

SECTION 26 10 00 - BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SCOPE

- A. Minimum composition requirements and/or installation methods for the following materials and work are included in this section:
 - 1. Miscellaneous Supports
 - 2. Access Doors and Panels
 - 3. Excavation and Backfilling
 - 4. Fire Stopping
 - 5. Boxes and Cabinets
 - 6. Equipment Pads, Bases and Supporting Devices
 - 7. Identification
 - 8. Flashing and Sealing
 - 9. Cutting and Patching

1.2 SUBMITTALS

- A. Provide five (5) sets or electronic files of Product data for:
 - 1. Access Doors and Panels
 - 2. Fire Stopping
 - 3. Boxes and Cabinets
 - 4. Identification
 - 5. Coordination drawings for sleeves, underground construction, access panel and door locations.

1.3 QUALITY ASSURANCE

- A. The contractor shall engage the services of a qualified installer for the installation and application of joint sealers, flashing, access panels, cutting and patching, excavation and concrete work.
- B. All work shall be done in a neat and workmanlike manner. All methods of construction, details of workmanship, that are not specifically described or indicated in the contract documents, shall be subject to the control and approval of the Owner's Representative. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equivalent" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval.
- C. Materials specified herein shall comply with the latest applicable requirements of:
 - 1. The following Articles of the National Electric Code (NFPA 70)
 - a) 312 - Cabinets, Cutout Boxes and Meter socket Enclosures
 - b) 314 - Outlet, Device, Pull and Junction Boxes, Conduit bodies and

fittings

1.4 PROJECT CONDITIONS

- A. The following conditions apply to excavation:
 - 1. Maintain and protect existing building services which cross the excavation area.
 - 2. Protect utilities, sidewalks, structures, pavements and other facilities from damage caused by settling, lateral movements, undermining, washouts and other hazards created by excavation work.
 - 3. Locate and verify existing underground utilities in excavation areas. If utilities are indicated to remain, support and protect services during excavation operations.
 - 4. Verify subsurface conditions prior to excavation work.
- B. Apply all flashing, sealers and fire stopping within the temperature and humidity limits permitted by the manufacturer.

PART 2 - PRODUCTS

2.1 MISCELLANEOUS SUPPORTS

- A. Metal bars, plates, tubing, etc. shall conform ASTM standards:
 - 1. Steel plates, shapes, bars, and grating - ASTM A 36
 - 2. Cold-Formed Steel Tubing - ASTM A 500
 - 3. Hot - Rolled Steel Tubing - ASTM A 501
 - 4. Steel Pipe - ASTM A 53, Schedule 40, welded
- B. Metal Fasteners shall be Zinc-coated (type, grade and class as required)

2.2 ACCESS DOORS AND PANELS

- A. Steel access doors and frames shall be fire rated as required, factory fabricated and assembled units, complete with attachment devices and fasteners ready for installation. Joints and seams shall be continuously welded steel, with welds ground smooth and flush.
- B. Construction:
 - 1. Frames:
 - a) 16 gage steel with 1 inch wide exposed perimeter flange and adjustable masonry anchors for units installed in masonry, pre-cast, cast in place concrete, ceramic tile.
 - b) 16-gage steel, perforated flanges with bead for gypsum or plaster wall board.
 - c) 16-gage steel with galvanized expanded metal lath and exposed

casing bead, welded to perimeter of frame for full bed plaster applications.

2. Access Doors:
 - a) Provide 14 gage sheet steel flush panel doors with concealed continuous piano hinge factory installed, primed and painted, set to open 175 degrees.
 - b) Provide fire rated, insulated flush panel doors, with continuous piano hinge and self closing mechanism rated for 1 ½ hour "B" labeled, in fire rated partitions.
- C. Provide flush, screwdriver operated cam locks on all access doors.

2.3 FIRE STOPPING

- A. Fire-stopping for Openings through Fire and Smoke Rated Walls and all Floor Assemblies shall be listed or classified by an approved independent testing laboratory for "Through-Penetration Fire-Stop Systems." The system shall meet the requirements of "Fire Tests of Through-Penetration Fire-Stops" designated ASTM E814.
- B. Acceptable Manufacturers:
 1. Dow Corning Fire-Stop System Foams and Sealants.
 2. Nelson Electric Fire-Stop System Putty, CLK and WRP.
 3. Thomas & Betts - S-100 FS500/600,
 4. Carborundum Fyre Putty.
 5. Hilti Firestop Systems

