record Drawings: Keep up to date, monthly payments withheld if not updated.

F. Shop Drawings and Submittals: Submittals on interior luminaries.

G. Cutting and Patching:

1. Obtain written permission from the Architect before core drilling or cutting any structural members. Exact method and location of conduit penetrations and/or openings in concrete walls, floors, or ceilings shall be as approved by the Architect.

2. All core drilling, cutting and patching for this work shall be performed under this Section of the specifications. Use craftsmen skilled in their respective sections for cutting, fitting, repairing, patching of plaster and finishing of materials including carpentry work, metal work or concrete work required for this Work. Do not weaken walls, partitions or floor with cutting. Holes required to be cut in floors must be drilled without excessive breaking out around the holes. Patching and/or refinishing shall be determined by the Architect.

3. Use care in piercing waterproofing. After the part piercing the waterproofing has been set in place, seal openings and make absolutely watertight.

4. Seal all openings to meet the fire rating of the particular wall floor or ceiling.

1.3 JOB CONDITIONS

A. Existing Conditions:

1. The contractor shall visit the site and verify existing conditions. Where existing conditions differ from the drawings, adjustment shall be made and allowances included for all necessary equipment to complete all parts of the drawings and specifications.

2. Electrical circuits affecting work shall be de-energized while working on or near them.

3. Arrange the work so that electrical power is available to all electrical equipment within existing facility at all times. Schedule all interruptions at the convenience of the Owner, including exact time and duration. Provide temporary power during all periods of interruption, which are deemed excessive by the Owner. Costs of all premium time (overtime) resulting from the scheduled power interruptions and all costs for providing temporary power shall be included in the cost of the Work.

B. Protection:

1. Protection of apparatus, materials and equipment. Take such precautions as necessary to properly protect all apparatus, fixtures, appliances, material, equipment and installations from damage of any kind. The Engineer may reject any particular piece or pieces of material, apparatus or equipment scratched, dented or otherwise damaged.

2. Seal equipment or components exposed to the weather and make watertight and insect proof. Protect equipment outlets and conduit openings with temporary plugs or caps at all times that work is not in progress.

C. Sequencing and Scheduling:

1. Work lines and established heights shall be in strict accordance with architectural drawings and specifications insofar as these drawings and specifications extend. Verify all dimensions shown and establish all elevations and detailed dimensions not shown.

2. Lay out and coordinate all work well enough in advance to avoid conflicts or interferences with other work in progress so that in case of interference the electrical layout may be altered to suit the conditions, prior to the installation of any work and without additional cost to the Owner. Conflicts arising from lack of coordination shall be this Contractor's responsibility. Maintain all code-required clearances about electrical equipment. Unless specifically noted otherwise, establish the exact location of electrical equipment based on the actual dimensions of equipment furnished.

1.4 WORK IN COOPERATION WITH OTHER SECTIONS

A. Examine the drawings and specifications and determine the work to be performed by the electrical, mechanical and other sections. Provide the type and amount of electrical materials and equipment necessary to place this work in proper operation, completely wired, tested and ready for use. This shall include all conduit, wire, motor starters, disconnects, relays, time clocks and other devices for the required operation sequence of all electrical, mechanical and other systems or equipment. Where a conflict occurs on drawings, the most stringent shall apply.

b. Plan all work so that it proceeds with a minimum of interference with other sections. Inform all parties concerned of openings required for equipment or conduit required in the building construction for Electrical Work and provide all special frames, sleeves and anchor bolts as required. Coordinate the electrical work with the mechanical installation. Promptly report to the Architect any delay or difficulties encountered in the installation of this work which might prevent prompt and proper installation, or make it unsuitable to connect with or receive

the work of other sections. Failure to so report shall constitute an acceptance of the work of other sections as being fit and proper for the execution of this work.

1.5 TESTING AND ADJUSTMENT

A. Upon completion of all Electrical Work, the contractor shall provide all testing as follows:

1. Operational Test: Test all circuit breakers and equipment. Replace all faulty devices and equipment discovered during testing with new devices and equipment at no additional cost, and that part of the system (or devices or equipment) shall then be retested.

1.6 FINAL INSPECTION AND ACCEPTANCE

A. After all requirements of the specifications and/or the drawings have been fully completed, representatives of the Owner will inspect the Work. The Contractor shall provide competent personnel to demonstrate the operation of any item of system, to the full satisfaction of each representative.

B. Final acceptance of the work will be made by the Owner after receipt of approval and recommendation of acceptance from each representative.

C. The Contractor shall furnish Record Drawings before final payment of retention.

END OF SECTION

SECTION 16110

RACEWAYS AND BOXES

PART 1: GENERAL

1.1 SECTION INCLUDES

A. Rigid Galvanized Steel Conduit (RGS).

B. Electrical Metallic Tubing (EMT).

C. Rigid Non-metallic Conduit (PVC).

D. Flexible Metal Electrical Conduit.

E. Liquid-tight Flexible Metal Conduit.

F. Gutters, Wireways and Troughs.

G. Fittings, Couplings, and Connectors.

H. Supporting Devices.

I. Sealant.

J. Outdoor Outlet Boxes.

K. Indoor Outlet Boxes and Small Junction and Pull Boxes.

1.2 RELATED SECTIONS

A. Section 16010 - Basic Electrical Requirements.

1.3 REFERENCES

A.	ANSI C80.3	Electrical Metallic Tubing - Zinc Coated.
B.	ANSI 870	Wireways, Auxiliary Gutters, and Associated Fittings.
C.	NECA	Standard of Installation.
D.	NEMA KS 1	Enclosed Switches.
E.	NEMA FB 1	Fittings, Cast Metal Boxes & Conduit Bodies for Conduit & Cable Assemblies.
F.	NEMA OS 1	Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
G.	CEC	California Electrical Code, (based on National Electrical Code).
H.	UL 1	Flexible Metal Conduit.

I. UL 5 Surface Metal Raceways and Fittings.

J. UL 50 Cabinets and Boxes.

K. UL 360 Liquid-Tight Flexible Conduit.

L. UL 514A Metallic Outlet Boxes.

M. UL 514B Fittings for Conduit and Outlet Boxes.

1.4 DESIGN REQUIREMENTS

A. Raceway Size: Use a minimum conduit inside diameter of 3/4-inch. Size conduit and raceway for a maximum cross-sectional fill area of 40%. Up size accordingly as required by system wiring at no additional costs to the County.

B. Gutter, Wireway and Trough Size: Size for a maximum cross sectional fill area of 20%.

C. Raceway Support: For each support and group of fasteners provide strength equal to the maximum weight of the present load plus all future raceways for which the support provides space, times a safety factor. Except as otherwise indicated, use a safety factor greater than four where necessary to provide a minimum safety allowance of 200 lbs. Provide additional support strength where required to prevent distortion of raceway during wire pulling.

