SECTION 16010 – ELECTRICAL GENERAL PROVISIONS

GENERAL

1. This Section valid only when considered in total with other Contract Documents. Cross references are for the convenience of the reader and their inclusion in or omission from any section in no way limits scope of intent of any Contract Document.

2. Definitions:

   "Wiring" includes in addition to conductors, all raceways, conduit, fittings, boxes, switches, hangers, and other accessories related to such wiring.

   "Concealed" means hidden from sight in chases, furred spaces, shafts, hung ceilings, or embedded in construction.

   "Exposed" means not installed underground or "concealed" as defined above.

   "Regulating authorities" means all governmental, utility, and fire protection authorities having jurisdiction.

   "Provide" means to supply, erect, install, and connect up complete, in readiness for regular operation, the particular work referred to.

   "Furnish" means to supply and deliver to the job.

   "As accepted of accepted" means by equipment or materials, which in the opinion of the Engineer, is equal in quantity, durability, appearance, strength, design and performance to the equipment or material specified and will function adequately in accordance with the general design.

3. Singular Numbers

   Where any device or part of equipment is herein referred to in the singular number, such reference shall be deemed to apply to as many such devices as are required to complete the installation or as shown.

4. Intent

   It is the intention of the Specifications and Drawings to call for finished work, tested and ready for operation. Any apparatus, appliance, material or work not shown on Drawings, but mentioned in the Specifications or vice versa, or any incidental accessories necessary to make the work complete and ready for operation, even if not particularly specified, shall be provided. Should there appear to be discrepancies or questions or intent in the Contract Documents, refer the matter to the Architect for his decision, before ordering any materials or equipment or before the start of any related work. The decision of the Architect shall be final, conclusive and binding.

5. Drawings and Data

   If so directed by the Architect, without extra charge, make reasonable modifications in layout as needed to prevent conflict with work or other trades or for proper execution of work.

   Include minor details not usually shown or specified, but necessary for proper installation and operation of a system or piece of equipment in work and in bid price, the same as if specified or shown.

6. Materials and Equipment

Materials and equipment shall be standard products of a reputable manufacturer regularly engaged in the manufacture of the specified item. Where more than one unit is required or any item, furnish by the same manufacturer, except where specified otherwise. Install materials and equipment in accordance with manufacturer's recommendations. Should variance between plans and specifications occur with these, contact the Architect immediately so that variations in installation can be known by all parties concerned.

Deliver materials and equipment to the Project in the manufacturer's original, unopened, labeled containers, and adequately protect against moisture, tampering or damage from improper handling or storage. Do not deliver materials to the job before they are ready for installation, unless adequate security is provided.

The Owner's representative may require removal from the premises of such material or work as in his opinion is not in accordance with the Specifications; he will also require substitution, without delay, and satisfactory work or material. The Architect has the authority to stop work whenever such stoppage may be necessary to insure proper execution of the Contract.

7. Shop Drawings and Samples

Provide shop drawings consisting of manufacturer's certified scale drawings, cuts, catalogs, or descriptive literature with complete certified characteristics of equipment, dimensions, capacity, code requirements, etc.

In addition to the general contractor's review prior to submittal, installer to check shop drawings thoroughly to ascertain that they comply in detail with plans and specifications; electrical characteristics are correct for available service; and that dimensions are shown and checked to fit available space. Clearly note any deviations from plans and specifications on certified shop drawings. Include reference to appropriate Section, Page, and Line numbers of the Specifications. Installer to stamp drawings with his firm's name, date, and approval indicating that above has been complied with. Shop drawings received without this stamp will be rejected without further explanation.

Submit for review, with such promptness as to cause no delay in work, all sample requested, checked by and stamped with the approval of subcontractor, and identified clearly as to material, manufacturer, and pertinent catalog numbers, and use for which intended.

Review will be only for conformance with design concept of project and compliance with information given in Contract Documents. Review of a separated item will not indicate review of assembly in which item functions. Direct specific attention in writing on resubmitted shop drawings to revisions other than corrections called for on previous submissions.

Commence no work requiring a shop drawing or sample until submission has been reviewed. Review of shop drawings or samples does not relieve subcontractor from responsibility for any deviations from requirements of Contract Documents unless subcontractor has, in writing, called attention to such deviations at time of submission and received written permission for specific deviation. Review does not relieve Contractor from responsibility for errors or omissions in shop drawings.

Submit layouts of equipment rooms or areas, with sections, where other than designed or scheduled equipment is proposed to be furnished, showing configuration and adequate space.

8. Record Drawings

Maintain at site a set of record drawings, which clearly indicated (by shading, coloring, or some other acceptable method) the day-by-day extent or work installed.

9. Codes, Ordinances, Certificates, Permits and Fees

Give necessary notices, obtain permits, and pay taxes, fees and other costs in connection with work, file necessary pans, prepare documents, and obtain necessary approvals of regulating authorities having jurisdiction; obtain all required certificates of inspections for work and deliver to the Architect before request for acceptance and final payment of work.

Include in work, labor, materials, services, apparatus, drawings (in addition to Contract Drawings and Documents) required to comply with applicable laws, ordinances, rules and regulations.

Drawings and Specifications take precedence when they are more stringent than codes, ordinances, standards and statutes. Codes, ordinances, standards and statutes take precedence where they are more stringent or conflict with drawings and specifications. The following industry standards, specifications, and codes are minimum requirements:

9.1 Applicable City, County, and State mechanical, electrical, gas, plumbing, health and sanitary code, laws, and ordinances.

9.2 City or other applicable building code.

9.3 National Electrical Safety Code.

9.4 Underwriters Laboratories, Inc., Standards

9.5 National Fire Protection Association Standards

10. Coordination of Trades

Schedule and coordinate work with that of other Divisions and Sections to execute the contract expeditiously and avoid unnecessary delays.

Examine fully specifications and drawings for other trades, to become familiar with all conditions affecting work, and consult and cooperate with other Divisions and Sections for determining space requirements and adequate clearances with respect to other equipment in the building. The Architect reserves the right to determine space priority in the event of interference between piping, conduit and equipment of various trades.

If the work is installed without coordinating with other trades, and such installation interferes with their installation, make any changes necessary to correct the conditions, without extra charge.

Provide fabrication drawings of critical areas if so directed by the Architect.

11. Temporary Openings.

Provide temporary openings required for admission of apparatus. Notify and coordinate with the general contractor accordingly.

12. Sleeves

Furnish and set sleeves in locations where conduit pass through floors, walls, partitions, concrete beams, and roof. Assume cost for cutting, patching, finishing, etc. resulting from failure to accomplish this requirement. Openings not to impair strength, function, or aesthetics or work cut.

Provide conduits passing through floors, walls, partitions, roofs or concrete beams with sleeves having internal diameter 1 inch larger than outside diameter of conduit.

In sleeves passing through fire walls or floors, or lightproof or soundproof walls, floors and partitions, pack space between sleeve and pipe with non-shrink grout (Chase-tec brand or Engineer approved equal), neoprene coated asbestos rope, or other approved sealant materials. UL listed pre-fabricated assemblies are acceptable.

13. Excavation and Backfill

Perform necessary excavation, shoring, and backfilling required for the proper laying of pipes and conduits inside the building and premises, and outside as may be necessary. Remove excavated materials as directed.

14. Scaffolding, Rigging and Hoisting

Provide scaffolding, rigging, hoisting, and services necessary for erection and delivery of equipment and materials provided under this Division. Remove same from premises when no longer required.