2.4 BOXES AND CABINETS

- A. Outlet Boxes and Covers
 1. Shall be galvanized steel, not less than 1-1/2" deep, 4" square, with knockouts. Outlet boxes exposed to moisture, exterior, wet or damp locations shall be cadmium cast alloy complete with threaded hubs and gasketed screw fastened covers. Minimum box size shall be as indicated in Article 314 of the National Electrical Code for the conductors and devices installed. Boxes shall be approved for the environmental condition of the location where they will be installed.
 2. Acceptable manufacturers:
 - a) Steel City
 - b) Raco
 - c) Appleton
 - d) Crouse Hinds
 - e) Approved equivalent

B. Flush Floor Outlet Boxes

1. Provide flush service for power or communications/data as called for. Boxes shall be suitable for carpet or tile applications. Stamped steel, concrete tight, fully adjustable box with interior and exterior leveling screws, and with 1/2", 3/4" and 1" knockouts. Complete with expandable cap to prevent ingress of concrete during pour. Provide polished brass integrated carpet plate/duplex floor plate and duplex receptacle where called for. Provide polished brass integrated carpet plate/3/4"-2" floor plate where utilized for communications and data.
2. Make: Steel City 68-D with P60-CACP or P60-3/4-2-CACP as equivalent. required, or approved
3. Provide 14 gauge galvanized steel multiple service type for power, communications and data. Boxes shall have hinged cover with carpet plate for flush appearance and recessed floor access to power and communication device. Boxes shall have leveling screws for adjustment to pour and adjustment of floor flange of 3/4" from box top of box after pour. Boxes shall include one duplex receptacle faceplate and one data device plate. Refer to schedule for device and cable requirements for each floor box.
4. Design Make:
 - a) Steel City:
 - b) Box - 664 - (nominal 3-3/4" deep)
 - c) Carpet Plate - 664-CST (color by Architect)
 - d) Receptacle Faceplate - 664RP
 - e) Device Plate - 664-BP
 - f) Approved equivalent

C. Pull and Junction Boxes

1. Shall be constructed of not less than 14 gauge galvanized steel with trim for flush or surface mounting in accordance with the location to be installed. Provide screw-on type covers. Boxes installed in damp or wet locations shall be of raintight construction with gasketed cover and threaded conduit hubs. In no case shall boxes be sized smaller than as indicated in Article 314 of the National Electrical Code for conduit and conductor sizes installed. Boxes shall be approved for the environmental condition of the location where they will be installed.
2. Acceptable manufacturers:
 - a) Hoffman
 - b) Keystone
 - c) Approved equivalent
3. Flush floor junction boxes shall be recessed cover boxes designed for flush mounting in masonry. Provide checkered plate gasketed cover suitable for foot traffic. Make: O.Z. Gedney Type YR or approved equal.

- D. Terminal and Equipment Cabinets:
1. Terminal and Equipment Cabinets shall be code gauge galvanized steel with removable endwalls. Fronts shall be of code gauge steel, flush or surface type (as indicated) with concealed trim clamps, concealed hinges, flush lock, and grey baked enamel finish. Boxes and front shall be U.L. listed and shall be minimum 35"H x 24"W x 6"D. Provide removable insulated plywood terminal board mounted on inside back wall of cabinet.
 2. Acceptable manufacturer:
 - a) Square D "Mono-Flat"
 - b) Approved equivalent

2.5 EQUIPMENT BASES, PADS AND SUPPORTING DEVICES

- A. Supports, support hardware and fasteners shall be protected with zinc coating or treatment of equivalent corrosion resistance using approved alternative treatment, finish or inherent material characteristic. Products used for outdoor applications shall be hot dipped galvanized.
- B. Provide clevis hangers, riser clamps, conduit straps, threaded c clamps with retainers, ceiling trapeze hangers, wall brackets and spring steel clamps as applicable.
- C. 14 gauge U-Channel systems with 9/16 inch diameter holes at a minimum of 1 1/2 inches on center in the top surface. Provide fittings and accessories by the same manufacturer that match and mate channel.
- D. Provide carbon steel wedge or sleeve type expansion anchors, steel spring head toggle bolts and heat treated steel power driven threaded stud fastening equipment as required by construction types.
- E. Provided field fabricated supporting devices such as angles, channels, pipe supports, etc. All fabricated supports shall be of metal construction as called for in 2.1.
- F. Acceptable Manufacturers:
1. Thomas & Betts Corporation (Kindorf)
 2. B-Line
 3. Unistrut Diversified Products
 4. Cooper Industries
 5. Allied Tube
 6. American Electric
 7. Killark Electric Mfg. Co.
 8. O/Z Gedney
 9. Spring City Electrical Mfg. Co.
 10. Approved Equivalent

