

- C. Product Description: Galvanized 12 gage) thick steel. With holes 1-1/2 inches on center.

2.3 SPRING STEEL CLIPS

- A. Furnish materials in accordance with County standards.
- B. Product Description: Mounting hole and screw closure.

2.4 SLEEVES

- A. Furnish materials in accordance with County standards.
- B. Sleeves for Through Non-fire Rated Floors: 18 gage thick galvanized steel.
- C. Sleeves for Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage thick galvanized steel.
- D. Sleeves for Through Fire Rated and Fire Resistive Floors and Walls, and Fire Proofing: Prefabricated fire rated sleeves including seals, UL listed.
- E. Fire-stopping Insulation: Glass fiber type, non-combustible.

2.5 MECHANICAL SLEEVE SEALS

- A. Manufacturers:
 - 1. Thunderline Link-Seal, Inc.
 - 2. NMP Corporation.
 - 3. Substitutions: Section 01 25 00 – Substitution Procedure.
- B. Furnish materials in accordance with County standards.
- C. Product Description: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

2.6 FIRESTOPPING

- A. Manufacturers:
 - 1. Dow Corning Corp.
 - 2. Fire Trak Corp.
 - 3. Hilti Corp.

4. International Protective Coating Corp.
5. 3M fire Protection Products.
6. Specified Technology, Inc.
7. Substitutions: Not Permitted.

B. Furnish materials in accordance with County standards.

C. Product Description: Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only one type for each similar application.

1. Silicone Firestopping Elastomeric Firestopping: Single component silicone elastomeric compound and compatible silicone sealant.
2. Foam Firestopping Compounds: Single component foam compound.
3. Formulated Firestopping Compound of Incombustible Fibers: Formulated compound mixed with incombustible non-asbestos fibers.
4. Fiber Stuffing and Sealant Firestopping: Composite of mineral fiber stuffing insulation with silicone elastomer for smoke stopping.
5. Mechanical Firestopping Device with Fillers: Mechanical device with incombustible fillers and silicone elastomer, covered with sheet stainless steel jacket, joined with collars, penetration sealed with flanged stops.
6. Intumescent Firestopping: Intumescent putty compound which expands on exposure to surface heat gain.
7. Firestop Pillows: Formed mineral fiber pillows.

D. Color: Dark gray As selected from manufacturer's full range of colors.

2.7 FIRESTOPPING ACCESSORIES

A. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.

B. Dam Material: Permanent:

1. Mineral fiberboard.
2. Mineral fiber matting.
3. Sheet metal.

4. Plywood or particle board.
 5. Alumina silicate fire board.
- C. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.
- D. General:
1. Furnish UL listed products or products tested by independent testing laboratory.
 2. Select products with rating not less than rating of wall or floor being penetrated.
- E. Non-Rated Surfaces:
1. Stamped steel, chrome plated, hinged, split ring escutcheons or floor plates or ceiling plates for covering openings in occupied areas where conduit is exposed.
 2. For exterior wall openings below grade, furnish modular mechanical type seal consisting of interlocking synthetic rubber links shaped to continuously fill annular space between conduit and cored opening or water-stop type wall sleeve.

PART 3: EXECUTION

3.1 EXAMINATION

- A. Section 01 31 00 – Project Management and Coordination: Verification of existing conditions before starting work.
- B. Verify openings are ready to receive sleeves.
- C. Verify openings are ready to receive firestopping.

3.2 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter affecting bond of firestopping material.
- B. Remove incompatible materials affecting bond.
- C. Install backing damming materials to arrest liquid material leakage.
- D. Obtain permission from Engineer before using powder-actuated anchors.
- E. Obtain permission from Engineer before drilling or cutting structural members.

3.3 INSTALLATION - HANGERS AND SUPPORTS

A. Anchors and Fasteners:

1. Concrete Structural Elements: Provide expansion anchors.
2. Steel Structural Elements: Provide beam clamps, spring steel clips, steel ramset fasteners, and welded fasteners.
3. Concrete Surfaces: Provide expansion anchors.
4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Provide toggle bolts and hollow wall fasteners.
5. Solid Masonry Walls: Provide expansion anchors and preset inserts.
6. Sheet Metal: Provide sheet metal screws.
7. Wood Elements: Provide wood screws.

B. Inserts:

1. Install inserts for placement in concrete forms.
2. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above flush with top of recessed into and grouted flush with slab.

C. Install conduit and raceway support and spacing in accordance with NEC.

D. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.

E. Install multiple conduit runs on common hangers.

F. Supports:

1. Fabricate supports from structural steel or formed steel channel. Install hexagon head bolts to present neat appearance with adequate strength and rigidity. Install spring lock washers under nuts.

2. Install surface mounted cabinets and panelboards with minimum of four anchors.
3. In wet and damp locations install steel channel supports to stand cabinets and panelboards 1 inch off wall.
4. Support vertical conduit at every floor.

3.4 INSTALLATION - FIRESTOPPING

- A. Install material at fire rated construction perimeters and openings containing penetrating sleeves, piping, ductwork, conduit and other items, requiring firestopping.
- B. Apply primer where recommended by manufacturer for type of firestopping material and substrate involved, and as required for compliance with required fire ratings.
- C. Apply firestopping material in sufficient thickness to achieve required fire and smoke rating, to uniform density and texture.
- D. Compress fibered material to maximum 40 percent of its uncompressed size.
- E. Place intumescent coating in sufficient coats to achieve rating required.
- F. Remove dam material after firestopping material has cured.
- G. Fire Rated Surface:
 1. Seal opening at floor, wall, partition, ceiling, and roof as follows:
 - a. Install sleeve through opening and extending beyond minimum of 1 inch on both sides of building element.
 - b. Size sleeve allowing minimum of 1 inch void between sleeve and building element.
 - c. Pack void with backing material.
 - d. Seal ends of sleeve with UL listed fire resistive silicone compound to meet fire rating of structure penetrated.
 2. Where conduit penetrates fire rated surface, install firestopping product in accordance with manufacturer's instructions.
- H. Non-Rated Surfaces:
 1. Seal opening through non-fire rated wall, partition floor, ceiling, and roof opening as follows:

- a. Install sleeve through opening and extending beyond minimum of 1 inch on both sides of building element.
 - b. Size sleeve allowing minimum of 1 inch void between sleeve and building element.
 - c. Install type of firestopping material recommended by manufacturer.
2. Install escutcheons floor plates or ceiling plates where conduit, penetrates non-fire rated surfaces in occupied spaces. Occupied spaces include rooms with finished ceilings and where penetration occurs below finished ceiling.
 3. Exterior wall openings below grade: Assemble rubber links of mechanical seal to size of conduit and tighten in place, in accordance with manufacturer's instructions.
 4. Interior partitions: Seal pipe penetrations at clean rooms, computer rooms, telecommunication rooms and data rooms. Apply sealant to both sides of penetration to completely fill annular space between sleeve and conduit.