D. Equipment Ground Conductor (Green): Where indicated, shown or required, raceway sizes shall be adequate to include the circuit conductors, an equipment ground conductor and a neutral conductor in accordance with percentage of fill requirements as specified.

1.5 SUBMITTALS

A. Conform to the requirements of Section 16010, Basic Electrical Requirements.

B. Product Data: Submit manufacturer's technical data for all items to be used including specifications, installation instructions and general recommendations.

C. Shop Drawings: Submit scale plan and elevation drawings of raceway systems showing layout and size of raceways, pull boxes and junction boxes within three feet of equipment to be installed by this contract.

D. Record Drawings: Provide shop drawings showing as-built conditions of all raceways, termination boxes, junction boxes, pull boxes and installed equipment.

1.6 SITE CONDITIONS

A. Conduit routing shown on the Drawings is approximate, actual routing will depend on site conditions and code requirements

B. Coordinate with the County for approved locations of conduit termination to existing equipment including electrical panels, telephone panels, consoles, furniture, etc.

PART 2: PRODUCTS

2.1 RIGID GALVANIZED STEEL CONDUIT (RGS)

A. Rigid steel conduit zinc coated shall conform to ANSI C80.2.

B. Rigid steel conduit zinc coated shall conform to ANSI C80.2.

C.

2.2 ELECTRIC METAL TUBING (EMT)

A. EMT, zinc coated shall conform to ANSI C80.3

2.3 RIGID NON-METALLIC CONDUIT (PVC)

A. Rigid non-metallic conduit shall be Schedule 40 PVC conduit manufactured in compliance with NEMA TC-2. PVC conduit shall be U.L. listed. Joints shall be solvent cement type.

B. Provide PVC elbows, bends, fittings and adapters as required for a complete installation. Provide solvent cement as recommended by the conduit manufacturer.

2.4 FLEXIBLE METAL ELECTRICAL CONDUIT (GREENFIELD)

A. Flexible metal electrical conduit shall conform to UL 1

2.5 LIQUID-TIGHT FLEXIBLE STEEL CONDUIT

A. Liquid-tight flexible steel conduit shall conform to UL 360.

B. Sizes 1.25 inches and smaller: Provide with a continuous copper bonding conductor wound spirally between convolutions.

C. Sizes 1.5 inches and larger: Provide with an internal grounding conductor and grounding bushings.

D. Also known as Seal Tight flexible conduit.

2.6 GUTTERS, WIREWAYS AND TROUGHS

A. Use NEMA Type 12.

B. Use 14 gauge bodies and covers.

C. Use above and below wall-mounted enclosures and cabinets for the collection of field device conduits, wires, and cables.

D. Do not use in inaccessible locations.

2.7 FITTINGS, COUPLINGS AND CONNECTORS

A. Fittings for conduit and outlet boxes shall conform to UL 514B.

B. Surface metal electrical raceways and fittings shall conform to UL 5

C. Use fittings listed and equally acceptable for specific conduit or raceway system used; e.g.: Use PVC coated fittings with PVC coated conduit.

D. For threaded rigid steel conduit, do not use threadless or compression type fittings.

E. For EMT, provide steel or malleable iron "concrete-tight" or "rain-tight" couplings and connectors. Use compression, set screw or stainless steel multiple locking type bodies. Do not use indentation type fittings.

F. Bushing and connectors shall be insulated type which maintain continuity of conduit grounding system. Insulating material shall be molded or locked into metallic body of the fitting. Bushings made entirely of nonmetallic material will not be allowed

G. Set screw connectors and couplings body shall have wall thickness at least equal to wall thickness of conduit used. Couplings or conduit trade size ¾-inch through 2 inch shall have two set screws per fitting and 2.5-inch through 4-inch shall have four set screws per fitting. Set screws shall be case hardened steel with hex head and cup point.

H. Provide flexible metal conduit fittings made of steel or malleable iron. Insulate with one of the following types:

1. Wedge and screw type having an angular wedge fitting between the convolutions of the conduit.

2. Squeeze or clamp type having a bearing surface contoured to wrap around the conduit and clamped by one or more screws.

3. Steel, multiple point type, for threading into internal wall of the conduit convolutions

I. Liquid-tight flexible metal conduit shall incorporate a threaded grounding cone, a steel, nylon or equal plastic compression ring and a gland for tightening. Fitting shall be steel, or malleable iron with insulated throat, with male thread and locknut or male bushing with or without "O" ring seal.

J. Expansion fittings shall be hot-dipped galvanized malleable iron with a packing ring to prevent entrance of water, a pressure ring, a grounding ring and a separate external copper bonding jumper.

K. Inferior material such as "pot metal" shall not be used for any type of fitting.

L. All locknuts shall be the bonding type with sharp edges for digging into the metal wall of an enclosure.

2.8 SUPPORTING DEVICES

A. General: Provide supporting devices with manufacturers standard materials, designed and constructed in accordance with published product information, for a complete installation.

B. Raceway Supports: Provide manufacturer's standard supports including clevis hangers, riser clamps, conduit straps, threaded C-clamps with retainers, ceiling trapeze, wall brackets and spring steel clamps.

C. Corrosion Resistance: Provide all supports, support hardware and fasteners hot-dipped galvanized or cadmium plated.

D. Fasteners: Provide fasteners as required by the type of wall or ceiling construction and the equipment to be supported by the fastener.

E. U-Channel Strut Systems: Provide minimum 12 gauge U-channel strut system for mounting and supporting electrical equipment. Fittings shall mate with the U-channel.

F. Fittings for Strut System: Galvanized steel end caps, conduit clamps, conduit hangers, U-bolts.

2.9 OUTDOOR OUTLET BOXES

A. Conform to NEMA FB 1, for fittings, cast metal boxes and conduit bodies

B. Provide electrical boxes and fittings which are UL-listed and labeled, and conform to UL 50, UL 514A, UL 514B, and UL 514C

C. Select covers for boxes of types appropriate for each use and location.

D. Provide gaskets for covers of boxes in damp locations.

E. Corrosion resistance: Provide galvanized or other equally acceptable corrosion resistant finish for all boxes, accessories and fittings.

2.10 INDOOR OUTLET BOXES AND SMALL JUNCTION- AND PULL-BOXES

A. Conform to NEMA OS 1 for sheet-steel outlet boxes, device boxes, covers and box supports. Provide minimum 4-inch square by 1.5-inch deep, one piece, deep-drawn, galvanized steel, outlet boxes for general use. Provide square cornered, straight sided gang boxes wherever required by CEC or more than two wiring devices are indicated in the same location. Provide boxes of increased depth where required by the project conditions.