15. Hangers, Inserts, Supports, and Bases

Provide required structural members, hangers, supports, and inserts to keep piping and conduit in proper alignment and prevent transmission of injurious thrusts and vibrations. "Tie wire" is not an approved support method.

16. Cutting and Patching

Cut complete construction work only if sleeves, openings, chases, etc., were inadvertently omitted, and only wit specific permission of the Architect. In no case shall reinforcing steel be cut without specific written permission of the Owner's representative.

Provide sleeves, caps, plates, escutcheons, flashings, etc., required to fill or close the openings. Provide final grouting, concrete, asphalt, masonry, painting, and other materials as required. Make repairs in like and kind for exact matching of surfaces and finishes.

Where cutting and patching occurs in street, sidewalks, alleys, and the like, cooperate fully with Owner and municipal authorities to maintain safe and required traffic flows. No extras will be allowed for traffic patrolmen and overtime work if such is required by City, County, or State officials. Patching is to meet requirements of municipal or other government bodies.

17. Cleaning

Includes removing tools, scaffolding, surplus materials, barricades, temporary walks, debris, and rubbish from the Project promptly upon completion of that portion of the work. Leave the area of operations completely clean and free of these items.

During the course of construction, cap all equipment and electrical conduit in an approved manner to insure adequate protection against entrance of foreign substances.

18. Guarantee

Each complete system shall be guaranteed by the Contractor for a period of one year from the date of acceptance of work by Owner in writing, to be free of defects of materials and workmanship, and to perform satisfactorily under all conditions of load or service. The guarantees provides that any additional controls, protective devices, or equipment be provided as necessary to make the system of equipment operate satisfactorily, and that any faulty materials or workmanship be replaced or repaired. On failure of guarantor to do the above after written notice from the Owner, the Owner may have the work done at the cost of the guarantor.

For additional requirements refer to paragraph on guarantees in each individual Section.

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

END OF SECTION 16010

SECTION 16100 – BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1. General

This Section valid only when considered in total with all other Contract Documents. Cross references where noted are for convenience and their inclusion or omission from any particular Section in no way limits scope of particular Section or intent of any Contract Documents.

Provide acceptable complete raceway systems for all electrical conductors including conductors for telephone, signal, special systems, control and other systems required by applicable codes, rules, and regulations. Raceways shall be sized according to National Electric Code unless shown larger than required by N.E.C. Where acceptable by local code ordinances it shall be permissible to use type NM and NMC wiring for branch circuit within the guestrooms. The electrical contractor shall indicate specifically on the bid form the type wiring methods to be used. Outlet boxes shall be plastic when type NM and NMC wiring methods are utilized. Also, where acceptable by local code, MN cable or ENT may be used for branch circuit wiring within the guest rooms.

Other Sections of this Division valid only when considered in conjunction with these General Provisions.

PART 2 - MATERIALS

2.1 Conduits, Fittings, and Boxes

Conduit: Conduit manufactured by National, Republic, Triangle, Allied. All conduit shall be furnished by one manufacturer with exception of non-metallic, PVC coated and flexible conduit, and shall be Underwriter Laboratory listed and approved for the installation in which it is used.

All raceways shall be GRC for entire installation except as noted or shown. Rigid steel conduit, elbows, standard couplings shall be hot dipped galvanized rigid steel. If partitions of walls are filled with solid concrete grout, and where subject to injury or damage, e.g. consider area up to 4' above floor level subject to injury. Verify these areas prior to installation.

Rigid Conduit: Rigid steel, hot dipped, galvanized, or sherardized with baked enamel coating, zinc coated threads and protective caps.

Thinwall Conduit: Electro galvanized "Electrical metallic Tubing" of cold rolled steel, electrically welded. Baked clear plastic enamel coating.

Flexible Conduit: National "Flexsteel" flexible steel conduit, formed of one continuous length of electro galvanized spirally wound steep grip.

Liquid-Tight Flexible Conduit: Anacondra "Sealtite" liquid-tight flexible steel conduit, formed of one continuous length of electro galvanized spirally wound steel strip with neoprene jacket.

Non-Metallic Type 40 PVC Plastic Duct: Carlon PV-Duit Plus, as manufactured per NEMA TC-2, and UL-651 Standards and UL listed for underground uses.

Intermediate Metal Conduit: Conduit shall be hot-dipped galvanized intermediate metal conduit manufactured in accordance with UL #1242.

PVC-Coated Rigid Conduit: Robroy Plasti-bond as manufactured per NEMA RNI-1974 (Type A) and galvanized conduit prior to plastic coating per Federal Spec. WWC-581d, ASIS C801-1966.

2.2 Conduit Fittings:

Conduit fittings manufactured by Thomas and Betts, Raco, O.Z. Gedney, or Appleton. All fittings shall be by one manufactured and shall be UL approved.

Rigid Conduit Fittings: Threaded type, galvanized steel, or malleable iron, water, and concrete tight. All connectors at cabinets, boxes, outlets, gutters, panelboards, etc., shall be nylon insulated, metallic bushings with double locknuts.

Thinwall Conduit Fittings: Compression or set-screw type, galvanized steel, rain, and concrete tight. All connectors shall be nylon insulated. Indentor or set screw type fittings will not be allowed.

Flexible Conduit Fittings: Squeeze or screw type, galvanized malleable iron or steel, with nylon insulated throats.

Liquid-Tight Flexible Conduit Fittings: Galvanized steel or malleable iron liquid-tight with neoprene gaskets, "O" ring and retainer, nylon insulated throats.

Non-Metallic Type 40 PVC Duct: Joints of the ducts assembled together with approved couplings to make a water tight joint. Provide expansion fittings on all non-metallic duct per manufacturer's recommendations.

IMC Fittings: All rigid fittings specified under Paragraph 2.2.1, or UL approved compression IMC fittings.

PVC-Coated Ridig Fittings: Robroy Plast-Bond 2 as required for all PVC coated rigid conduit installation.

Condulets: R&S, Appleton, Efcor, Gedney or Killark, cast feraloy types with sheet steel covers, provide neoprene gaskets for all locations.

2.3 Conduit Size and Type:

Conduit size and type to be used for various applications, as follows (unless shown otherwise on Contract Drawings):

Rigid Conduit: All conduit, regardless of size, installed under poured concrete floor slabs and in walls unless otherwise noted. Rigid conduit in earth shall be PVC coated rigid conduit, or concrete encased.

Thinwall Conduit (EMT): Installed in partitions, above suspended ceiling and where exposed above 6'-0" in dry interior locations where not subject to mechanical stress. EMT larger than 3 1/2" diameter shall not be used.

Flexible Conduit: Connections to suspended unit heaters, fans, and similar small equipment subject to vibration not exposed to rain or water drip. Connections from junction box to lighting fixtures in accessible ceilings. Connection from junction boxes to switch for narrow switches in hollow metal jamb posts (mullions).

Liquid-Tight Flexible Conduit: Final connections to all motor operated equipment. Provide green ground wire except as otherwise permitted by Article 351-9 of the N.E.C.

Non-Metallic Type 40 PVC Plastic Duct: Minimum 3/4" trade size. Conduit in earth under building slabs shall be permitted and installed per N.E.C. requirements. Conduits in earth not under building

slabs shall be routed 24" below finish grade, or as shown on Contract Drawings.

Intermediate Metal Conduit: Installed in all corrosive locations, or in earth unless otherwise noted. All risers and elbows from all underground conduit installations and as shown on Contract Documents.

2.4 Outlet Boxes:

Wireways: Wireways and fittings, screw and/or hinged cover as shown shall be constructed of code gauge enameled sheet metal.