3.5 INSTALLATION - EQUIPMENT BASES AND SUPPORTS

- A. Provide housekeeping pads of concrete, minimum 3-1/2 inches thick and extending 6 inches beyond supported equipment.
- B. Using templates furnished with equipment, install anchor bolts, and accessories for mounting and anchoring equipment.
- C. Construct supports of steel members. Brace and fasten with flanges bolted to structure.

3.6 INSTALLATION - SLEEVES

- A. Exterior watertight entries: Seal with adjustable interlocking rubber links.
- B. Conduit penetrations not required to be watertight: Sleeve and fill with silicon foam.
- C. Set sleeves in position in forms. Provide reinforcing around sleeves.
- D. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- E. Extend sleeves through floors 1 inch above finished floor level. Caulk sleeves.
- F. Where conduit or raceway penetrates floor, ceiling, or wall, close off space between conduit or raceway and adjacent work with fire stopping insulation and caulk airtight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
- G. Install chrome plated steel escutcheons at finished surfaces.

3.7 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Inspect installed firestopping for compliance with specifications and submitted schedule.

3.8 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.
- B. Clean adjacent surfaces of firestopping materials.

3.9 PROTECTION OF FINISHED WORK

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.
- B. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 28 05 33

CONDUITS AND BACKBOXES FOR ELECTRONIC SAFETY AND SECURITY

PART 1: GENERAL

1.1 SUMMARY

- A. Section includes conduit and tubing, surface raceways, wireways, outlet boxes, pull and junction boxes, and handholes.
- B. Related Sections:
 - 1. Section 26 05 03 - Equipment Wiring Connections.
 - 2. Section 26 05 33 - Raceway and Boxes for Electrical Systems.
 - 3. Section 26 27 16 - Electrical Cabinets and Enclosures.
 - 4. Section 26 27 26 - Wiring Devices.
 - 5. Section 28 05 29 - Hangers and Supports for Electronic Safety and Security.
 - 6. Section 28 05 53 - Identification for Electronic Safety and Security.

1.2 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.
 - 2. ANSI C80.3 - Specification for Electrical Metallic Tubing, Zinc Coated.
 - 3. ANSI C80.5 - Aluminum Rigid Conduit - (ARC).
- B. National Electrical Manufacturers Association:
 - 1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
 - 2. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
 - 3. NEMA OS 1 - Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
 - 4. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers, and Box Supports.

5. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
6. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Tubing and Conduit.
7. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

1.3 SYSTEM DESCRIPTION

- A. Raceway and boxes located as indicated on Drawings, and at other locations required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements. Raceway and boxes are shown in approximate locations unless dimensioned. Provide raceway to complete wiring system.
- B. Wet and Damp Locations: Provide rigid steel and aluminum conduit. Provide cast metal or nonmetallic outlet, junction, and pull boxes. Provide flush mounting outlet box in finished areas.
- C. Concealed Dry Locations: Provide rigid steel and aluminum conduit, intermediate metal conduit and electrical metallic tubing. Provide sheet-metal boxes. Provide flush mounting outlet box in finished areas. Provide hinged enclosure for large pull boxes.
- D. Exposed Dry Locations: Provide rigid steel and aluminum conduit, intermediate metal conduit. Provide sheet-metal boxes. Provide flush mounting outlet box in finished areas. Provide hinged enclosure for large pull boxes.

1.4 DESIGN REQUIREMENTS

- A. Minimum Raceway Size: 3/4 inch unless otherwise specified.

1.5 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit for the following:
 1. Flexible metal conduit.
 2. Liquidtight flexible metal conduit.
 3. Raceway fittings.
 4. Conduit bodies.
 5. Pull and junction boxes.
- C. Manufacturer's Installation Instructions: Submit application conditions and limitations of use stipulated by Product testing agency specified under Regulatory

Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

1.6 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents:
 - 1. Record actual routing of conduits larger than 2 inch.
 - 2. Record actual locations and mounting heights of outlet, pull, and junction boxes.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
- B. Protect PVC conduit from sunlight.

1.8 COORDINATION

- A. Coordinate installation of outlet boxes for equipment connected under Section 26 05 03.
- B. Coordinate mounting heights, orientation and locations of outlets mounted above counters, benches, and backsplashes.

PART 2: PRODUCTS

2.1 METAL CONDUIT

- A. Manufacturers:
 - 1. Carlon Electrical Products.
 - 2. Hubbell Wiring Devices.
 - 3. Thomas & Betts Corp.
 - 4. Walker Systems Inc.
 - 5. The Wiremold Co.
 - 6. Substitutions: Section 01 25 00 – Substitution Procedures.
- B. Rigid Steel Conduit: ANSI C80.1.
- C. Rigid Aluminum Conduit: ANSI C80.5.

- D. Intermediate Metal Conduit (IMC): Rigid steel.
- E. Fittings and Conduit Bodies: NEMA FB 1; material to match conduit.

2.2 FLEXIBLE METAL CONDUIT

- A. Manufacturers:
 - 1. Carlon Electrical Products.
 - 2. Hubbell Wiring Devices.
 - 3. Thomas & Betts Corp.
 - 4. Walker Systems Inc.
 - 5. The Wiremold Co.
 - 6. Substitutions: Section 01 25 00 – Substitution Procedures.
- B. Product Description: Interlocked steel construction.
- C. Fittings: NEMA FB 1.

2.3 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

- A. Manufacturers:
 - 1. Carlon Electrical Products.
 - 2. Hubbell Wiring Devices.
 - 3. Thomas & Betts Corp.
 - 4. Walker Systems Inc.
 - 5. The Wiremold Co.
 - 6. Substitutions: Section 01 25 00 – Substitution Procedures.
- B. Product Description: Interlocked steel construction with PVC jacket.
- C. Fittings: NEMA FB 1.

2.4 ELECTRICAL METALLIC TUBING (EMT)

- A. Manufacturers:
 - 1. Carlon Electrical Products.

2. Hubbell Wiring Devices.
3. Thomas & Betts Corp.
4. Walker Systems Inc.
5. The Wiremold Co.
6. Substitutions: Section 01 25 00 – Substitution Procedures.