B. Furnish with stamped knockouts in the back and sides.

C. Provide threaded screw holes with corrosion-resistant screws for securing box covers and wiring devices.

D. Accessories: Provide outlet box accessories as required for each installation, including plaster covers, mounting brackets, wallboard hangers, extension rings, fixture studs, cable clamps and metal straps for supporting outlet boxes, which are compatible with outlet boxes being used and fulfilling requirements of individual wiring situations.

2.11 FIRESTOPPING/SEALANT MATERIALS

A. Accepted Products: International Protective Coatings Corp. FlameSafe® FSP 1100, Nelson FSP, Domtar Fire-Halt® or approved equal.

PART 3: EXECUTION

3.1 INSTALLATION

A. Penetrations:

1. Firestop and seal all penetrations of fire walls and floors with minimum three hour sealant or Fire Stop Putty (FSP). This includes but is not limited to all raceway, conductor, sleeve and cable tray penetrations where penetrating device does not completely seal the hole.

2. Provide a suitable caulk for purposes of speech privacy and air flow restriction where a fire rated seal is not required.

B. Raceways and Fittings:

1. Comply with CEC, for application, size, location and installation of each type of raceway.
2. Where not specifically shown on the drawings or specified, use the following guidelines for the selection of raceway types:
   a. RGS – Exterior locations above building overhang (roof).
   b. EMT – Interior dry exposed locations. Exterior or wet areas use rain tight fittings.
   c. PVC – Concrete encased. Below grade under concrete slab. Buried below grade. Use metal risers.
   d. Flexible Metal – Use to connect to equipment that must be mechanically isolated or shifted to final position in indoor dry locations only. Use where conduit must be fished in building voids. Do not use in corrosive atmosphere.
   e. Liquid-Tight Flexible Metal – Use when flexible metal is required in wet or outdoor locations.
3. Install no more than the equivalent of three 90-degree bends between boxes.
4. Conduit and EMT runs shall be mechanically and electrically continuous from service entrance to all outlets. Each conduit shall enter and be securely connected to a cabinet, junction box, pull box or outlet by means of a locknut on the outside and a bushing on the inside or by means of a liquid-tight, threaded, self-locking, cold-weld type wedge adapter.
5. Keep conduit at least 6 inches away from parallel runs of steam and hot-water pipes.
6. Level and square raceway runs.
7. Complete installation of electrical raceways before starting installation of cables/wires within raceways.
8. Provide supports for raceways as specified.
9. Prevent foreign matter from entering raceways; use temporary closure protection.

10. Make bends and offsets so the inside diameter is not effectively reduced.
11. Unless otherwise indicated, keep the legs of a bend in the same plane and the straight legs of offsets parallel.
12. Use raceway fittings that are of types compatible with the associated raceway and suitable for the use and location.
13. Run raceways with a minimum number of bends. All bends shall have the longest possible radii.
14. Install exposed raceways parallel and perpendicular to nearby surfaces or exposed structural members, and follow the surface contours.
15. Run exposed, parallel or banked raceways together.
16. Make bends in parallel or banked runs from the same center line so that the bends are parallel. Factory elbows may be used in banked runs where they can be installed parallel.
17. Join and terminate raceways with fittings designed and equally acceptable for the purpose of the raceway system and make up tight.
18. Where the installation is such that joints cannot be made tight, use bonding jumpers to provide electrical continuity of the raceway system.
19. Make the set screws of threadless fittings up tight; do not use pliers. Compression fittings shall be tightened with two wrenches.
20. Where raceways are terminated with locknuts and bushings, align the raceway to enter squarely and install the locknuts so that the dished part is against the box.
21. Where terminating in threaded hubs, screw the raceway or fitting tight into the hub so the end bears against the wire protection shoulder.
22. Where chase nipples are used, align the raceway and coupling square to the box and tighten the chase nipple so no threads are exposed. Running threads are not allowed.
23. Install nylon pull strings in empty raceways. Leave not less than 12 inches of slack at each end of the conduit.
24. Horizontal cross runs of conduit or EMT may be installed in partitions only where explicitly permitted. Exposed horizontal runs, where permitted, shall be installed close to ceiling or ceiling beams.
25. Conduits and EMT connected to wall outlets shall be run in such a manner that they will not cross water, steam or waste pipes or radiator branches.
26. Conduits and EMT shall not be run through beams, except where clearly indicated on drawings or where permitted.
27. Conduits and raceways above suspended ceilings may be supported from the floor construction above or from the main ceiling support members, however, the finished installation shall not interfere with the removability of ceiling panels.
28. At building expansion joints, provide expansion fittings and cross at right angles to joint.
29. Provide conduits stubbed up through or from concrete floor for connection to freestanding equipment with an adjustable top or coupling threaded inside for plugs, set flush with the finished floor. Where no equipment connections are made, install screwdriver-operated threaded flush brass plugs in conduit end.

30. Provide expansion fittings for all rigidly fastened conduits spanning a building expansion joint and if not otherwise provided, for all runs 1.5 inches or larger, exceeding 150 feet in length.

C. Boxes and Fittings:

1. Coordination: Coordinate installation of electrical boxes and fittings with wire/cable and raceway installation work, and with general construction work.
2. Weatherproof: Provide weatherproof outlets for all interior and exterior locations exposed to weather or moisture.
3. Knockout Caps: Provide knockout closures to cap unused knockout holes where blanks have been removed.
4. Anchoring: Support and fasten boxes securely per CEC.
5. Sizes: Provide boxes of sizes adequate to meet CEC volume requirements, but in no case smaller than sizes indicated.
6. Do not use sectional (gangable) boxes.
7. Do not use device plates as covers for boxes in exposed locations.
8. Do not use round boxes where conduit must enter box through side of box, which would result in difficult and insecure connections when fastened with locknut or bushing on rounded surface.
9. Threaded Hubs: Use threaded hub type boxes with gasketed weatherproof covers in all exterior locations; where installed on unfinished walls, columns or plasters; where exposed to moisture laden atmosphere; or where indicated.
10. Extension Rings: Where extension rings are required on existing outlet boxes, drill new mounting holes in the rings to align with the mounting holes on the existing boxes.

D. Pull and Junction Boxes:

1. Conform to CEC.
2. Locate junction and pull boxes in accessible locations.
3. Do not locate boxes in finished areas UON.
4. Supports: Provide in each box sufficient clamps, grids, or devices to which cables are secured in neat and orderly fashion permitting ready identification and so that no cable will have an unsupported length of more than 30 inches.