Wireways and fittings installed on exterior and where subject to water or similar conditions shall be raintight type construction without knockouts, constructed from galvanized sheet steel.

Approved manufacturers are Square-D Company, Alwalt or Gibbons.

Outlet boxes and accessories used in the conduit systems as manufactured by Appleton, Raco, Steel City, or Bowers. All boxes electro-galvanized or zinc plated steel.

Location: Approximate location of outlets is shown on Plans, but each outlet location shall be checked before installation. Refer to electrical notes on Drawings and Specification Sections covering systems and equipment for types of boxes required and mounting instructions. Coordinate installation of boxes and conduit stubs with equipment supplier and Architect.

2.5 Type of Boxes:

Flush masonry wall outlets: Masonry box, 2 1/2", 3 1/2" deep, with concentric K.O.'s (single or multi-ganged as required).

Wood or Metal Stud Wall Outlets: 4" square box - 1 1/2" or 2 1/8" deep with conduit K.O.'s (plastic rings) and required square extension rings and/or device corners.

Wood or Metal Stud Wall Outlets (Multi-Gang): Same as masonry outlets with required supports (no single gang boxes allowed).

Outlets in Plaster or Gypboard Ceilings: 4" octagon box, 2 1/8" deep, with conduit K.O.'s and required extension rings and/or covers. Fixtures not provided with prewired junctions shall have 4" octagon box above accessible ceiling with flexible conduit connection to fixture box of wiring channel.

Where surface wall outlet boxes are allowed they shall be the following types:

2 gang 4" square box, 2 1/8" deep

Multi-gang solid gang masonry box, 2 1/2" deep

All boxes with 1/2" raised steel cover and approved mounting accessories.

Where outlet boxes are mounted on conduit stubs on roof or other areas as indicated, boxes shall be Type FS or FD malleable iron, cadmium finish.

Floor Boxes and Fittings: Russel-Stoll, Fullman, Steel City and comparable to as follows:

Power: LEW #632SE-DFB and with #DCF-1, carpet flange in carpeted areas.

Telephone and Low Voltage Signal: LEW #532SE with 2" #538 brass kick ring and DF-1, carpet flange in carpeted areas.

Use deep boxes for all floor boxes where feasible.

Outlets in Concrete: Concrete boxes - depth as required with conduit K.O.'s and mounting lugs designed to mount on forms without rocking.

Outlets for W.P. Receptacles: Boxes shall be type FS or FD cast steel.

For exposed wiring on the exterior of building and on interior of building where subject to water use case feraloy type boxes with weatherproof covers, and neoprene gaskets, and for other exposed wiring on the interior of building, use code gauge 4" square or larger galvanized boxes and 1/2" raised steel cover plate.

2.6 Pull and Junction Boxes and Wireways:

Provide pull boxes, junction boxes, and auxiliary wiring gutters where indicated and where required to facilitate installation of the wiring. Such boxes and gutters shall meet all requirements of Articles 362, 370, and 374 of NEC.

For concealed conduit, install flush with ceiling or wall with covers accessible and easily removable. Where flush boxes are installed in finish ceiling and walls, provide cover to match material and finish specified for devices which shall exceed the box face dimensions by a sufficient amount to allow no gap between box and finished material.

Pull and junction boxes not specifically described in other Sections or on the Drawings, shall be fabricated o code gauge galvanized steel with screw covers, brass hardware, and baked enamel finish, equal to Circle AW.

Pull and junction boxes installed in poured concrete floors: Flush type cast iron with watertight gasketed covers, gray metallic finish. Where boxes are installed in floors with tile or carpet floor covering, covers shall be of the recessed type to accommodate the floor covering. Cast iron boxes as manufactured by Lew Electric Fittings Company.

2.7 Wire and Cable

Materials listed in this Section are products of Anaconda Wire, General Cable, and General Electric. All wire required for this Project furnished by one manufacturer, unless otherwise noted or specifically approved. Submit for review, prior to placing orders, a complete schedule of wire, cable, and connectors to be installed.

In no case shall a conductor a size less than No. 12 AWG be used for lighting or receptacle circuits. Where home-run conductors are specifically indicated to be larger than #12 (i.e., three #10-3/4"C), it shall be understood that the increase in conductor size shall extend the entire length of the circuit. Conductors for line voltage control shall be minimum #16 AWG.

All wire and cable is to be new and unused, manufactured within a six month period preceding the delivery to the job site. Submit UL label with date (for all wire coils).

All branch circuit wire to be delivered to the job unbroken or spools.

Wire and Cable: NEC grades insulated to 600 volts by ASTM Standards unless otherwise indicated.

2.8 Wire and Cable Types

Type THHN or XHHW (90 degree C) shall be used where lighting branch circuit conductors are routed through fluorescent fixture channels, for panel and equipment feeders, and where exterior exposure of raceways is encountered. May be used for motors in mechanical equipment rooms, and for similar

circuits in other high ambient temperature areas. All wiring to motor or equipment subject to vibration shall be stranded.

Type AF (150 degree C): Minimum size No. 14 stranded, use for filed tap-off connections to incandescent fixture sockets, and other high operating temperature equipment connection where operating temperature exceeds 90 degree C.

Type MTW or Type T (60 degree C): Minimum size No. 14 solid or stranded, coded, multi-conductor, individually insulated with an overall jacket. Use for low voltage signal and control circuits operating at 25 volts or less.

Portable cords: Type SJO, 300 volt constant service and type SJ, 600 volt constant service shall be used as shown and required.

2.9 Connectors

Splices for Conductors No. 10 and Smaller: Made with Ideal, Wing-Nut insulated, solderless, screw-on connectors (size as recommended by manufacturer).

Connectors for Conductors No. 8 and Larger: To be compression or split bolt types; T & B, O.Z. Gedney, Blackburn, or Burndy mechanical connector. Fill connector voids with electrical insulation putty, follow with 3M Scotch Tape #50 so insulation is equivalent to or greater than insulation of conductor.

Control wiring and all other stranded wiring to screw connections shall be provided with T & B "STA-KON" terminals, or as noted on contract Drawings.

Install approved expansion joint type fittings in raceway systems crossing building expansion joints and as recommended by raceway manufacturer where expansion is caused by temperature changes or similar type conditions. Expansion fittings to maintain approved raceway system (provide bonding jumpers as required).

2.10 Identification and Tagging:

Wire and Cable for Feeders, Sub-Feeders, Control, and Branch Conductors identified as follows:

Switch legs for local wall switches to be distinctive color such as purple.

Colors: Assigned to each conductor as described and carried throughout all main and branch circuit distribution.

Electrical system color codes, main and branch conductors identified as follows:

	120/208V
A Phase	Black
B Phase	Red
C Phase	Blue
Neutral	White
Ground	Green

Conductor Insulation: Colored in sizes up through No. 8; conductors No. 6 and larger: May have black insulation but phase color coded with 1/2" brand or colored tape at all junctions and terminations.

Main and feeder cables tagged in all pull boxes, wireways and wiring gutters of panels. Tags to be of fireproof materials as manufactured by "Brady" or approved equal.

Mark underground stubouts with concrete monuments (8" x 8" x 8") installed 1" below finish grade,

over but not in contact with capped ends. Identify capped empty raceway with linen tags located inside of raceway ends. Pitch all conduits uniformly to manholes to eliminate pockets. All joints shall be watertight.

Numbered bands to identify each wire or cable at panelboards and/or piece of equipment served.

2.11 Access Panels

Provide access panels in building construction where required for access to concealed junction boxes, pull boxes, etc.