B. Product Description: ANSI C80.3; galvanized tubing.

C. Fittings and Conduit Bodies: NEMA FB 1; steel compression type.

2.5 OUTLET BOXES

A. Manufacturers:

1. Carlon Electrical Products.
2. Hubbell Wiring Devices.
3. Thomas & Betts Corp.
4. Walker Systems Inc.
5. The Wiremold Co.
6. Substitutions: Section 01 25 00 – Substitution Procedure.

B. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.

1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; furnish 1/2 inch male fixture studs where required.
2. Concrete Ceiling Boxes: Concrete type.

C. Nonmetallic Outlet Boxes: NEMA OS 2.

D. Cast Boxes: NEMA FB 1, Type FD, aluminum. Furnish gasketed cover by box manufacturer. Furnish threaded hubs.

E. Wall Plates for Finished Areas: As specified in Section 26 27 26.

F. Wall Plates for Unfinished Areas: Furnish gasketed cover.

2.6 PULL AND JUNCTION BOXES

A. Manufacturers:

1. Carlon Electrical Products.
 2. Hubbell Wiring Devices.
 3. Thomas & Betts Corp.
 4. Walker Systems Inc.
 5. The Wiremold Co.
 6. Substitutions: Section 01 25 00 – Substitution Procedure.
- B. Sheet Metal Boxes: NEMA OS 1, galvanized steel.
- C. Hinged Enclosures: As specified in Section 26 27 16.
- D. Surface Mounted Cast Metal Box: NEMA 250, Type 4; flat-flanged, surface mounted junction box:
1. Material: Galvanized cast iron or Cast aluminum.
 2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.

PART 3: EXECUTION

3.1 EXAMINATION

- A. Section 01 31 00 – Project Management and Coordination.
- B. Verify outlet locations and routing and termination locations of raceway prior to rough-in.

3.2 EXISTING WORK

- A. Remove exposed abandoned raceway, including abandoned raceway above accessible ceiling finishes. Cut raceway flush with walls and floors, and patch surfaces.
- B. Remove concealed abandoned raceway to its source.
- C. Disconnect abandoned outlets and remove devices. Remove abandoned outlets when raceway is abandoned and removed. Install blank cover for abandoned outlets not removed.
- D. Maintain access to existing boxes and other installations remaining active and requiring access. Modify installation or provide access panel.

- E. Extend existing raceway and box installations using materials and methods compatible with existing electrical installations, or as specified.
- F. Clean and repair existing raceway and boxes to remain or to be reinstalled.

3.3 INSTALLATION

- A. Install Work in accordance with County standards.
- B. Ground and bond raceway and boxes in accordance with Section 26 05 26.
- C. Fasten raceway and box supports to structure and finishes in accordance with Section 26 05 29.
- D. Identify raceway and boxes in accordance with Section 26 05 53.
- E. Arrange raceway and boxes to maintain headroom and present neat appearance.

3.4 INSTALLATION - RACEWAY

- A. Raceway routing is shown in approximate locations unless dimensioned. Route to complete wiring system.
- B. Arrange raceway supports to prevent misalignment during wiring installation.
- C. Support raceway using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
- D. Group related raceway; support using conduit rack. Construct rack using steel channel specified in Section 26 05 29 ; provide space on each for 25 percent additional raceways.
- E. Do not support raceway with wire or perforated pipe straps. Remove wire used for temporary supports
- F. Do not attach raceway to ceiling support wires or other piping systems.
- G. Construct wireway supports from steel channel specified in Section 26 05 29.
- H. Route exposed raceway parallel and perpendicular to walls.
- I. Route raceway installed above accessible ceilings parallel and perpendicular to walls.
- J. Route conduit in and under slab from point-to-point.
- K. Maintain clearance between raceway and piping for maintenance purposes.

- L. Maintain 12 inch clearance between raceway and surfaces with temperatures exceeding 104 degrees F.
- M. Cut conduit square using saw or pipe cutter; de-burr cut ends.
- N. Bring conduit to shoulder of fittings; fasten securely.
- O. Install conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.
- P. Install no more than equivalent of three 90 degree bends between boxes. Install conduit bodies to make sharp changes in direction, as around beams. Install hydraulic one-shot bender to fabricate or factory elbows for bends in metal conduit larger than 2 inch size.
- Q. Avoid moisture traps; install junction box with drain fitting at low points in conduit system.
- R. Install fittings to accommodate expansion and deflection where raceway crosses seismic, control and expansion joints.
- S. Install suitable pull string or cord in each empty raceway except sleeves and nipples.
- T. Install suitable caps to protect installed conduit against entrance of dirt and moisture.
- U. Surface Raceway: Install flat-head screws, clips, and straps to fasten raceway channel to surfaces; mount plumb and level. Install insulating bushings and inserts at connections to outlets and corner fittings.
- V. Close ends and unused openings in wireway.

3.5 INSTALLATION - BOXES

- A. Install wall mounted boxes at elevations to accommodate mounting heights specified in section for outlet device.
- B. Adjust box location up to 10 feet prior to rough-in to accommodate intended purpose.
- C. Orient boxes to accommodate wiring devices oriented as specified in Section 26 27 26.
- D. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
- E. In Accessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.

- F. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.
- G. Do not install flush mounting box back-to-back in walls; install with minimum 6 inches separation. Install with minimum 24 inches separation in acoustic rated walls.
- H. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
- I. Install stamped steel bridges to fasten flush mounting outlet box between studs.
- J. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
- K. Install adjustable steel channel fasteners for hung ceiling outlet box.
- L. Do not fasten boxes to ceiling support wires or other piping systems.
- M. Support boxes independently of conduit.
- N. Install gang box where more than one device is mounted together. Do not use sectional box.
- O. Install gang box with plaster ring for single device outlets.

3.6 INTERFACE WITH OTHER PRODUCTS

- A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods in accordance with Section 26 05 29.
- B. Route conduit through roof openings for piping and ductwork or through suitable roof jack with pitch pocket. Coordinate location with roofing installation.
- C. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.

3.7 ADJUSTING

- A. Section 01 70 00 - Execution and Closeout Requirements: Testing, adjusting, and balancing.
- B. Adjust flush-mounting outlets to make front flush with finished wall material.
- C. Install knockout closures in unused openings in boxes.

3.8 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.

- B. Clean interior of boxes to remove dust, debris, and other material.
- C. Clean exposed surfaces and restore finish.