E. Raceway Supports:

1. Compliance: Install hangers, sleeves, seals, U-channel supports and fasteners as indicated and in accordance with manufacturer's written instructions. Comply with requirements of CEC and American National Standards Institute (ANSI)/National Electrical Manufacturers Association (NEMA) for installation of supporting devices.
2. Provide individual and multiple (trapeze) raceway hangers, and riser clamps as necessary to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assembly, and for securing hanger rods and conduits.
3. Arrange for grouping of parallel runs of horizontal raceways to be supported together on trapeze type hangers where possible.

4. Support individual horizontal conduits and EMT 1.5 inches in size and smaller by either one-hole pipe straps or separate pipe hangers. Use separate pipe hangers for larger sizes. Spring steel fasteners may be used in lieu of pipe straps or hangers for sizes 1.5-inch and smaller in dry locations. For hanger rods with spring steel fasteners, use 0.3-inch diameter or larger threaded steel. Use steel fasteners that are specifically designed for supporting single conduits or EMT. Unless otherwise indicated, do not use wire as a means of support. Use spring steel conduit supports only for lighting system branch circuit raceway in suspended ceilings in dry locations.
5. Except as otherwise indicated, space supports for metallic and non-metallic raceways in accordance with the requirements of this Section and the requirements of the CEC.
6. Provide support for exposed or concealed raceway as close as practical to and not exceeding 12 inches from an unsupported box or access fitting. In horizontal runs a support at a box or access fitting may be omitted when the box or access fitting is independently supported and the raceway termination is not made with a chase nipple or threadless box connector.
7. In vertical runs provide such support that the load produced by the weight of the raceway and the enclosed conductors is carried entirely by the conduit supports, with no weight load on raceway termination's or conductor terminals.

F. Miscellaneous Supports:

1. Provide supports for all miscellaneous electrical components as required to produce the same safety allowances as specified for raceway supports above. Provide metal channel racks for mounting cabinets, panelboards, disconnects, control enclosures, pull boxes, junction boxes etc.
2. In open overhead spaces, cast boxes threaded to raceways need not be separately supported except where used for fixture support; support sheet metal boxes directly from the building structure or by bar hangers. Where bar hangers are used, attach the bar to raceways on opposite sides of the box and support the raceway with an equally acceptable type fastener not more than 24 inches from the box. When penetrating reinforced-concrete members, avoid cutting any reinforcing steel.
3. Wood backing shall not be used for mounting any equipment except as required for temporary power or telephone terminal strips or unless noted otherwise on drawings. Only steel frame work or strut type channels shall be used for equipment mounting.
4. In hollow masonry, tile, plaster or gypsum board, use toggle type bolts to secure equipment, conduit runs and outlet boxes in place.

G. Fasteners:

5. Unless otherwise indicated securely fasten all electrical items and their supporting hardware including, but not limited to, conduits, raceways, cables, busways, cabinets, panelboards, wall-mounted transformers, boxes, disconnect switches and control components to the building structure.
6. Fasten by means of wood screws or screw-type nails on wood; by toggle bolts on hollow masonry units; by concrete inserts or expansion bolts on concrete or brick; by machine screws; welded threaded studs, or spring-tension clamps on

steel work. Do not weld conduits or pipe straps to steel structures. In partitions of light steel construction use sheet metal screws.

7. Do not use powder charged devices or Ramsets to attach fasteners (unless otherwise approved by the County).
8. Holes cut to a depth of more than 1.5 inches in reinforced concrete beams or to a depth of more than 3/4 inches in concrete joints shall not be allowed. Notify the Facility if such penetration is needed.
9. Loads applied to any fastener shall not exceed one-fifth of the proof test load. Use vibration and shock-resistant fasteners.

3.2 ADJUSTING AND CLEANING

A. Upon completion of installation of raceways, inspect interiors of raceways at all outlet, junction and pull boxes, remove burrs and obstructions.

B. Run a swab or mandrel to remove dirt and blockages. Raceways which are deformed and prevent the passage of a mandrel shall be replaced.

C. Remove dirt and construction debris from all outlet, junction and pull boxes.

END OF SECTION

SECTION 16123

BUILDING WIRE AND CABLE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Building wire and cable.

B. Wiring connectors and connections.

1.2 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

1.3 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum ten years documented experience.

1.4 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. or testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.

1.5 PROJECT CONDITIONS

A. Conductor sizes are based on copper.

B. Aluminum conductors shall not be used.

C. Wire and cable routing shown on Drawings is approximate unless dimensioned. Route wire and cable as required to meet Project Conditions.

D. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.

1.6 COORDINATION

A. Coordinate Work with other trades.

B. Determine required separation between cable and other work.

C. Determine cable routing to avoid interference with other work.

PART 2 PRODUCTS

2.1 BUILDING WIRE AND CABLE

A. Description: Single conductor insulated wire.

B. Conductor: Copper.

C. Insulation Voltage Rating: 600 volts.

D. Insulation: ANSI/NFPA 70; Type THHN/THWN or XHHN insulation for feeders and branch circuits.

2.2 WIRING CONNECTORS

A. Split Bolt Connectors:

1. ILSCO, Model SK.

2. Burndy, Model KSU.

3. Blackburn, Model HPS.

B. Solderless Pressure Connectors:

1. ILSCO, Model SLUH.

2. Burndy, Model KA-U.

3. Panduit, Model LAM

C. Spring Wire Connectors:

1. Buchanan, Models 31, 33, 35 and 37.

2. 3M.

3. Ideal Wirenut.

D. Compression Connectors:

1. Burndy, Model HYLUG/HYLINK.

2. Panduit, Model LAA.

3. Blackburn, Model ATL.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that mechanical work likely to damage wire and cable has been completed.

3.2 PREPARATION

A. Completely and thoroughly swab raceway before installing wire.

3.3 WIRING METHODS

A. Concealed Dry Interior Locations: Use only building wire, Type THHN/THWN or XHHN insulation, in raceway.

B. Exposed Dry Interior Locations: Use only building wire, Type THHN/THWN or XHHN insulation, in raceway.

C. Above Accessible Ceilings: Use only building wire, Type THHN/THWN or XHHN insulation, in raceway.

D. Wet or Damp Interior Locations: Use only building wire, Type THHN/THWN or XHHN insulation, in raceway.

E. Exterior Locations: Use only building wire, Type XHHW insulation, in raceway.

F. Underground Installations: Use only building wire, Type XHHW insulation, in raceway.

G. Use wiring methods indicated on Drawings.

3.4 INSTALLATION

A. Install products in accordance with manufacturers instructions.

B. Use solid conductor for feeders and branch circuits 10 AWG and smaller.

C. Use stranded conductors for control circuits.

D. Use conductor not smaller than 12 AWG for power and lighting circuits.

E. Use conductor not smaller than 16 AWG for control circuits.

F. Use 10 AWG conductors for 20 ampere, 120-volt branch circuits longer than 75 feet.

G. Use 10 AWG conductors for 20 ampere, 277-volt branch circuits longer than 200 feet.

H. Pull all conductors into raceway at same time.

I. Use suitable wire pulling lubricant for building wire 4 AWG and larger.

J. Protect exposed cable from damage.

K. Support cables above accessible ceiling, using spring metal clips or metal or plastic cable ties to support cables from structure. Do not rest cable on ceiling panels.