Access panels shall be of the flush steel panel type of ample size to permit inspection and servicing of the concealed item. Panels shall be Milcor Style B for plaster walls and ceiling, style M for masonry walls and ceilings.

2.12 Wiring Devices and Device Plates

Provide the following devices where indicated on the drawings. Devices shall be ivory in color in the guest rooms, public spaces and office areas. Types of devices other than those listed below shall be of the same standard or quality. The catalog numbers and manufacturers listed are intended to indicate the type and quality. Specification grade devices and places shall be as manufactured by Leviton or as accepted. Devices shall have screw type terminals.

Receptacles: Where special receptacles are required, verify the exact type required to mate with equipment cord caps before ordering. Receptacles and plug configurations shall conform with NEMA Standards for amperage and voltage classification and shall comply with NEMA WD-1 and UL 20 tests.

A. Grounding type duplex throughout: Leviton 16242 Decora Series.

B. Duplex weatherproof receptacle shall have integral ground-fault protection Leviton 6598I with 6196-V cover.

C. Duplex receptacle with integral ground-fault protection Leviton 6598.

Switches: Switches, unless noted, shall be the a-c tumbler, quiet type; 20A. Leviton 5611 Decora series with lighted handle in the off position or as accepted. Switches shall be fully rated for either inductive or incandescent loads and shall comply with Federal Specification W-C-596D as verified by UL, using NEMA tests WD-1, 3.02 through 3.10 and UL test 49B. Key switches shall be Leviton 1121L series.

Device Plates: Provide a device plate for each outlet to suit the device installed and blank plates or covers for junction boxes or empty outlets. Flush device plates shall be high abuse nylon, Leviton Decora Series, color to match device. Acceptable alternate: Lutron or approved equal.

A. Device plates shall be one-piece type and a shape suitable for the devices and outlets installed. Sectional device plates will not be permitted. Where exposed wiring is permitted, device plates shall be galvanized.

b. Telephone plates shall have bushed center or telephone jack opening. Color of jack and plate shall match Leviton Decora Series.

PART 3 - INSTALLATIONS

3.1 Conduit Installation

Conduit Systems: Installed for all wiring, lighting, power, signal, control communications, etc. Install conduit below or above concrete at floors or roof slabs.

Minimum size conduit 1/2" trade size. Where specific size is not called for on Drawings or in the Specifications, select size required from Chapter 9 of the N.E.C. Where specified sizes required by Drawings or Specifications are larger than code requires, the larger size shall be installed. All empty conduits shall be equipped with 200 lb. nylon pull cord.

All conduit concealed, except in crawl spaces, unfinished equipment, and storage rooms, equipment bays, etc., as shown on Plans, mechanical equipment rooms, and at connections to surface panels and free standing equipment.

Where exposed raceways are permitted by the Owners' representative in finished areas, paint as directed by Owner's representative and use approved escutcheons where entering or leaving finished areas.

All conduit routed in lines parallel or perpendicular to building construction. No conduit installed less than 6" from any piping installed by other trades. Exposed conduit fittings (condulet type) for all sharp corners, tees, etc.

Conduit system mechanically and electrically continuous from outlet and to all cabinets, junction, or pull boxes. Conduit shall enter and be secured to all cabinets and boxes in such a manner that all parts of the system will have electrical continuity.

Conduit: Securely fastened at intervals as follows: 8 foot spacing up through 1" and N.E.C. scheduled spacing for sizes over 1".

Fasteners: Two-hold malleable straps, minerlac hangers, or split pipe hangers. Multiple runs of conduit uniformly spaced and supported on unistrut channels independently from building structure. Standard anchorage by Phillips self-drilling anchors and bolts, or concrete inserts. Any form of strap iron or wire hangers will not be allowed. Do not support raceways from other crafts, pipe, pipe supports, ducts, or other related equipment. Wire or perforated strapping shall not be used for hanging conduit.

Vertical runs of raceways shall be supported on heavy steel clamps. Clamps shall be bolted tightly around the conduit and shall rest securely on the building structure without blocking. Clamps shall be placed below couplings.

Underground Conduits: All risers and elbows from all underground conduit installations shall be PVC-coated galvanized rigid steel long radius elbows with steel up to connection above floor. Double half-lapped GRC elbows with 10 mil PVC tape are acceptable in lieu of PVC-coated.

Apply thoroughly, Permacel 412 Ribbon Dope Thread Sealant or comparable material to male threaded ends of metallic raceways installed, below grade, in concrete or mortar or in wet type locations. Running threads shall not be used.

Ground Wire: A separate, code sized, copper grounding conductor shall be provided for the entire length of all raceways.

Conduit runs from outlet to outlet and from outlets and junction points shall contain not more than three 90 degree bends, and shall not exceed 150 feet in length. Accessible pull or junction boxes or condulet shall be installed when more than three bends are required. Each junction box shall be supported independent of the conduit.

When installing conduit, all cuts shall be smooth and square with the run and with inside and outside

burrs removed. Conduit joints in concrete or in the earth shall be made watertight with compound seal.

Unless otherwise indicated where conduit raceways enter or leave the top of a concrete slab, it shall be accomplished with an approved hot dipped galvanized rigid steel (heavy wall) coupling installed flush to 1/4" below finish floor level. Extend conduit raceways from flush coupling as required to complete run.

Raceways installed below grade shall be installed a minimum of 24" below finish grade, or a minimum of 3" from surface of raceway to bottom side of 4" thick or greater concrete slabs poured on grade.

Conduit raceways shall not be installed where they will be subject to injury or damage, e.g. sharp rocks in bottom of trench or backfill. Provide approved materials for backfill and install without damaging the raceways.

Underground conduit runs or banks shall be supported on preformed, non-metallic separators. Spacing between exterior surfaces of conduits generally shall be not less than the following:

Two (2) inches between telephone conduit.

Two (2) inches between conduits containing cable operating at not over 600 volts.

Six (6) inches between a telephone conduit and any power circuit in the same envelope.

Spacing in separators shall not exceed five (5) feet and be close enough to prevent sagging of conduits and breaking of coupling and watertight seals.

Raceways shall not be covered until approved by Owner.

To open ends of conduit shall be capped to keep out debris until the Project is complete.

Raceways extended through roof and similar areas shall be flashed in an approved manner (extend flashing 6" above and 4" below roofing). Verify flashing requirements with Owner's representative and comply as directed. Coordinate and schedule installation for a proper and approved installation. Pitch pockets are specifically not acceptable.

Pull a mandrill and swab through all conduit before installing conductors. Cleaning conduits with compressed air alone is not acceptable.

3.2 Conductor Installation

Where applicable, or as directed cover all exposed taps, joints and splices with approved insulating material, equal to original insulation of conductor, e.g. for 600 volt or less use sufficient self vulcanizing Okonite as accepted equal, electrical rubber tape covered with Manson, as accepted equal, electrical friction tape of highest quality, as accepted.

Make splices and taps only when required and as directed in approved location, such as junction boxes, wireways, etc.

Wiring, including fish tapes, pull wires, etc., to be installed in raceways shall not be installed until raceway system is complete, clean, dry and free of all foreign materials

Conductors sizes #8 and larger or conductors serving motors and where subject to vibration shall be stranded #8 and smaller sized stranded conductors that terminate to a screw or similar type connection shall be provided with approved crimping type terminals.

Lubricant to facilitate the installation of wire through raceway systems shall be "Polywater P".