END OF SECTION

SECTION 28 05 53

IDENTIFICATION FOR ELECTRONIC SAFETY AND SECURITY

PART 1: GENERAL

1.1 SUMMARY

A. Section Includes:

1. Nameplates.
2. Labels.
3. Wire markers.
4. Conduit markers.
5. Stencils.
6. Lockout Devices.

B. Related Sections:

1. Section 26 05 53 - Identification for Electrical Systems.
2. Section 27 05 53 - Identification for Communications Systems.

1.2 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data:

1. Submit manufacturer's catalog literature for each product required.
2. Submit electrical identification schedule including list of wording, symbols, letter size, color coding, tag number, location, and function.

C. Samples:

1. Submit two tags, actual size.
2. Submit two labels, actual size.

D. Manufacturer's Installation Instructions: Indicate installation instructions, special procedures, and installation.

1.3 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record actual locations of tagged devices; include tag numbers.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with County standard.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years documented experience approved by manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Accept identification products on site in original containers. Inspect for damage.
- B. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
- C. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Install labels or nameplates only when ambient temperature and humidity conditions for adhesive are within range recommended by manufacturer.

1.8 EXTRA MATERIALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for extra materials.
- B. Furnish two containers of spray-on adhesive.

PART 2: PRODUCTS

2.1 NAMEPLATES

- A. Furnish materials in accordance County standards.

- B. Product Description: Laminated three-layer plastic with engraved black letters on white contrasting background color.
- C. Letter Size:
 - 1. 1/8 inch high letters for identifying individual equipment and loads.
 - 2. 1/4 inch high letters for identifying grouped equipment and loads.
- D. Minimum nameplate thickness: 1/8 inch.

2.2 LABELS

- A. Furnish materials in accordance with County standards.
- B. Labels: Embossed adhesive tape, with 3/16 inch white letters on black background.

2.3 WIRE MARKERS

- A. Furnish materials in accordance with County standards.
- B. Description: Cloth tape, split sleeve, or tubing type wire markers.
- C. Legend:
 - 1. Power and Lighting Circuits: Branch circuit or feeder number as indicated on Drawings.
 - 2. Control Circuits: Control wire number as indicated on [schematic and interconnection diagrams. shop drawings.

2.4 CONDUIT AND RACEWAY MARKERS

- A. Furnish materials in accordance with County standards.
- B. Description: Nameplate fastened with straps Nameplate fastened with adhesive Labels fastened with adhesive.
- C. Color:
 - 1. Fire Alarm System: Red lettering on white background.
- D. Legend:
 - 1. Fire Alarm System: FIRE ALARM.

2.5 STENCILS

- A. Furnish materials in accordance with County standards.

B. Stencils: With clean cut symbols and letters of following size:

1. Up to 2 inches Outside Diameter of Raceway: 1/2 inch high letters.
2. 2-1/2 to 6 inches Outside Diameter of Raceway: 1 inch high letters.

C. Stencil Paint: Semi-gloss enamel, colors conforming to the following:

1. Red lettering on white background.

2.6 LOCKOUT DEVICES

A. Lockout Hasps:

1. Anodized aluminum hasp with erasable label surface; size minimum 7-1/4 x 3 inches.

PART 3: EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 EXISTING WORK

- A. Install identification on existing equipment to remain in accordance with this section.
- B. Install identification on unmarked existing equipment.
- C. Replace lost nameplates labels and markers.
- D. Re-stencil existing equipment.

3.3 INSTALLATION

A. Install identifying devices after completion of painting.

B. Nameplate Installation:

1. Install nameplate parallel to equipment lines.
2. Install nameplate for each electrical distribution and control equipment enclosure with corrosive-resistant mechanical fasteners, or adhesive.
3. Install nameplates for each control panel and major control components located outside panel with corrosive-resistant mechanical fasteners, or adhesive.
4. Secure nameplate to equipment front using screws, rivets, or adhesive.

5. Secure nameplate to inside surface of door on recessed panels in finished locations.
 6. Install nameplates for the following:
 - a. Panels.
- C. Label Installation:
1. Install label parallel to equipment lines.
 2. Install label for identification of individual control device stations.
 3. Install labels for permanent adhesion and seal with clear lacquer.
- D. Wire Marker Installation:
1. Install wire marker for each conductor at panelboard gutters, pull boxes, outlet and junction boxes, and each load connection.
 2. Mark data cabling at each end. Install additional marking at accessible locations along the cable run.
 3. Install labels at data outlets identifying patch panel and port designation [as indicated on Drawings].
- E. Conduit Marker Installation:
1. Install conduit marker for each conduit longer than 6 feet.
 2. Conduit Marker Spacing: 20 feet on center.
 3. Raceway Painting: Identify conduit using field painting.
 - a. Paint colored band on each conduit longer than 6 feet.
 - b. Paint bands 20 feet on center.
 - c. Color:
 - 1) Fire Alarm System: Red.

END OF SECTION

SECTION 28 31 00

INTELLIGENT REPORTING FIRE DETECTION AND ALARM

PART 1: GENERAL

1.1 CONTRACTOR QUALIFICATIONS

A. All work specified in this section shall be performed by a qualified Fire Life-safety System (FLS) contractor. The FLS contractor shall provide the following documentation to show compliance with contractor qualifications. The documents shall be bound, indexed in the order listed below and provided during the submittal process.

1. **CONTRACTOR'S LICENSE:** A copy of the FLS contractor's valid State of California C-10 License.
2. **PROOF OF EXPERIENCE:** Proof that the FLS contractor has been regularly engaged in the business of fire alarm contracting consisting of, but not limited to, engineering, fabrication, installation, and servicing of fire alarm systems of the type and manufacturer specified herein for at least the past ten (10) consecutive years.
3. **INSURANCE CERTIFICATES:** Copy of FLS contractor's current liability insurance and state industrial insurance certificates in conformance with the contract documents.
4. **PROJECT LIST:** A List containing at least ten (10) California installations completed within the last five (5) years by the FLS contractor that are comparable in scope and nature to that specified in the contract document. List to include only those jobs that have been performed under same company name by current owners.
5. **SERVICE CAPABILITY:** Documentation indicating in detail that the FLS contractor has competent engineering, installation, service personnel and facilities with reasonable stock of service parts within 100 air miles of the job site.
6. **CERTIFICATION:**
 - a. Evidence that the FLS contractor is Underwriters Laboratories, Inc. (UL) listed under the classification of PROTECTIVE SIGNALING SERVICES-LOCAL, AUXILIARY, REMOTE STATION AND PROPRIETARY (UUJS).
 - b. Evidence that the FLS contractor is Underwriters Laboratories, Inc. (UL) listed under the classification of CENTRAL STATION PROTECTIVE SIGNALING SERVICES (UUFX).
 - c. Copies of the following: (NICET) Certificates. Proof that the certificate holders are a part of the FLS contractor's local facility servicing this project and will be actively involved in this project.
 - 1) Technician Level 2 minimum of (4).
 - 2) Technician Level 4 minimum of (2).