2.6 IDENTIFICATION

- A. Provide adhesive marking labels for raceway and metal-clad cable. The labels shall indicate voltage and service, and be located above ceilings every 75 feet and on wall mounted conduit in mechanical and equipment rooms.
- B. Provide self colored, adhesive vinyl tape, minimum 3 mils thick by 3/4 inch wide for all phase marking on cable.
- C. Provide for all underground or buried systems, 6-inch wide bright colored continuously printed, plastic tape compounded for direct-burial services. Printing shall indicate service below.
- D. Provide engraved, plastic laminated labels, signs and instruction plates. Engraving stock melamine plastic laminate. Use 1/16-inch minimum thick for signs up to 20 square inches or 8 inches in length. Use 1/8 inch thick for larger sizes. Engraved legend in white letters on black face and punched for mechanical fasteners. Emergency equipment shall have red face.
- E. Using permanent means, label all receptacles, individual circuit breakers, devices, etc., showing panel designation and circuit number. Dymo tape is not acceptable.
- F. Acceptable Manufacturers:
 - 1. W.H. Brady Co.
 - 2. Markal Corp.
 - 3. National Band & Tag Company
 - 4. Panduit Corporation
 - 5. Cole-Flex Corporation
 - 6. Approved Equivalent

PART 3 - EXECUTION

3.1 ACCESS DOORS AND PANELS

- A. Install access doors, sized to permit complete access for any concealed and/or inaccessible junction boxes, control and monitoring devices, duct mounted fire alarm detectors and other electrical equipment requiring access for maintenance or operation.
- B. Set frames accurately in position and securely attach to supports with face panels plumb and level in relation to adjacent finish surfaces.
- C. Adjust hardware and panels after installation for proper operation.

3.2 EXCAVATION AND TRENCHING

A. Preparatory Work

1. Build lines to grade and elevations shown. Provide stakes, grade boards, cleats, nails, and instruments. Locate and stake each new run for its entire length. Verify elevations given. Start excavation at low point. Notify Engineer of elevation discrepancies. Protect marks and stations. Before excavating work, coordinate with Owner's Site Representative and other trades. Furnish schedule of operations to Owner and each trade. Provide and maintain temporary bridges, walks and bridges over excavations where underground utility lines, sewers, water lines, etc., cross access roads, walks, and streets. Make necessary arrangement with authorities having jurisdiction.
2. Examine substrates, areas and conditions, with the installer present, for compliance with requirements for installation tolerances and other conditions affecting installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Protection

1. Establish conditions, before starting work, by taking photographs to determine state to which existing conditions must be restored. Submit such photographs notarized, identified and dated for record.
2. Provide bracing, shoring, sheathing and other work for: protection of personnel, the contract work, excavations, trees, shrubs, existing structures, and surrounding properties. Slope sides of excavations to comply with local codes and ordinances. Provide, erect, and maintain barricades, warning signs, flags, and lights to provide protection for work, workmen, public, and property. Plank walks, pavements, and curbs to be crossed by equipment. Protect adjacent property, existing fences, trees, shrubs, roads, curbs, sidewalks, manholes, hydrants, and other items.
3. Restore, repair, rebuild or replace any such items damaged or destroyed to condition equal to that existing before such damage occurred.

C. Existing Utilities

1. Every attempt has been made to indicate existing utilities as accurately as possible from existing drawings, surveys, and data. Report immediately other utility lines encountered, but not shown on the drawings. Notify Underground Facilities Protection Organization (UFPO), where same exists, before starting work. Phone (800)-962-7962 for information and location of nearest organization address and telephone number. Verify exact location of existing utility lines where work crosses existing utilities and where connections are to be made by test hole before starting work. Notify utility companies, municipalities, and other involved jurisdictions when excavation occurs within vicinity of existing underground service such as sewers, water, electric, gas, telephone, including such services owned by Owner. If existing service lines, utilities and utility structures

which are to remain in service are uncovered or encountered during this excavation, they shall be protected from damage, and securely supported as directed and approved by the involved jurisdiction. Comply with [Section 1918 of Penal Law of State of New York] [Local Ordinance] with regard to work in vicinity of combustible gas piping. Immediately report damage or injury to utility lines to Owner's Representative and involved jurisdiction. Repair or replace utility lines damaged or injured as directed and approved by the involved jurisdiction. Excavate by hand in proximity to existing underground utility lines; take extreme care when excavating around ductbanks carrying energized cable. Remove plug or cap inactive or abandoned utilities encountered during construction operations. The location of such utilities shall be noted on the record drawings. Verify "inactivity" of services with involved jurisdiction before start of work.

D. Cutting and Patching

1. Before starting work, obtain necessary permits and pay fees and charges for same. Cut paved areas as called for, perpendicular to surface and in straight saw-cut lines. Replace pavements, roadways, streets, blacktop areas, walks, disturbed by excavating operations with materials equal to adjacent pavements. Grade all replacement pavements away from building.