Wall Box Installation: Wall boxes mounted flush in wall shall not be back-to-back, provide minimum 12" separation. Boxes shall have conduit openings plugged with duct seal. Install boxes plumb and square with wall face and with front of box or cover located within 1/8" of face finish wall. Boxes in masonry set with the bottom of the box tight to the masonry unit. Handy boxes and sectional switch boxes not allowed.

3.3 Wiring Devices

Install wiring devices of the types indicated on the drawings. All connections shall be made up tight and the devices set plumb. Use care in installing devices in order to prevent damage to the device and the wires in the outlet box.

Device Plates: Provide a device plate for each outlet to suit the device installed, and install blank plates or covers for junction boxes and empty outlets.

END OF SECTION 16100

SECTION 16400 – SERVICE AND DISTRIBUTION

PART 1 - GENERAL

1.1 The work specified in this Section includes but it not limited to the electrical service, grounding, panelboards, disconnect switches, transformers, and other distribution equipment as specified.

Installation of the miscellaneous electrical wiring required for all plumbing, A/C, and heating equipment, complete as shown on the mechanical and/or electrical drawings, and specified herein, including all labor, materials, equipment, accessories, services, and tests of all systems.

The following items of labor or materials related to or incidental to the installation of the electrical work will be furnished and installed under other Sections:

All motor and motor drive equipment such as pumps, etc., will be furnished and set in place by the mechanical, plumbing, and special systems contractors.

Equipment indicated as N.I.C. (Not in Contract).

PART 2 - MATERIALS

2.1 Grounding

Provide main ground connections between all apparatus and conduits and the water and/or gas piping, as required by the latest edition of the NEC, and according to the requirements of the local utility company. Grounding conductors so routed as to permit, as far as practicable, the shortest and most direct path to the ground electrode system. All ground connections will have clean contact surfaces and will be tinned and sweated while bolting. Install all ground conductors in conduit and make connections readily accessible for inspection.

The entire grounding system will conform to Article 250 of the NEC.

Equipment grounding consists of connecting all noncurrent-carrying metal parts of the wiring system to a ground source. This includes the conduit or other steel raceway itself, boxes, and similar components, as well as the metal enclosures of panels and equipment.

Ground source to be the ground terminal of the system grounding at the main service equipment.

Branch circuit and distribution panelboards and switchboards will be grounded as shown on Contract Drawings.

Motors will be grounded by connecting a bare conductor from each motor frame to the grounding terminal on the rigid-to-flexible conduit adaptor. Ground conductor for motor equipment will be at least 50 percent of the total copper per phase of the largest feeder to the equipment grounded. Minimum size ground conductor No. 12 AWG.

Connect all step-down transformers and switchgear to the main ground with copper ground wire.

2.2 Main Switchboard (Service Entrance Section)

Provide the service entrance distribution switchboard as herein specified and shown on the associated electrical drawings. Switchboard will be designed, built, and tested in accordance with applicable portion of the latest editions to NEMA PB-2 and Underwriter's Laboratories No. UL-891.

The switchboard, NEMA-1 enclosed, factory preassembled metal-clad units, shipped in sections to facilitate handling and field assembly, consisting of an incoming service entrance pull section, metering section (when required by the local utility company), and fusible switch distribution sections. Provide equipment ground bus for the entire length of service entrance and distribution section line-up.

Provide engraved Micarta identification nameplates with 1/4" high letters for each circuit (screwed on cover of each switch), properly marked to indicate equipment served and circuit number. Nameplates will be furnished and installed by equipment manufacturer for every switch in the service entrance and distribution line-up. Provide an engraved, Micarta mimic bus showing the power distribution

All equipment rated to comply with NEMA standards for construction, capacity, and quiet operation.

All equipment compartments with hinged access doors provided with friction catches to facilitate inspection and adjustment. Live compartments secured with captive bolts.

Provide at one end of the switchgear an incoming service entrance with utility approved pull spaced. NEMA-1 construction, to match and line up with the switchgear. The Service Entrance Section will be equipped with removable front and side panels, main cross-over bussing and landing lugs, sized to accommodate service entrance feeder. Bus bars will be tin plated aluminum 750 ampere/square inch.

Acceptable manufacturers are Square "D", or as accepted by the Engineer.

2.2.1 Metering Section:

Provide in the metering section facilities for mounting Utility Company furnished and installed CT's and PT's and metering per P.U.E.S.R. and Utility Company requirements.

2.2.2 Distribution Sections:

The fusible switch distribution Sections NEMA 1 construction will consist of completely enclosed, self-supporting metal clad structures containing distribution fused switches, bus bars, supports, etc.

Enclosed Construction: The switchboard framework will be fabricated on a die-formed steel base or base assembly consisting of the formed steel and commercial channel welded or bolted together to rigidly support the entire shipping unit for moving on rollers and floor mounting. The framework is to be formed code gauge steel, rigidly welded and bolted together to support all cover plates, busing, and component devices during shipment and installation. Each switchboard section will have an open bottom and individual removal top plate for installation and termination of conduit. Top and bottom conduit areas are to be clearly shown and dimensioned on the Shop Drawings. The wireway front covers are to be hinged to permit access to the branch switch load side terminals without removing the covers. All front plates used for mounting meters, selector switches, or other front mounted devices will be hinged with all wiring installed and placed with flexibility at the hinged side. All closure plates will be screw removable and small enough for easy handling by one man. The paint finish will be gray enamel over a rust-inhibiting phosphate primer.

Bus bars will be tin plated aluminum 750 ampere per square inch. Unless otherwise indicated, bus bar bracing will be as shown on the drawings. No tapered bus will be allowed. The end section is to have bus bar provisions for future addition of a switchboard section. The provisions will include the bus bars installed to the extreme side of the switchboard and prepunched to facilitate the future bolted splice plates. The horizontal main bus bar supports, connections, and joints are to be bolted with grade 5 carriage bolts and Bellebille washers to be free of required periodic maintenance. Provide equipment ground bus.

The fusible switches will be quick-make, quick-break and suitable for use on the service as described for the sized as shown on the associated drawings. The units will be listed and approved by

Underwriter's Laboratories for general service entrance use and where applicable, will be dual horsepower rated for both standard one-time or dual-element fuses. The fusible switches will be group mounted in panel-type construction. Each switch is to be enclosed in a separate steel enclosure. The enclosure will employ a hinged cover for access to the fuses which will be interlocked with the operating handle to prevent opening the cover when the switch is in the ON position. This interlock will be constructed so that it can be released with a standard electrician's tool for testing fuses without interrupting service. The units will have padlocking provisions in the OFF position and the operating handle position will give positive switch position indication, i.e. horizontal OFF diagonal ON.

All fused switches in distribution panelboards and switchboards will accept only Class "R" type current-limiting fuses.

2.3 Branch Circuit Panelboards

NO PANELS SHALL BE LOCATED IN AREAS VISIBLE TO GUESTS

120/208 Volt, 3-Phase, 4-Wire Circuit Breaker Type: Provide circuit breaker panelboard as indicated in the panelboard schedules, and where shown on the plans. Panelboard will be of a dead-front safety type, equipped with thermal-magnetic molded case circuit breakers with frame and trip ratings as shown on the schedule. The unit will be listed, approved by UL for service entrance use and labeled at each unit. Unless otherwise indicated, bus bar bracing shall be 10,000 RMS Amperes symmetrical.