7. PROOF OF TRAINED PERSONNEL:

- a. Documentation that the FLS contractor has on staff personnel **factory trained and certified** for the equipment proposed for this project. Also, a statement that personnel meeting these qualifications are in the local facility, and will be maintained at that facility throughout the duration of the project and the warranty period.
- b. Documentation that the FLS contractor is a NESCO-affiliated Engineered Systems Distributor (ESD). Documentation shall include verification that the FLS contractor has received the required training, has passed annual NOTIFIER quality audits, and is currently an affiliate in good-standing.

1.2 DESCRIPTION:

- A. This section of the specification includes the furnishing, installing, connecting and testing of the addressable, microprocessor controlled, networked fire detection and emergency voice evacuation system. The system shall monitor the following: manual fire alarm stations, water-flow alarm switches, valve supervisory tamper switches, post indicator valves, back-flow preventer supervisory switches, early warning smoke and heat detectors, duct smoke detectors and/or area smoke detectors for fan stop fire suppression system, kitchen fire extinguishing system and control of fire/smoke dampers. Smoke control functions shall comply with requirements specified by the designated Fire Protection Engineer through his Rational Analysis. The system shall include an integral Digital Alarm Communicator Transmitter (DACT) for Central Station Monitoring. System shall include digital voice evacuation system, fireman's telephone system, auxiliary control devices, annunciators, and wiring as shown on the drawings and specified herein. System design shall allow for a 20% expansion without the addition of any control equipment components.

1.3 APPLICABLE STANDARDS AND SPECIFICATIONS:

- A. The specifications and standards listed below form a part of this specification. The system shall fully comply with the codes and standards applicable to the dates and occupancies specified by the Architect and shown in the bid documents.
- B. National Fire Protection Association: NFPA. 13 Sprinkler Systems, NFPA 70 National Electric Code, NFPA 72 National Fire Alarm Code, NFPA 90A Air Conditioning Systems, NFPA 92A Smoke Control Systems, NFPA 101 Life Safety Code
- C. Underwriters Laboratories Inc. (UL) - UL 268 Smoke Detectors for Protective Signaling Systems, UL 864 (9th Edition) Control Units for Protective Signaling Systems, UL 268A Smoke Detectors for Duct Applications, UL 521 Heat Detectors for Protective Signaling Systems, UL 464 Audible Signaling Appliances, UL 38 Manually Actuated Signaling Boxes, UL 346 Waterflow Indicators for Protective Signaling Systems, and UL 1971 Visual Notification Appliances
- D. California State Building Codes (CBC, CFC, CEC, and CMC).
- E. ANSI/ASME A17.2 and State of California Elevator Code requirements.

1.4 SCOPE:

- A. Provide a new intelligent reporting, microprocessor controlled fire detection system. It shall be installed in accordance with the specifications and drawings.
- B. The FLS contractor shall install all peripheral devices and control equipment. All raceway, boxes, and terminal cabinets are to be furnished and installed by the Electrical Contractor.
- C. Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system on site. Modification includes addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modifications on-site.
- D. All required special equipment, including a laptop computer, for programming, shall be furnished by the FLS contractor, turned over to the Building Owner and shall remain on site and shall be covered during the warranty period. A Control Panel that has an integral QWERTY keypad which allows for system program modifications on site is acceptable.
- E. Basic Performance:
 - 1. Alarm and trouble signals from the FACP and LCD shall be digitally encoded by listed electronic devices onto a NFPA Style 4 looped multiplex communication system.
 - 2. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded onto NFPA Style 4 (Class B) Signaling Line Circuits (SLC).
 - 3. Initiation Device Circuits (IDC) shall be wired NFPA Style B (Class B).
 - 4. Notification Appliance Circuits (NAC) shall be wired Class B (NFPA Style Y).
 - 5. A single ground or open on any system signaling line circuit, initiating device circuit, or notification appliance circuit shall not cause system malfunction and must transmit a trouble condition to the main panel.
 - 6. Alarm signals arriving at the main FACP shall not be lost following a power failure (or outage) until the alarm signal is processed and recorded.
 - 7. Speaker circuits shall be arranged such that there is a minimum of one speaker circuit per floor, per elevator bank, and per stairway.
 - 8. Speaker circuits shall be electrically supervised for open and short circuit conditions. If a short circuit exists on a speaker circuit, it shall not be possible to activate that circuit.
 - 9. Speaker circuits shall be 25 or 70.7 VRMS. Speaker circuits shall have 20% space capacity for future expansion or increased power output requirements.
 - 10. Up to 32 minutes of custom digital audio messages shall be capable of being stored electronic-ally within the Digital Voice Command equipment (DVC).

11. Speaker circuits and control equipment shall be arranged such that loss of any one (1) speaker circuit will not cause the loss of any other speaker circuit in the system.
12. Two-way telephone communication circuits shall be arranged to allow communication between the fire command center and up to seven (7) remote telephone locations simultaneously.
13. A system event/report printer shall be provided in the Fire Command Center.
14. All system smoke detectors shall be of the Addressable type.
15. Addressable Residential Room smoke detectors shall report as supervisory signals only. Residential Room smoke detectors shall be equipped with an audible sounder base which shall provide program capability for activation by command of the FACP. Power for the sounder base shall originate from a NAC circuit and shall allow synchronization of the temporal 3 pattern with other audible devices in the system.
16. Existing initialing devices shall be reconnected to the new system if found compatible; otherwise replace devices to obtain a functional system.

1.5 SUBMITTALS:

- A. The FLS contractor shall submit three complete sets of equipment catalog data sheet documentation to ensure compliance with these specifications. Submittals will be automatically rejected if complete listing information from the California State Fire Marshal (CSFM) does not accompany submittals.
- B. Equipment and devices are as shown on the contract drawings. The FLS contractor shall submit shop drawings compliant with CBC Section 907, "Construction Documents" for approval. Installation shall not be performed prior to approval by Engineer and Authority Having Jurisdiction.

PART 2: PRODUCTS

2.1 GENERAL EQUIPMENT AND MATERIAL REQUIREMENTS:

- A. All equipment shall be new and of the manufacturer's latest design.