L. Use suitable cable fittings and connectors.

M. Neatly train and lace wiring inside boxes, equipment, and panelboards.

N. Clean conductor surfaces before installing lugs and connectors.

O. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.

P. Use suitable reducing connectors or mechanical connector adaptors for connecting aluminum conductors to copper conductors.

Q. Use split bolt connectors for copper conductor splices and taps, 6 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.

R. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.

S. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

3.5 FIELD QUALITY CONTROL

A. Inspect wire and cable for physical damage and proper connection.

B. Verify continuity of each branch circuit conductor.

END OF SECTION

SECTION 16170

GROUNDING AND BONDING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Grounding electrodes and conductors.

B. Equipment grounding conductors.

C. Bonding.

1.2 RELATED SECTIONS

A. Section 16010 Basic Electrical Requirements.

1.3 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

1.4 GROUNDING ELECTRODE SYSTEM

A. Concrete-encased electrode.

B. Rod electrode.

1.5 PERFORMANCE REQUIREMENTS

A. System Resistance: 25 ohms.

B. Submit under provisions of General section.

C. Product Data: Provide data for grounding electrodes and connections.

D. Test Reports: Indicate overall resistance to ground and resistance of each electrode.

E. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation and installation of exothermic connectors.

1.6 PROJECT RECORD DOCUMENTS

A. Accurately records actual locations of grounding electrodes.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this Section with minimum five years documented experience.

1.8 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. or testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.

PART 2 PRODUCTS

2.1 ROD ELECTRODE

A. Material: Copper-clad steel.

B. Diameter: 3/4 inch.

C. Length: 10 feet.

2.2 MECHANICAL CONNECTORS

A. Manufacturers:

1. Burndy
2. Ideal
3. Thomas and Betts (T&B)

B. Material: Bronze.

2.3 EXOTHERMIC CONNECTIONS

A. Manufacturers:

1. Therm-O-weld
2. Cadweld
3. Kumwell

2.4 WIRE

A. Material: Stranded copper.

B. Foundation Electrodes: 2/0 AWG.

C. Grounding Electrode Conductor: Size to meet NFPA 70 requirements.

2.5 GROUNDING WELL COMPONENTS

A. Well Pipe 8-inch diameter by 24-inch long concrete pipe with belled end.

B. Well Cover: Cast iron with legend "GROUND" embossed on cover.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that final backfill and compaction has been completed before driving rod electrodes.

3.2 INSTALLATION

A. Install Products in accordance with manufacturer's instructions.

B. Install rod electrodes at locations indicated. Install additional rod electrodes as required to achieve specified resistance to ground.

C. Provide grounding well pipe with cover at [each rod location] [rod locations where indicated]. Install well pipes top flush with finished grade.

D. Provide grounding electrode conductor and connect to reinforcing steel in foundation footing where indicated. Bond steel together.

E. Provide bonding to meet Regulatory Requirements.

F. Bond together metal siding not attached to grounded structure; bond to ground.

G. Bond together reinforcing steel and metal accessories in pool and fountain structures.

H. Install transient suppression plate where indicated.

I. Install ground grid under access floors where indicated. Construct grid of 2 AWG bare copper wire installed on 24 inch centers both ways. Bond each access floor pedestal to grid.

J. Bond together each metallic raceway, pipe, duct and other metal object entering space under access floors. Bond to underfloor ground grid. Use 2 AWG bare copper conductor.

K. Provide isolated equipment grounding conductor in addition to required equipment grounding conductor for circuits supplying electronic cash registers, personal computers, isolated ground receptacles, and as indicted on drawings.

L. Provide grounding and bonding in-patient care areas to meet requirements of NFPA 99 and ANSI/NFPA 70.

M. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.

3.3 FIELD QUALITY CONTROL

A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

B. Use suitable test instrument to measure resistance to ground of system. Perform testing in accordance with test instrument manufacturer's recommendations using the fall-of-potential method.

END OF SECTION

SECTION 16190

SUPPORTING DEVICES

PART 1: GENERAL

1.1 SECTION INCLUDES

A. Conduit and equipment supports.

B. Anchors and fasteners.

1.2 REFERENCES

A. NECA - National Electrical Contractors Association.

B. ANSI/NFPA 70 - National Electrical Code.

1.3 SUBMITTALS

A. Product Data: Provide manufacturer's catalog data for fastening systems.

B. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.4 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

J. Furnish products listed and classified by Underwriters Laboratories, Inc. or testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.

PART 2: PRODUCTS

2.1 PRODUCT REQUIREMENTS

A. Materials and Finishes: Provide adequate corrosion resistance.

B. Provide materials, sizes, and types of anchors, fasteners and supports to carry the loads of equipment and conduit. Consider weight of wire in conduit when selecting products.

C. Anchors and Fasteners:

1. Concrete Structural Elements: Use precast insert system, expansion anchors, powder-actuated anchors and preset inserts.

2. Steel Structural Elements: Use beams clamps with seismic safety strap, spring steel clips, steel ramset fasteners, and welded fasteners.

3. Concrete Surfaces: Use self-drilling anchors and expansion anchors.

4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts and hollow wall fasteners.

5. Solid Masonry Walls: Use expansion anchors and preset inserts.

6. Sheet Metal: Use sheet metal screws.

J. Wood Elements: Use wood screws.

PART 3: EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Provide anchors, fasteners, and supports in accordance with NECA "Standard of Installation".

C. Do not fasten supports to pipes, ducts, mechanical equipment, and conduit.

D. Do not use spring steel clips and clamps.

E. Obtain permission from Architect before using powder-actuated anchors.

F. Obtain permission from Architect before drilling or cutting structural members.

G. Fabricate supports from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.

H. Install surface-mounted cabinets and panelboards with minimum of four anchors.

I. In wet and damp locations uses steel channel supports to stand cabinets and panelboards one inch off wall.

J. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

END OF SECTION

SECTION 16470

PANELBOARDS

PART 1: GENERAL

1.1 SECTION INCLUDES

A. Branch circuit panelboards.

1.2 RELATED SECTIONS

A. Section 16010 - Basic Electrical Requirements.

1.3 REFERENCES

A. NECA (National Electrical Contractors Association) "Standard of Installation."

B. NEMA AB 1 - Molded Case Circuit Breakers.

C. NEMA KS 1 - Enclosed Switches.

E. NEMA PB 1 - Panelboards.

D. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

E. NFPA 70 - National Electrical Code.

1.4 SUBMITTALS

A. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.

B. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.5 PROJECT RECORD DOCUMENTS

A. Record actual locations of Products; indicate actual branch circuit arrangement.

1.6 OPERATION AND MAINTENANCE DATA

A. Maintenance Data: Include spare parts data listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.7 QUALITY ASSURANCE

A. Perform Work in accordance with NECA Standard of Installation.

B. Maintain one copy of each document on site.

1.8 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience.

1.9 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Furnish products listed and classified by UL as suitable for purpose specified and indicated.

1.10 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings and instructed by manufacturer.

1.11 MAINTENANCE MATERIALS

A. Provide maintenance materials as per owner requirements.

B. Provide two of each panelboard key.

PART 2: PRODUCTS

2.1 MANUFACTURERS

A. Square D, General Electric, Westinghouse, Siemens, Cutler Hammer.

B. Or equal.

2.2 BRANCH CIRCUIT PANELBOARDS

A. Lighting and Appliance Branch Circuit Panelboards: NEMA PB1, circuit breaker type.

B. Panelboard Bus: Copper, ratings as indicated. Provide copper ground bus in each panelboard.

C. Minimum integrated short circuit rating: 10,000 amperes rms symmetrical for 240 volt panelboards; 14,000 amperes rms symmetrical for 480 volt panelboards, or as indicated on drawings.

D. Molded Case Circuit Breakers: NEMA AB 1, bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles. Provide circuit breakers UL listed as Type SWD for lighting circuits. Provide UL Class A ground fault interrupter circuit breakers where scheduled. Do not use tandem circuit breakers.

E. Current Limiting Molded Case Circuit Breakers: NEMA AB 1. Provide circuit breakers with integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole. Interrupting rating 100,000 symmetrical amperes, let-through current and energy level less than permitted for same size Class RK-5 fuse.

F. Enclosure: NEMA PB 1, Type 1.

G. Cabinet box: 6 inches deep; width: 20 inches for 240 volt and less panelboards, 20 inches for 480 volt panelboards.

PART 3: EXECUTION

3.1 INSTALLATION

A. Install panelboards in accordance with NEMA PB 1.1.

B. Install panelboards plumb. Install recessed panelboards flush with wall finishes. Provide supports as shown on drawings.

C. Height: 6 ft to top of panelboard; install panelboards taller than 6 ft with bottom no more than 4 inches above floor.

D. Provide filler plates for unused spaces in panelboards.

E. Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads.

G. Provide spare conduits out of each recessed panelboard to an accessible location above ceiling. Minimum spare conduits: 5 empty 1 inch. Identify each as SPARE.

3.2 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed as per owner requirement.

B. Measure steady state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads to within 20 percent of each other. Maintain proper phasing for multi-wire branch circuits.

C. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers, fusible switches, and fuses.

END OF SECTION

SECTION 16510

INTERIOR LUMINAIRES

PART 1: GENERAL

1.1 SECTION INCLUDES

A. Interior luminaires and accessories.

B. Exit signs.

C. Ballasts.

D. Lamps.

E. Luminaire accessories.

1.2 REFERENCES

A. ANSI C78.379 - Electric Lamps - Incandescent and High-Intensity Discharge Reflector Lamps - Classification of Beam Patterns.

B. ANSI C82.1 - Ballasts for Fluorescent Lamps -Specifications.

C. ANSI C82.4 - Ballasts for High-Intensity Discharge and Low Pressure Sodium Lamps (Multiple Supply Type).

D. ANSI/NFPA 70 - National Electrical Code.

E. ANSI/NFPA 101 - Life Safety Code.

F. NEMA WD 6 - Wiring Devices-Dimensional Requirements.

1.3 SUBMITTALS

A. Shop Drawings: Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.

C. Product Data: Provide dimensions, ratings, and performance data.

D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements.

E. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.4 PROJECT RECORD DOCUMENTS

A. Accurately record actual locations of each luminaire.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum five years documented experience.

1.8 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Conform to requirements of NFPA 101.

C. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.9 EXTRA MATERIALS

A. Provide 10 spare of each type of plastic lens.

B. Provide 10 spare of each type of lamp installed.

D. Provide 10 spare of each type of ballast installed.

PART 2: PRODUCTS

2.1 LUMINAIRES

A. Furnish products as specified in schedule on Drawings.

B. Install ballasts, lamps, and specified accessories at factory.

2.2 EXIT SIGNS

A. Manufacturers: Furnish products as specified on drawings.

B. Description: Exit sign fixture.

C. Housing: Extruded aluminum or sheet steel.

D. Directional Arrows: Universal type for field adjustment.

E. Mounting: Universal, for field selection.

F. Lamps: Manufacturers standard.

G. Input Voltage: As indicated on Drawings.

2.3 BALLASTS

A. Fluorescent Ballast:

1. Description: ANSI C82.1, high power factor type electromagnetic ballast.

2. Provide ballast suitable for lamps specified.

3. Voltage: Match luminaire voltage.

4. Source Quality Control: Certify ballast design and construction by Certified Ballast Manufacturers, Inc.

2.4 LAMPS

B. Fluorescent Lamp Manufacturers:

1. Phillips

2. Sylania

3. General Electric

PART 3: EXECUTION

3.1 EXAMINATION

A. Examine substrateand supporting grids for luminaires.

B. Examine each luminaire to determine suitability for lamps specified.

3.2 INSTALLATION

A. Install in accordance with manufacturers instructions.

B. Install suspended luminaires and exit signs using pendants supported from swivel hangers. Provide pendant length required to suspend luminaire at indicated height.

C. Support luminaires independent of ceiling framing.

D. Locate recessed ceiling luminaires as indicated on reflected ceiling plan.

E. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prohibit movement.

F. Exposed Grid Ceilings: Support surface mounted luminaires on grid ceiling directly from building structure and provide auxiliary members spanning ceiling Ts. [Fasten surface mounted luminaires to ceiling T using bolts, screws, rivets, or suitable clips].

G. Install recessed luminaires to permit removal from below.

H. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.