All circuit breakers will be boit-on type quick-break, quick-make, thermal-magnetic, trip indicating, have a common trip on all multiple breakers and will be UL approved for switching duty. Circuit breakers mechanism will be enclosed in molded bakelite case and sealed to prevent tampering. Tandem, twin duplex, or thin types are not acceptable. The circuit breakers will operate in any position and will be removable from the front of the panelboard without disturbing adjacent units. All breakers will have large permanent individual circuit numbers affixed to each breaker in a uniform position. The interrupting capacity (RMS Symmetrical amperes) based on NEMA test procedures. All breakers having a 225 amp frame and larger will be equipped with adjustable trips. Circuit breakers are to be mounted so that they can be removed without disturbing the bussing or other branch breakers.

Bus bar connections to the branch circuit breakers will be the "distributed phase" or "phase sequence" type. Single-phase, three-wire panelboard bussing will be such that any two-pole breakers are connected to opposite polarities in such manner that two-pole breakers can be installed in any location. Three-phase, four-wire bussing will be such that any three adjacent single-pole breakers are individually connected to each of the three different phases in such a manner that two or three-pole breakers can be installed at any location. All current-carrying parts of the bus assembly will be plated. Mains rating will be shown in the panelboard schedule on the Plans. Provide an equipment ground bus. Bus bars will be tin plated aluminum 750 amperes per square inch.

Wiring Terminals: Terminals for feeder conductors to the panelboard mains and neutral will be UL listed as suitable for the type of conductor specified. Terminals for branch circuit wiring, both breaker and neutral, will be UL listed as suitable for the type of conductor specified.

The panelboards bus assembly will be enclosed in a steel cabinet. The size of the wiring gutters and gauge of steel will be in accordance with NEMA Standard Publication No. PBI-1971 NEC Wiring and UL Standards No. 67 for panelboards. The box will be fabricated from galvanized steel or equivalent rust-resistant steel. Fronts will include doors and have flush-brushed, stainless steel, cylinder tumbler-type locks with catches and spring-loaded door pulls. The flush lock will not protrude beyond the front of the door. All panelboard locks will be keyed alike. Fronts will have adjustable indicating trim clamps which will be completely concealed steel hinges. Fronts will not be removable with door in the locked position. A circuit directory frame and card with a clear plastic covering will be provided on the inside of the door.

The directory will be typed to identify the load fed by each circuit. Fronts will be of code gauge, full finished steel with rust-inhibiting primer and baked-enamel finish. Provide one spare 3/4" conduit for each three unused poles and one spare 1" conduit in all flush mounted panelboards. Extend conduits from panelboard to an accessible point beyond the area of finished wall or ceiling construction.

Line wires of multi-wire branch circuits will be of opposite phases.

Acceptable panelboard manufacturers are Square "D", or as accepted by the Engineer.

2.4 Branch Circuits

A general layout of branch circuit wiring and routing is indicated. Generally, receptacles and appliances are on separate circuits form lighting.

No. 14 wires will be permitted only on control circuits of relays, contractors, starters, etc. No. 12 wire will be a minimum size for any lighting, motor or general branch circuits unless specifically noted otherwise.

In general, conductor sizes for major branch circuits such as large motor and equipment branch circuits are noted. Where conductor sizes for circuits are note noted, provide branch circuits with conductors sized as follows:

Conductor for individual motor branch circuits will have ampere capacity of not less than 125% of the full load running current of the motor.

Conductors for Multiple Motor Branch Circuits: Have ampere capacity of not less than 125% of the running current of the largest motor plus 100% of the running current for each additional motor connected to the circuit.

Conductor sizes for lighting, receptacles, and small motor branch circuits, with less than 20 ampere connected load, are not shown. Conductors for such circuits are sized as follows:

Conductor size for branch circuits (120/208V) 75 feet in length from branch circuit panel to center of load, not smaller than No. 12, up to 150 feet not smaller than No.10, up to 200 feet not smaller than No. 8.

Where specific conductor sizes required by the Drawings and Specifications are larger than code requires, the largest sizes are installed.

2.5 Disconnect Switches and Protective Devices

Disconnecting devices, when not included with electrically-operated equipment furnished under other Sections of the Specifications, will be provided under this Section.

Safety disconnect switches will be quick-make, quick-break, heavy duty, horsepower rated, with voltage rating as required by the system and current rating as scheduled or as required by the motor manufacturer. All switches will be furnished with a defeatable cover interlock. All disconnect switches fusible except where otherwise noted.

All fused switches will accept only Class "R" type current-limiting fuses and reject all other class and type.

Disconnect switches for 1/3 and 1/2 horsepower 120 volt motors and fractional horsepower motors

(3/4 or less) single phase motors may be a manual motor starter with pilot light. Provide thermal overload protection when not integral with motor.

Disconnect switches for fractional horsepower motors and for equipment of similar capacity will be a heavy duty industrial type fused disconnect, with solid neutral where required.

Disconnects installed indoors to have NEMA 1 enclosures. Disconnects installed outdoors or in wet locations to have NEMA 4 enclosures.

2.6 Fuses

All fuses will be non-renewable Type R, current limiting, 250 or 600 volt, with interrupting rating of 200,000 amperes RMS, as manufactured by Bussman Division of McGraw Edison Co., with current rating and type as scheduled.

Fuses protecting distribution and branch circuit panels will be Buss RK1 low-peak dual element type or as noted on Drawings.

Fuses protecting motor branch circuits will be Buss Fusetron dual-element type, sized for motor nameplate data per manufacturer's recommendation. All other fuses must be typed as noted on the Contract Drawings. Fuses furnished by Contractor and approved by Engineer different from those specified will be coordinated with each other and with circuit breakers which they are protecting. The Contractor will provide a written statement certifying that coordination verification has been performed. Provide a fuse in each fuseholder and a label inside each switch cover indicating specific type of fuse required for replacement in all fuses switches including panels, S.E.E., distribution switchboards, and disconnects.

Provide three spare fuses for each type and current rating used on work. Fuses will be mounted in fuse clips in a panel with a hinged, lockable door and installed in the mechanical room(s) as directed. Mount fuses by current rating in a manner to make sizes evident and fuses readily available. Cabinets will be as manufactured by Bussman Division of McGraw Edison.

PART 3 - INSTALLATION

All equipment will be installed in accordance with manufacturer's recommendations and applicable codes as specified elsewhere.

END OF SECTION 16400

SECTION 16500 - LIGHTING

PART 1 –FIXTURE INSTALLATION

Fixtures will be recessed in furred ceiling shall be installed so that they can be removed from below the ceiling, unless indicated otherwise.

Recessed fixtures installed with metal bar hangers for attaching to ceiling supports. Fixtures will not be supported directly from ceiling, provide galvanized steel wire as required for supporting fixture from structure. No wood or other combustible material will be used for supporting fixture.

Ascertain the type of ceiling construction for each fixture and provide suitable frame and fixture accessories to suit. Furnish substantial mounting frames or plaster rings for all recessed and semi-recessed lighting fixtures indicated or required. All frames will be made of galvanized steel with extra cross members where required to insure maintenance of proper opening dimension during installation.

Directly connected recessed fixtures in removable ceilings will be connected to the branch circuit with flexible conduit and branch conduit wire from an accessible junction box. Where fluorescent fixture housings are connected together, use 90 degree C wire for branch circuit feed through fixture channels.

Internal fixture wiring will be single conductor, stranded, asbestos covered. Type AF, of not less than 16 AWG. All stranded wires will have ends soldered before connection to screw terminals is made.

Fixtures will be grounded to the grounding system.

Prior to placing orders for recessed fluorescent fixtures. Contractor will verify the types of ceilings and suspension systems that have been approved for the project and will order fixtures with flanges as required to fit in the approved ceilings.