2.2 EQUIPMENT MANUFACTURERS:

- A. The Fire Alarm System shall be limited to the following manufacturers.
 1. **NOTIFIER** as supplied by NESCO affiliate.
 2. No other manufactures will be considered.

2.3 MAIN FIRE ALARM CONTROL PANEL – NFS2-3030:

- A. The FACP shall be a NOTIFIER Model NFS2-3030 and shall contain a microprocessor based Central Processing Unit (CPU). The CPU shall communicate with and control the

following types of equipment used to make up the system: intelligent addressable smoke and thermal (heat) detectors, addressable modules, printer, annunciators, network node gateway and other system controlled devices.

B. The FACP shall provide the following features:

1. The control panel shall provide capacity for the number of devices required plus 20%, and be capable of expansion to 3,180 intelligent/addressable devices.
2. The alarm control panel shall include a full featured operator interface control and annunciation panel that shall include a backlit Liquid Crystal Display (LCD), individual color coded system status LEDs, and full QWERTY keypad for the field programming and control of the alarm system.
3. All programming or editing of the system software shall be achieved without special equipment and without interrupting the alarm monitoring functions of the alarm control panel. The system shall be fully programmable, configurable, and expandable in the field without the need for special tools, PROM programmers or PC based programmers. It shall not require replacement of memory ICs to facilitate programming changes.
4. The ability to display or print system reports.

C. Signaling Line Circuits (SLC)

1. The system shall include one SLC with the capability for expansion to ten. Each SLC interface shall provide power to and communicate with up to 159 intelligent detectors (ionization, photoelectric or thermal) and 159 intelligent modules (monitor or control) for a total system capacity of 3,180 devices. The SLC shall be capable of NFPA 72 Style 4, Style 6, or Style 7 (Class A or B) wiring. System shall be capable of polling 318 devices in less than two seconds.
2. The Loop Control Module (LCM/LEM) shall send and receive fully digital information to and from all intelligent detectors for processing to determine whether normal, alarm, pre-alarm, or trouble conditions exist for each detector. The software shall automatically maintain the detector's desired sensitivity level by adjusting for the effects of environmental factors, including the accumulation of dust in each detector. The digital information shall also be used for automatic detector testing and for the automatic determination of detector maintenance requirements.
3. Drift compensation to extend detector accuracy over life. Drift compensation shall also include a smoothing feature, allowing transient noise signals to be filtered out.
4. The detector software shall meet NFPA 72, Chapter 7 requirements and be certified by UL as a calibrated sensitivity test instrument.
5. The detector software shall allow manual or automatic sensitivity adjustment. System shall be capable of performing periodic detector test, conducted automatically by the software.

D. Digital Voice Command Center

1. The Digital Voice Command Center (DVC) located with the FACP shall contain the equipment required for all audio control, emergency telephone system control, signaling and supervisory functions. This shall include speaker zone indication and control, telephone circuit indication and control, digital voice units, microphone and main telephone handset.
2. The DVC shall be capable of operating 8 channels of audio and 5 channels of firefighter's telephone simultaneously.
3. The DVC shall be capable of controlling up to 32 DAA series digital amplifiers or 4 channels of analog amplification using the DVC-AO option.
4. DVC's and DAA's shall operate as nodes on the Noti-Fire-Net network and shall support fiber or twisted pair communication methods.

E. Serial Interfaces

1. The system shall include a serial RS-232 interface. The interface shall be a means of connecting UL Listed Electronic Data Processing (EDP) peripherals.
2. The system shall include an RS-485 port for the serial connection of optional annunciators, Smoke Control Panel, and remote LCD displays.
3. The system shall include a Network/Service Connection (NUP) port for communications with the NFN Gateway Module and/or NCM High Speed Network Modules for either copper or fiber optic connection.

F. Notification Appliance Circuit (NAC)

1. Each DAA Digital Audio Amplifier shall provide two (2) Class A or four (4) Class B Supervised 25 or 70.7 VAC Audio Outputs and one (1) Fireman's Telephone Riser Circuit. Connected speaker loads shall provide for a minimum 50% headroom factor above the amplifier's rated output. Fireman's telephone risers shall support up to seven (7) independently addressed ringing telephone circuits.
2. Each ACPS-610 Addressable Charger/Power Supply shall provide four (4), Class A or four (4) Class B fully addressable Notification Appliance Circuits (NAC) rated for 1.5 Amps each at 24VDC. Power supply shall be capable of charging 12 to 200 AH batteries with full supervision.

G. Remote Notification Appliance Circuit (NAC)

1. Each FCPS-24S8 Field Charging Power Supply shall provide four (4) Class A or four (4) Class B Notification Appliance Circuits (NAC) rated for 1.5 Amps each at 24VDC. Power supply shall also be capable of providing 6 Amps of standalone resettable/non-resettable 24VDC Power for auxiliary devices.

H. Control Modules

1. Six circuit modules shall be configurable for 3.0 ampere, 24 VDC NAC output with synch, 63 Watts of 70.7 volt audio, or form C relay control with contacts rated at 3.0 amperes, 30 VDC.

2. Each circuit shall be capable of being activated by any initiating device or from any combination of initiating devices.

I. Enclosures:

1. The control panel shall be housed in a UL-listed cabinet suitable for surface or semi-flush mounting. The cabinet and front shall be corrosion protected, given a rust-resistant prime coat, and manufacturer's standard finish.
2. The door shall provide a key lock and shall include a glass or other transparent opening for viewing of all indicators. For convenience, the door may be selected for either right or left hand hinging.

2.4 SYSTEM COMPONENTS

A. Serially Connected Annunciator, NOTIFIER LCD-160

1. The annunciator shall communicate with the alarm control panel via a two wire RS-485 (multi-drop) communications interface. The annunciator shall provide a 640 character display.
2. The annunciator shall require no more than four wires for operation. Annunciation shall include: intelligent addressable points, system software zones, control relays, and notification appliance circuits.

B. Smoke Control Graphic Annunciator, NOTIFIER SCS/Kirkland Graphic

1. 1. The annunciator shall communicate with the alarm control panel via a two wire RS-485 communications interface. The annunciator shall provide necessary inputs and outputs for all HAND/OFF/AUTO functionality and all necessary indicators. The annunciator shall require no more than four wires for operation.
2. 2. The annunciator shall monitor switch positions and drive LED's on the faceplate of the Smoke Control Graphic display. Design of the Smoke Control Graphic shall be per the rational analysis provided by the Fire Protection Engineer and in accordance with applicable Code requirements.