I. Install clips to secure recessed grid-supported luminaires in place.

J. Install wall mounted luminaires, emergency lighting units and exit signs at height as indicated on Drawings.

K. Install accessories furnished with each luminaire.

L. Connect luminaires, emergency lighting units and exit signs to branch circuit outlets provided under Section 16130.

M. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

N. Bond products and metal accessories to branch circuit equipment grounding conductor.

O. Install specified lamps in each luminaire, emergency lighting unit and exit sign.

3.3 FIELD QUALITY CONTROL

A. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

3.4 ADJUSTING

A. Aim and adjust luminaires as indicated on Drawings and as directed.

C. Adjust exit sign directional arrows as indicated.

D. Relamp luminaires that have failed lamps at Substantial Completion.

3.5 CLEANING

A. Clean electrical parts to remove conductive and deleterious materials.

B. Remove dirt and debris from enclosure.

C. Clean photometric control surfaces as recommended by manufacturer.

D. Clean finishes and touch up damage.

3.6 DEMONSTRATION

A. Provide minimum of two hours demonstration of luminaire operation.

END OF SECTION

SECTION 16720

NURSE CALL

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:
   1. Furnish and install all equipment, accessories and materials for the Nurse Call System using lamp and electronic tone annunciation at a central annunciator station to register calls from patient and other call-in stations as described in Contract Documents.

B. Related Sections:
   1. Section 16010, Basic Electrical Requirements

1.2 REFERENCES

A. General:
   1. Standards listed by reference, including revisions by issuing authority, form a part of this specification section to extent indicated.

B. Underwriters Laboratories, Inc.:
   1. UL 1069 Hospital Signaling and Nurse Call Equipment

C. National Fire Protection Association (NFPA):
   1. NFPA 70 National Electrical Code

1.3 SYSTEM DESCRIPTION

A. Performance Requirements: Provide nurse call equipments, which has been manufactured and installed to maintain performance criteria stated by manufacturer without defects, damage or failure.

1.4 SUBMITTALS

A. Product Data: Submit product data, including manufacturer's product sheet, for specified products.

B. Shop Drawings: Submit shop drawings showing layout, profiles and product components, including anchorage and accessories. Include cabling diagrams, wiring diagrams, station installation details, and equipment cabinet details.

C. Quality Assurance Submittals:
   1. Test reports: Certified test reports showing compliance with specified performance characteristics.
   2. Manufacturer's installation instructions.

D. Closeout Submittals:
   1. Submit the Operation and maintenance data for installed products in accordance with General Conditions 'Closeout Submittals Section. Include methods for maintaining installed products and precautions against cleaning materials and methods detrimental to finishes and performance. Include troubleshooting guide, wiring terminal identification and equipment parts list.
   2. Submit warranty documents specified herein.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to the required for a minimum of five years on an on going basis.

B. Regulatory Requirements: The installation shall comply with OSHPD requirements.

C. Pre-installation Meeting: Notify Architect five days prior to scheduling of pre-installation meeting. The pre-installation meeting shall verify project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer's warranty requirements.

1.6 DELIVERY, STORAGE & HANDLING

1. Ensure all necessary equipment and accessories have been ordered taking into account required lead-time and manufacturer's ordering instructions as to avoid construction delays.
2. Deliver material in manufacturer's original, unopened, undamaged containers with identification labels intact.
3. Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.

1.7 WARRANTY

A. Submit for Owner's acceptance, manufacturer's standard written warranty executed by authorized company official. Manufacturer's warranty is in addition to and not a limitation of, other rights Owner may have under Contract Documents. The written warranty shall be project specific and shall include project name, address, owner's information and period of the warranty.
   1. Warranty Period: Five years commencing on the Date of Substantial Completion.

1.8 OWNER'S INSTRUCTIONS

A. Instruct Owner's personnel in operation and maintenance of installed units.

1.9 MAINTENANCE

A. Extra Materials: Deliver to Owner extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels.
   1. Furnish three lamps for room dome lights and zone light units.
   2. Storage and Protect the extra materials as required by manufacturer from damage.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Nurse's Call System electrical components, devices and accessories shall be listed and labeled according to UL 1069 as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction and marked for intended use.

B. Nurse's call system shall be manufactured by Engineered Electronics, Inc, 4301 Industrial Access Road, Douglasville, GA 30134, 800-331-3541 or approved equal prior to bidding.

C. Annunciator:
   1. Model 900-275 with 15 LED indicator with common buzzer, system with visual indicator.

2. The annunciator shall be flush mount "100-828" with 3 Gang Box.
3. Power supply "900-826" 24 volts DC 2.5 amp.
4. Jumpers:
   a. Buzzer controlled by Point Input, Shunt on H9 (1-2) only.
   b. Buzzer intermittent – Shunt on H6 (1-2) and Flash Rate select (1-1) slow, (2-2) mid, (3-3) fast. H-9 is to be left open.
   c. Buzzer controlled by duty output from 900-203 control panel.

D. Visual and Audiovisual Control Panel:
1. Model 900-203
   a. 500-158 power supply
   b. 500-170 flasher control
   c. 500-172 terminal board
   d. 500-174 motherboard
   e. 100-193 transformer
   f. 100-180 capacitor
   g. 500-175 amplifier
2. Maintained common alarm contacts
3. Amplifier for audio systems
4. There shall be separate circuit boards for the Power Supply, Flasher, Terminal Board and Amplifier. Replacement of any board shall be possible without the use of any special tools for ease of maintenance.
5. There shall be an AC power Switch with power on indicator.
6. The power source shall be a 21vdc switcher power supply with built-in current limiting of 3amps. There shall be a 3amp resetable fuse for output to field wiring and a 3amp resetable fuse for output to console control.
7. The Power Supply shall have KED indicators showing status of supply voltage, 24 vdc to Field voltage and 24 vdc to Master Voltage.
8. The control shall be designed to function as an Audio/Visual system by inserting a modular type amplifier board. The Amplifier shall include separate Volume Controls for handset talk, handset listen and panel speaker. There shall also be a separate control for Amplifier gain.
9. The Flasher shall provide 4 levels of call signaling to Accommodate Normal Patient Calls and 3 levels of Emergency Calls.
10. The Flasher shall have a set of Dry Contacts which shall be settable for either normally open or normally closed operation.
11. The terminal board shall provide 80 individual screw terminals for point wire termination, 8 zone outputs, field settable in-groups of 5 positions and Interconnect Cable plugs for connecting to Master/Annunciator.
12. The control panel shall come from the factory a complete assembly and shall require only field wire connections to make the system functional.
13. The 900-203 Control panel shall conform to Underwriter's Laboratory (UL 1069)

E. Dome Light
1. Model 900-151
2. All lamps shall be an incandescent type. The lamps shall operate on 24 volts DC.
3. The lens shall attach securely to a two gang plate. The lens shall be attached with security screws.
4. The dome light shall be constructed on a 4 ½" x 4 ½" two gang plate without any subassemblies.
5. The dome light shall be designed to mount on either a single or two gang box.
6. The location of this device shall be above the doors.
7. The dome light shall conform to Underwriters' Laboratory, Inc. listed (U.L. 1069) Standard.