PART 2 – INSTALLATION OF LIGHTING FIXTURES

Installation of all lighting fixtures will be done by experienced mechanics. Lighting fixtures will not be installed where finished coat or paint has been applied to ceiling and walls until paint is thoroughly dry.

Lightings fixtures in equipment rooms will not be installed until after all piping and ductwork is in place. Lighting fixture layout shown on the Drawings is typical layout for bid purposes, but will be modified to provide adequate lighting of the equipment space according to final construction conditions. Any relocation of fixtures due to duct or piping interference will be as directed by the Architect at no expense to the Owner.

Contractor will be responsible for proper coordination of all lighting fixture locations. Provide support for all fixtures mounted on or recessed in hung ceiling. Confer with ceiling Contractor and other trades to coordinate lighting system.

Fixtures rigidly mounted to fixture stud in outlet boxes. Malleable iron hickies or extension pieces provided by Contractor where required.

Provide suitable cover plate or canopy for each fixture outlet box where the fixture does not provide a suitable cover.

Fixtures located on exterior of building to be installed with cadmium-plated brass screws and gasketed.

Verify all ceiling heights and clearances. Before proceeding with fixture installation, a schedule of mounting heights for all fixtures will be submitted for approval.

Each fixture will be completely wired in an approved manner with No. 14 AWG (minimum) copper standard wire, 600 bolt, with type AF insulation, recessed lay-in fixtures furnished with 7 feet No. 14 AF wire (minimum) and 6 feet Greenfield.

Circuit wiring running through the fixtures to be No. 12 AWG, with Type XHHW or THWN/THHN insulation. No joints in the wires other than those absolutely required. Provide fixture wires of sufficient length for making approved connections at the fixture outlets and at the lampholders or ballasts.

Joints and splices within fixtures to be either; soldered and taped with plastic electrician's tape, or secured by wire nuts or indent type lug fasteners.

Protect the lighting fixtures from damage during their unloading or removal, storage, or installation, and any broken fixtures, glassware, etc., must be replaced with new parts, without any additional expense to the Owner, unless undue delay or inconvenience.

Upon completion of the installation of the lighting fixtures and lighting equipment, they must be in first class operating order and in perfect condition as to finish, etc. Check for proper operation and appearance, alignment of fixtures, and proper placement of lenses, louvers, lamps, and other light-controlling or modifying appurtenances. Where special lighting effects, flood, or spotlighting is involved, perform final adjustment under the direct supervision of the Architect.

Cleaning: Immediately prior to occupancy, damp clean all glassware, fixture trims, reflectors, clean lamps or install new lamps as directed, with glass and fixtures free of labels.

Use of Lighting Fixtures: As soon as any portion of the lighting fixture work is ready for operation, the Owner will have the right to operation the same under the supervision of the Contractor. This will in no way be interpreted to mean the acceptance of such part of the installation or relieve the Contractor or his responsibility for the complete work or any part thereof.

END OF SECTION 16500

SECTION 16700 - COMMUNICATIONS

PART 1 - GENERAL

1.1 Description of Work

This Section includes Fire Alarm System, Television Distribution System and Telephone Raceway System Raceways. A box and cover plate will be provided at each location, mud rings are not acceptable.

1.2 Submittals

Provide submittal and shop drawings containing the following information for Fire Alarm and Television Systems;

1.2.1 Complete specifications on each item of equipment proposed.

1.2.2 Complete layout drawings showing plans of all areas and the location of each item of equipment, including control panels, annunciators, detectors, manual stations and other devices. Devices shall be consecutively number-coded for easy reference.

1.2.3 Wiring diagrams showing number and size of wires and conduit size to all points of connection.

1.3 Television Distribution System
The Electrical Contractor shall provide a complete and working television distribution system as specified herein and as shown on the drawings. As directed by the Owner, the system shall be one of the following:

1.3.1 Master Antenna System

1.3.2 Cable System from Local Cable TV system

1.3.3 Satellite Dish System
Where the system source is a local cable TV system, the entire system shall be installed under the direction of the local cable TV system supplier. When a satellite dish is to be the TV source, the electrical contractor shall subcontract with a supplier licensed and bonded to perform this work,

The television distribution system shall deliver all locally available VHF television channels to outlets located as shown on plans. Minimum signal strength at any television antenna outlet shall be +3 db mv on any local channel. System shall accept UHF equipment with minimum difficult and expense.

PART 2 - MATERIALS

2.1 Fire Alarm System
Equipment: The numbers listed below are those of Simplex Time Recorder Company and constitute the type and quality of equipment to be furnished. Systems of equivalent quality and function as manufactured by Pyrotronics, Honeywell, Gamewell or Notifier will be accepted.

2.1.1 The fire alarm control panel shall be Simplex Type 2001, and shall be composed of the following solid state, plug-in modules, factory interconnected to meet the specific installation requirements.

2.1.1.1 Automatic battery charger shall be current limited with automatic combination high-rate/trickle charge. Separate LED's (light emitting diodes) shall indicate high rate charge and charger trouble. The charger meter shall indicate voltage and trickle charge current. The trickle charge current shall be variable from 10 to 220 ma.

2.1.1.2 Status changes within the system shall be reported to the status monitoring module, which will process and transmit this information to the appropriate module for disposition. It shall include, on its door insert, a system "power-on" lamp, system trouble silencer switch with ringback silencer, alarm silencer switch with resound, ground indicator, alarm reset switch and milliammeter.

2.1.1.3 The fire alarm system shall electrically supervise alarm initiating circuits. As many of these modules as necessary shall be provided to furnish the number of zones specified on the drawings. A choice of two (2) plug-in loop monitors shall permit the use of either normally open or normally closed alarm initiating contacts. The normally open loop monitor shall supervise for opens. Ground detection shall be provided with either mode. In addition, each zone shall be equipped with a single-pole double-throw contact, rated at 2 amps resistive, for auxiliary control functions such as remote annunciation. It shall be possible to test each zone individually through text buttons which simulate both "alarm" and "shorts" conditions. In addition, this module shall provide a means to disconnect each zone individually. All test and disconnect switches shall be mounted inside the fire alarm control enclosure to prevent tampering. On the door insert, provide "zone disconnected" lamps to indicate zone disconnection for each zone.

2.1.1.4 The door insert shall include supervised red alarm lamp, amber trouble lamp, a lamp test pushbutton for each alarm initiating circuit. Failure of a zone alarm shall light its corresponding zone trouble lamp and sound the system trouble signal.

2.1.1.5 The fire alarm system shall provide 24 vdc filtered and regulated energy for control functions within the control panel and for supervision of alarm initiating and indicating circuits. A maximum of one hundred fifty (150) zones may be powered by this module.

2.1.1.6 A module shall be provided to supervise and control each signal circuit. An open or a ground in the signal circuit wires shall cause the system to sound. In addition, each module shall be equipped with a trouble lamp for easy identification of faults. Signal capacity shall be twenty (20) horns for each circuit, minimum.

2.1.1.7 An alarm module shall be employed to transmit both alarm and trouble signals to a remote receiving unit via leased telephone lines. The two (2) conductors connecting the protected premises to the remote receiver shall be electrically supervised and faults at either location shall be indicated visually and audible by both control panels. The door insert of the module shall contain remote line trouble lamps, trouble buzzer and silencer switch with ringback. It shall be possible to disconnect the remote receiving unit and drill the system through the use of the door-mounted switches provided for that purpose. Both switches shall be key operated and electrically interlocked to prevent accidental remote reporting during fill.