2.5 ADDRESSABLE DEVICES:

A. General

1. Addressable devices shall use simple to install and maintain rotary decimal (1-159) type address switches.
2. Addressable smoke and thermal detectors shall provide dual, bi-color alarm and power/polling LEDs. Both LEDs shall flash green under normal conditions, indicating that the detector is operational and in regular communication with the control panel, and both LEDs shall be placed into steady red illumination by the control panel, indicating that an alarm condition has been detected. If required, the LED flash shall have the ability to be removed from the system program. An output connection shall also be provided in the base to connect an external remote alarm LED.

3. The alarm control panel shall permit detector sensitivity adjustment through field programming of the system. Sensitivity shall be capable of being automatically adjusted by the panel on a time-of-day basis.
 4. Using software in the FACP, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72, Chapter 10.
 5. The detectors shall include a separate twist-lock base with tamper proof feature.
 6. The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a magnetic switch) or initiated remotely on command from the control panel.
 7. Detectors will operate in fully digital fashion, where the detector measures its designed environment variable and transmits a digital value to the FACP based on real-time measured values. Polling from the FACP is performed in a group fashion until a single device in the group provides new information, at which time the FACP stops the group poll and concentrates on the single device; greatly enhancing response speed. The FACP software, not the detector, shall make the alarm/normal decision, thereby allowing the sensitivity of each detector to be set in the FACP program and allowing the system operator to view the current analog value of each detector.
- B. Addressable Pull Box (manual station), NOTIFIER NBG-12LX
1. The addressable pull box shall, on command from the control panel, send data to the panel representing the state of the manual switch and the addressable communication module status. The pull box shall use a key operated test-reset lock, and shall be designed so that after actual emergency operation, the pull box cannot be restored to normal use except by the use of a key. Pull station shall contain a bi-colored status LED that functions as outlined above.
 2. The manual station shall be constructed of Lexan with clearly visible operating instructions provided on the cover. The word "Fire" shall appear on the front of the station in raised letters, 1.75 inches or larger.
- C. Intelligent Photoelectric Smoke Detector, NOTIFIER FSP-851
1. The detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the detected level of smoke density.
- D. Intelligent Heat Detector, NOTIFIER FST-851R and FST-851H
1. The detectors shall be 135 degree F rate-of-rise heat detectors and shall, on command from the control panel, send data to the panel representing the detected level of heat. For areas with higher anticipated ambient temperature levels, the detector shall be rated for 190 degree F and shall carry the "H" designation.
- E. Intelligent Duct Smoke Detector, NOTIFIER DNR/DNR-W

1. The smoke detector housing shall accommodate either an intelligent ionization detector or an intelligent photoelectric detector, that provides continuous monitoring and alarm verification from the panel. "W" suffix indicates weatherproof. Any duct smoke detectors to be installed outdoors shall be weatherproof, and shall not require any additional protection from excessive heat or moisture than that provided by the housing.
 2. Intelligent Duct Smoke Detectors shall be furnished under this section, and installed by the Mechanical Contractor. Manufacturer's installation instructions are to be furnished to the Mechanical Contractor for his use.
- F. Addressable Dry Contact Monitor Module, NOTIFIER FMM-1
1. Addressable monitor modules shall be provided to connect each waterflow and tamper switch and any other indicated dry contact device to be monitored by the FACP to the SLC.
 2. The monitor module shall mount in a 4-inch square, 2-1/2 inch deep electrical box.
 3. The IDC zone shall be suitable for Style D or Style B operation. A bi-color LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.
- G. Addressable Dual Dry Contact Monitor Module, NOTIFIER FDM-1
1. Where waterflow and tamper switches are grouped together, addressable dual monitor modules shall be provided to connect the dry contacts of each waterflow and tamper switch to be monitored by the FACP to the SLC.
 2. The monitor module shall mount in a 4-inch square, 2-1/2 inch deep electrical box.
 3. The module shall report two consecutive and discreet addresses to the FACP.
- H. Addressable Dry Contact Mini Monitor Module, NOTIFIER FMM-101
1. Addressable mini monitor modules shall be provided to connect weatherproof heat detectors and manual stations and/or any other indicated dry contact device to be monitored by the FACP to the SLC.
 2. The monitor module shall be capable of installation inside a single gang electrical box and behind the dry contact device it is intended to monitor.
- I. Addressable Control Relay Module, NOTIFIER FRM-1
1. Addressable control relay modules shall be provided to control the operation of HVAC equipment, fire/smoke dampers, elevator control, and any other indicated dry contact control function.
 2. The control module shall mount in a standard 4-inch square, 2-1/2 inch deep electrical box.

3. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary relays may be energized at the same time on the same pair of wires.

J. Addressable Control Module, NOTIFIER FCM-1

1. Addressable control modules shall be provided to control the operation of circuits requiring a 24VDC supervised output. The module shall supervise input power as well as its controlled output.
2. The control module shall mount in a standard 4-inch square, 2-1/2 inch deep electrical box.
3. The module shall be suitable for Class A or B operation. A bi-color LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.

2.6 NON-ADDRESSABLE DEVICES:

A. Multi-Voltage Single Pole Relay, NOTIFIER PR-1

1. Relay coil shall be rated for 24VDC, 24VAC, and 120VAC.
2. Each relay shall provide one set of Form C (SPDT) dry contacts rated for 7 Amps at 120VAC.
3. The relay shall be U.L. Listed and capable of constant duty use.

B. Waterflow Indicator:

1. Waterflow Switches shall be furnished and installed by the Sprinkler Contractor.
2. Waterflow Switches shall be connected under this section.
3. The Main sprinkler Waterflow Switch shall be connected to an exterior-mounted, 120VAC bell. Bell shall be furnished by the Sprinkler Contractor and powered and connected by the Electrical Contractor.

C. Sprinkler and Valve Supervisory Switches

1. Each sprinkler system water supply control valve riser, zone control valve, and standpipe system riser control valve, post indicator valve, and/or main gate valve shall be equipped with a supervisory switch.
2. Valve supervisory switches shall be connected under this section and furnished, installed, and adjusted for proper operation by the sprinkler contractor.

D. Electromagnetic Door Holders

1. Fire doors separating smoke compartments shall be furnished with electromagnetic door holders which shall release doors upon signal from the FACP or during loss of mains power.
2. Electromagnetic Door Holders shall be connected under this section and furnished, installed, and adjusted for proper operation by the Door Hardware

Contractor. 120VAC power shall be provided at the location of each door holder by the Electrical Contractor.