F. Push Button Emergency Station
1. Model 900-108
2. A mechanically locking push button switch for placing a call by pressing the switch inward.
3. Call switch and LED assembly are electrically isolated from the face plate.

4. Separate RED call assurance LED is part of the station so that when the switch is activated the LED will light in accordance with the type of common connected to input. The call then can only be cancelled by pulling switch back to the outward position.
5. It is possible to operate this station in conjunction with a patient, staff or emergency stations.
6. Coordinate the location of the station with the plans and OSHPD inspector.
7. The station shall conform to Underwriters' Laboratory, Inc. listed (U.L. 1069).

G. Shower Station
1. Model 900-110
2. A mechanically locking toggle type switch with rubber water seal is provided fro placing an emergency call by gently pulling the cord or pressing the switch downward.
3. The call switch provided with a 72" cord with pendant. Coordinate length of cord with owner and OSHPD requirements.
4. The call assurance lamp shall be a red LED.
5. A call placed from the emergency station can only be cancelled at the originating device.
6. Each emergency station shall be furnished with a single gang water proof plate gasket.
7. It is possible to operate a splash proof emergency station in conjunction with a patient, staff or other emergency stations.
8. The location of the station shall be as indicated on the plans. Coordination with OSHPD inspector is also required.
9. The station shall conform to Underwriters' Laboratory, Inc. standard (U.L. 1069).

H. Source Quality
1. Obtain nurse call equipment and system from a single manufacturer.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

A. Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions and product carton instructions for installation.

3.2 EXAMINATION

A. Verify substrate conditions which have been previously installed under other sections are acceptable for product installation in accordance with manufacturer's instruction.

3.3 INSTALLATION

A. Nurse Call Equipment
1. Install wiring in conduit as recommended by manufacturer
2. Provide separation as recommended by equipment manufacturer
3. Make splices, taps and terminations on numbered terminal strips in junction, pull and outlet boxes, terminal cabinets and equipment enclosures
4. Retain color-coding of conductors and apply wire and cable marking tape to designate wires and cables so all media are identified in coordination with system wiring diagrams. Label stations, controls and indications using approved consistent nomenclature.

B. Ground cable shields and equipment to eliminate shock hazard.
1. Locate signal ground terminal at main equipment cabinet. Isolate from power system and equipment grounding except at connection to main building ground bus.
2. Comply with requirements in sections 16010.

3.4 FIELD QUALITY REQUIREMENTS

A. Site testing – comply with the following
   1. Schedule test a minimum of 7 days in advance of performance tests.
   2. Submit a written record of test results
   3. Perform an operational system test to verify compliance of system with these specifications. Perform tests that include originating station-to-station and all-call messages and pages at each nurse call station. Verify proper routing, volume levels and freedom from noise and distortion. Test each available message path from each station on the system.
   4. Rectify deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify by the system test that the total system meets these specifications and complies with applicable standards. Report results in writing.

B. Verify that units and controls are labeled and interconnecting wires and terminals are identified in accordance with NFPA and UL 1069 requirements.

3.5 CLEANING

A. Replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance. Remove construction debris from project site and legally dispose of debris.

3.6 PROTECTION

A. Protect installed product and finish surfaces from damage during construction.

END OF SECTION

SECTION 15940

AIR OUTLETS AND INLETS

PART 1: GENERAL

1.1 WORK INCLUDED

A. Diffusers

B. Registers/grilles.

1.2 REFERENCES

A. ANSI/NFPA 90A - Installation of Air Conditioning and Ventilating Systems.

B. SMACNA - HVAC Duct Construction Standard.

1.3 SUBMITTALS

A. Submit product data under provisions of General Section.

B. Provide product data for items required for this project.

C. Submit schedule of outlets and inlets indicating type, size, location, application and noise level.

D. Review requirements of outlets and inlets as to size, finish and type of mounting prior to submitting product data and schedules of outlets and inlets.

PART 2: PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - CEILING DIFFUSERS

A. Anemostat

B. Metal Aire

C. Kreuger

2.2 RECTANGULAR CEILING DIFFUSERS

A. Rectangular, adjustable pattern, stamped, multicore type diffuser to discharge air in 360 degree pattern with sectorizing baffles where indicated; Model RMD manufactured by Anemostat.

A. Ceiling Diffusers: Shall be aluminum (or in steel) with baked off-white enamel over prime coat construction with separate opposed blade, Allen key-operated volume controls. Diffusers shall be provided with 24 x 24 extended shells or perforated panel suitable for use in ceilings as indicated on drawings. Verify frame type with Architect prior to ordering. Diffusers shall be as manufactured by "MetalAire Series 9000" or "Anemostat Model RMD" modular type or approved equal.

B. Provide frame as required for ceiling type.

C. Fabricate of steel or aluminum with baked enamel finish, color as specified by Architect.

D. Provide opposed blade damper, square to round neck adaptor and multi-louvered equalizing grid with damper adjustable from diffuser face.

2.3 ACCEPTABLE MANUFACTURERS - CEILING REGISTERS/GRILLES

A. Anemostat

B. Metal Aire

C. Kreuger

2.4 CEILING EXHAUST AND RETURN REGISTERS/GRILLES

A. Streamlined blades, depth of which exceeds 3/4 inch spacing with spring or other device to set blades, Model S35HOD manufactured by Anemostat.

B. Ceiling Return and Exhaust Registers and Grilles: "MetalAire Model RHD" or "Anemostat Model S35 HOD", all aluminum (or in steel) with baked off-white enamel over prime coat construction with opposed blade gang-operated volume control. Cores shall be without indents. Where located in tee ceilings provided with 24 x 24 extended shell or perforated panel as shown on drawing. Verify frame types with Architect before ordering.

C. Frame type shall be compatible with ceiling.

D. Fabricate of steel or aluminum with baked enamel finish, color as specified by Architect.

E. Where not individually connected to exhaust fans, provide integral, gang-operated opposed blade dampers with removable key operator, operable from face.

2.5 ACCEPTABLE MANUFACTURERS - WALL REGISTERS/GRILLES

A. Anemostat

B. Metal Aire

C. Kreuger

2.6 WALL SUPPLY REGISTERS/GRILLES

A. Streamlined and individually adjustable blades, depth of which exceeds 3/4 inch maximum spacing with spring or other device to set blades, vertical face, double deflection; Model S2VO manufactured by Anemostat.

B. Sidewall supply registers shall be "MetalAire Model VHD" or "Anemostat Model S2VO" double deflecting type with key operated opposed blade volume control aluminum (or in steel) with baked off-white enamel over prime coat construction. All sidewall supply registers shall be equipped with extractors.