2.1.2 End-of-Line Resistors: As required by manufacturer.

2.1.3 Automatic: Photoelectric Detectors: Simplex Type 2098-9636 automatic dual chamber photoelectric detector in lobby and corridor. Simplex Type 2098-9667 photoelectric detector with integral horn in guest rooms.

2.1.4 Strobe light/horn shall be Simplex Type 2903-9101 combination horn and lamp unit consisting of Simplex 2901-9833 horn and a Xenon strobe light with white Lexan lens, red lettered "Fire". Flash rate is 1 to 3 flashes per second; units exceeding this rate are not acceptable. These devices shall mount on Simplex Type 2975-9145 flush wall box with Simplex Type 2905-9960 trim ring.

2.1.5 Break Glass Station: Simplex 2099-9201, recess mounted. Station shall be keyed to match fire alarm panel, remote annunciator and remote lamp panels.

2.1.6 Exterior Horn/Lamp: Simplex 2903-9101/2901-9806 weather-proof, vibrating outside horn and pulsating red lamp 24 vcd combination. Mount flush. Unit shall be fully supervised, painted red.

2.1.7 Remote Annunciator: Provide a remote annunciator, flush mounted, where indicated on drawings. The annunciator shall indicate the status of all initiating circuits. Simplex 4306, backlighted. Each zone indicator shall be one-inch by three-inch (1" x 3") with two (2) lamps per zone. Engraving shall be as approved by the Architect/Engineer.

2.1.8 Fire Sprinkler OS&Y Valve Switch: The Fire Sprinkler OS&Y valve switch for monitoring status of OS&Y valve shall be provided by the fire protection system contractor.

2.2 Telephone

NOTE: Telephone equipment is and FFE item. The Owner shall purchase them. The general contractor shall be responsible for installation.

2.2.1 Provide all conduits, wiring, outlets, terminals, etc. as required by the telephone company and as shown on the drawings.

2.2.2 Wall Devices and Cover Plates to match design and color as specified in section 16100, item 2.12.

2.3 Television Antenna System Equipment

2.3.1 Antenna (when required): Winegard CH8200, 54-806, mHz, AM/FM/VHF/UHF boardband, mast mounted, equipped with outdoor antenna 300/75 ohm matching transformer and Winegard AC 9880 preamplifier with maximum noise figure: VHF 3 db, UHF 2.2 db, Gain = VHF 3 db, UHF 17.5 db.

2.3.2 Amplifier (when required): Winegard DA-8245, broadband VHF 50-890 mHz, capable of +54 db mv output per channel with a gain of 4 db. Noise figure shall be not greater than: VHF 1.5 db, UHF 5.1 db.

2.3.3 Splitters (as required): Winegard LS475C (four way) and LS-275c (two way) capable of 8-1000 mHz bandpass with an insertion loss of 7.1 db VHF (four way) and 3.5 VHF (two way).

2.3.4 Tapoffs: Winegard (SLT77blk, capable of 54-890 mHz bandpass minimum signal across; 75 ohms of 1000 mv rms color signal per channel. Winegard WH-5624 lighting arrester.

2.3.5 Cable: West Penn #841 or Belden 8228 75 ohm RG-6 foam coax installed by General Contractor.

2.3.6 Wall Devices and Cover Plates to match design and color as specified in section 16100, item 2.12.

PART 3 - INSTALLATIONS

3.1 Installation: Communication systems shall be installed by a qualified electrical contractor. All components of the same system, except where specifically indicated, shall be manufactured or furnished by the same manufacturer. Each system shall have a local manufacturer's representative and a local service organization which carrier a complete stock of parts and who shall provide maintenance for these system. Each system (including each manual station, thermal detector circuit, and each alarm system interconnected with the fire alarm system) shall be tested and checked out by the manufacturer or his authorized representative.

3.2 Fire Alarm System

3.2.1

System Operation: The activation of any approved non-coded device shall light its respective zone alarm lamp and cause the alarm signals to sound continuously throughout the building. The visual alarm indicator shall remain "locked-in" until the system has been reset. It shall be possible to silence the alarm signals; however, any subsequent zone alarm shall resound the signals. Power failures opens, grounds or any disarrangement of system wiring or components shall be indicated by a visual and audible trouble signal. The audible trouble signal may be silenced, but the trouble lamp shall remain lighted until the system has been returned to normal operating conditions, at which time the trouble signal shall resound until the trouble silence switch has been returned to the "normal" position.

3.2.2

Wiring: The Contractor shall furnish and install, in accordance with manufacturer's instruction, all wiring, conduit and outlet boxes required to complete the system as described herein and as shown on the plans. All wiring shall be in conduit and shall meet the requirements of the National, State and Local Electrical Codes. Wire size shall be as specified by the manufacturer (minimum #14 AWG). Wires shall be tagged at all junction points and shall test free from grounds or crosses between conductors. Final connections between equipment and the wiring system shall be made under the direct supervision of the manufacturer's factory-trained representative.

3.3 Telephone System

3.3.1 Maintain twelve inches (12") separation between power and telephone services and thirty-six Inches (36") minimum between service entrance terminations. Conduit runs less than one hundred feet (100'0") from point to point shall no contain more than two 90 degree, twenty four inch (24") radius bends. Conduit runs exceeding one hundred feet (100'0") from point to point, with more than one 90 degree bend, shall not contain square or oval conduit fittings ("Condulets"). All feeder conduits to telephone terminal cabinets shall enter top or bottom on the extreme right or left side of the box.

Telephone service raceway to the telephone service equipment in the building shall be extended from the telephone equipment room as shown on the drawings.

3.3.2 Provide empty conduit as indicated on the drawings. Provide pull boxes in accessible positions for every one hundred fifty feet (150'-0") of straight raceway for all telephone conduits, with screw covers, and label "Telephone". Pull boxes shall be the following sizes:

6" x 6" x 6" for 3/4" conduit runs.
6" x 4" x 36" for 1" through 2 1/2" conduit runs.
6" x 6" x 36" for 3" and larger conduit runs.

3.3.3. Provide 3/32" OD, 200-lb. strength polyethylene lines in all telephone raceways seventy-five feet (75'-0") or longer between pulling locations.

3.3.4 Provide three quarter inch (3/4") thick plywood backboards of sizes as indicated on the drawings for mounting telephone company use. Locate where three feet (3'-0") (minimum) front access space is available.

3.3.5 Telephone Equipment Room: Outlets and devices shown in the telephone equipment room drawings are intended to indicate quantities only. Contac the building and planning department at the telephone company for exact locations and make adjustments as required. Provide a one-half inch (1/2") conduit from the telephone equipment room to the nearest cold water pipe ground.

3.4 Television Antenna System

3.4.1 Signal Distribution: Television signals shall be distributed to individual television sets without any degradation of color fidelity, picture information, audio distortion, or cross channel interference

generated in the distribution system.

3.4.2 Antenna Installation (when required): Exact location of antenna shall be as directed by the Owner. Antenna shall be guyed and mounted to withstand the heaviest wind and ice conditions experienced in this location. Base shall be installed in a manner that prevents damage to the roof. Coaxial shield shall be connected to the mast without damage to the insulation. Twin lead wiring may be used only between the antenna and the mast mounted balun. Connections shall be either soldered or made with solder lugs and star-type plated lock washers. Entry of the cable to the building shall be to a weather head conduit firmly secured with no damage to the building. The mast height shall not exceed fifteen feet (15'-0") without approval of the Architect.

3.4.3 Grounding of the antenna and mast for lightning protection shall be done in accordance with the applicable codes, and minimum No. 8 AWG (copper wire bonding the mast to a known direct patch to the building grounding system).

END OF SECTION 16700