2.7 AUDIBLE, AUDIBLE/VISUAL, AND VISUAL DEVICES:

- A. Speakers and Speaker Strobes shall be System Sensor Spectralert S, SC, SP2, and SP2K or equal RS, AS, and E Series by Wheelock.
1. The notification appliances shall be Notifier Spectralert S, SC, and SP2 Series Wall Mount Strobe, Ceiling Mount Strobe and Ceiling Mount Speaker/Strobe appliances. Spectralert appliances with strobes shall be listed under UL Standard 1971 (Emergency Devices for the Hearing-Impaired for Indoor Fire Protection Service). Spectralert Speakers shall be UL listed under Standard 1480 (Fire Protective Signaling). Strobes shall be variable candela and suitable for wall or ceiling mount applications. Speakers shall provide variable power and line voltage taps (70.7 or 25 Volt line @ $\frac{1}{4}$, $\frac{1}{2}$, 1, and 2 Watts). Weatherproof devices shall be Spectralert SP2K and shall incorporate characteristics of the SP2 series.
 2. Sound output for Spectralert Speakers at 10 feet shall be field selectable for 87, 84, 81 or 78 dBA anechoic with a frequency response of 100 to 10,000 Hz. Spectralert combination devices and strobe devices shall provide listed strobe intensities of 15, 30, 75, 95, 115 and 177 candela for ceiling mount applications, with a flash rate of one flash per second minimum across the listed voltage range. The strobe appliance shall incorporate a Xenon flashtube enclosed in a rugged Lexan lens.

2.8 FIREMAN'S TELEPHONE SYSTEM DEVICES:

- A. Fireman's Telephone Jacks and Handsets, NOTIFIER FPJ and FHS
1. Fireman's Telephone Jacks shall be furnished and installed as shown on the drawings and as required by the Code. The receptacle shall be semi-flush and mounted with a single-gang box.
 2. Jack shall be compatible with remote handsets, Model FHS (furnish 6 with FHSC-S enclosure or as local AHJ requires).
- B. Firephone Control Module, NOTIFIER FTM-1
1. The Firephone Control Module shall support up to two fireman's telephone jacks. The module shall allow for direct dial programming from the ACS annunciator to associated jacks and shall provide dial and ring tone to handsets inserted.
 2. The Firephone Control Module shall be connected to and powered by the SLC loop and shall be capable of Class A or B supervision.

2.9 CONDUIT, BOXES, AND WIRE:

- A. Conduit:
1. Conduit shall be in accordance with the National Electrical Code (NEC), local and state requirements.

2. All wiring shall be installed complete conduit system. Conduit fill shall not exceed 40 percent of interior cross sectional area where three or more cables are contained within a single conduit.
 3. Cable must be separated from any open conductors of power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, per NEC Article 760-29.
 4. Conduit shall not enter any FACP, or any other remotely mounted control panel equipment or backboxes, except where conduit entry is specified by the manufacturer.
 5. Wire and cable shall be installed in conduit. Conduit shall be 3/4 inch minimum.
- B. The FACP(s) shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled at the main power distribution Panel as FIRE ALARM. Fire alarm control panel primary power wiring shall be 12 AWG. The FACP cabinet shall be grounded.
- C. Wire:
1. Wiring shall be in accordance with local, state and national codes (e.g., NEC Article 760) and as recommended by the manufacturer of the fire alarm system. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 16 AWG for initiating device circuits and signaling line circuits, and 12 AWG for notification appliance circuits.
 2. All field wiring shall be completely supervised and new at time of installation.
 3. Two-hour survivability shall be observed as required.

PART 3: EXECUTION

3.1 INSTALLATION:

- A. The entire system shall be installed in a workmanlike manner in accordance with approved manufacturers' manuals and wiring diagrams. System devices and wire, except as noted, shall be installed by the FLS contractor. The Electrical Contractor shall furnish all conduit, outlet boxes, junction boxes, terminal cabinets and similar devices necessary for the completed installation.
- B. Installation of conduit, outlet boxes, junction boxes, terminal cabinets, special back boxes and similar devices shall comply with the requirements of other Sections.
- C. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas.
- D. Smoke detector heads shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.
- E. Duct mounted Smoke Detectors shall be furnished and wired by the FLS contractor and installed by the Mechanical contractor. All shutdown and interface wiring shall be

performed by the Electrical contractor. All air pressure differential testing shall be performed by the Mechanical/Air Balance contractor.

- F. The sprinkler flow and tamper switches shall be furnished, installed and adjusted by the Sprinkler contractor, wired and tested by the FLS contractor.
- G. Manual Pull Stations shall be mounted 48 inches above finished floor measured to the top of the station.
- H. Audible and Visual devices shall be mounted no lower than 80 inches nor higher than 96 inches above finished floor measured at strobe center. Audible devices shall be no closer than 6 inches to the ceiling surface.
- I. Area Smoke Detectors shall be mounted no closer than 36 inches to any HVAC supply or return register or lighting fixture.
- J. Area Smoke and Heat Detectors shall be mounted no closer than 6 inches to any wall where ceiling mounted or to the ceiling where wall mounted.

3.2 WARRANTY:

- A. All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance. The full cost of maintenance, labor and materials required to correct any defect during this one-year period shall be included in the submittal bid.

3.3 FINAL INSPECTION:

- A. At the final inspection a factory trained representative of the manufacturer of the major equipment shall demonstrate that the systems function properly in every respect.

3.4 INSTRUCTION:

- A. Provide instruction as required for operating the system. Hands-on demonstrations of the operation of all system components and the entire system including control by event functions shall be provided. Instruction shall be recorded using audio and video for future use by the Owner.
- B. The contractor and/or the systems manufacturer's representatives shall provide a factory generated "Frame and Post" instruction set.

3.5 SPARE PARTS:

- A. Provide a minimum of two (2) of each type of automatic fire detector used in the project (Smoke, Duct, Heat, etc.).
- B. Provide a minimum of one (1) Manual Fire Alarm Station.
- C. Provide a minimum of one (1) of each type of Monitor Module used in the project (FMM and FDM).
- D. Provide a minimum of one (1) of each type of Control Module used in the project (FCM, FRM, etc.).

- E. Provide a minimum of one (1) of each type of Indicating Appliance used in the project (Speaker, Speaker Strobe, and Strobe). Where more than a single device type is required to provide the various candela ratings as used throughout the project, one of each device type shall be furnished.

END OF SECTION