E. Methods

1. Provide for buried work in contract both inside and outside of building. Excavate to proper depth and width for installation work as called for and comply with rules set forth by New York State and Local Authority Department of Labor. Remove materials including masonry work, rubble, earth, brickwork, concrete, sand, debris, abandoned pipe lines, drains and sewers, rocks, boulders, and concrete, all of which is considered "earth excavation." Provide for legal disposition of excess excavated materials. Make allowance for gravel fill, sand bases, form work, floor slabs, manholes, anchors and thrust blocks, sheet piling, drainage pumps, and work space. Start excavation at rough grade and provide form work and sheet piling where required.

F. Trench excavation:

1. By open cut, to proper depth and grade no wider than required for placement of work and not more than 100 ft. in advance of utility being installed.
2. Should trench bottom be wet, unstable, and/or otherwise incapable of supporting the contract work, immediately report same to Owner's Representative. Should it be deemed unsuitable, excavate to depth as directed and back fill with gravel to trench depth, or provide concrete cradling.

3. Should rock be encountered, excavate 6 in. deeper and fill space between trench bottom and pipe with coarse sand, well tamped to form firm bed.

G. Shoring, bracing, sheathing:

1. In addition to governing codes, protect sides of excavations with sheeting and bracing where necessary to prevent sliding or caving of banks and to protect adjacent structures. Remove as back fill is placed.
2. Provide at locations adjacent to existing manholes, hydrants, and similar items.

H. General excavation:

1. As required for all buried work. This shall include, but not be limited to, piping, tanks, ductbanks, conduits, footings, manholes, anchors, concrete pads, thrust blocks, fixture bases, and other work in contract.
2. Backfill
 - a) Provide bedding around piping with coarse sand from 6 in. below to 8 in. above. Apply by hand and compact under and at sides by mechanical means
 - b) Piping, jackets and sand bed must be inspected and tested prior to backfill of any nature. Provide necessary anchors, thrust blocks, and testing.
 - c) Fill and thoroughly compact remainder of trench in 6-in. layers, use ordinary fill material, except as otherwise specified. Do not use frozen material. Remove boulders, stones, broken rock, wood, bricks, blocks, and debris from fill material before backfill operation.
 - d) Under roadways, manholes, drives, parking areas, walks, slabs, on grade and at utility entrance to building provide backfill in 6 in. layers with gravel or crushed stone, free from organic or other unsuitable material, to grade. Thoroughly compact each layer.
 - e) Compaction to not less than 95% density compared to maximum laboratory tests by weight, per modified ASTM D1557-64T, latest editions, method "A" under slab on grade, roadways, drives, and other paved areas and 85% for general grading. Submit certified results of tests by an approved soil testing laboratory.
3. Removal of water
 - a) Provide pumps, hoses, pipe, labor and fuel, necessary to keep excavations free of water accumulation. Maintain and operate equipment for required duration. Manage discharge water in a manner so not to interfering with any trade's work and not to

undermine or disturb existing or adjacent structures or land. Grade to prevent surface water from flowing into all excavations and trenches. Do not discharge dirt, backfill, or debris into sanitary or storm drainage systems.

I. Rock Excavation

1. Rock Excavation defined as:

- a) Ledge rock requiring blasting or air hammer for removal.
- b) Boulders in excess of 1-1/2 cu. yds. in size. Demonstrate that material in question cannot be removed with a 1-1/2 yd. backhoe or shovel.
- c) Procedure:
 - (1) Should rock be encountered, remove only upon written order of the Owners Representative.
- d) Measurement of rock excavation, for purpose of payment to Contractor, will be taken 1 ft. wider than ductbank, manhole, pipe or conduit being installed. No allowance made for additional rock taken out accidentally or for convenience of Contractor beyond amount required for installation of work. Rock excavation claimed must be measured each day and verified by Owner's Representative. Maintain daily accounting. No claim for extra compensation honored except through procedures outlined above.
- e) Blasting:
 - (1) Should rock be encountered which cannot be removed with a 3/4 cu. yd. capacity power shovel without drilling and blasting, blasting shall be done by a licensed Contractor. Work shall be accomplished entirely at the Contractor's risk and he shall accept liability for resultant damage. The transportation, handling, storage, and the use of explosives shall be performed in accordance with the provisions of local and state laws and authorities having jurisdiction, and in accordance with ANSI A10.2.

J. Job completion

- 1. On completion of the work, clean the entire site, remove surplus earth, large stones and debris, to off-site legal disposal. Remove tools and equipment and leave the entire area in a neat condition.
- 2. Rough grade to 6 in. below finished grade. Scarify subsoil to depth of 2 in. to achieve bond between topsoil and subsoil.
- 3. Repave, reseed and completely restore the area to the condition prior to

the start of excavation and trenching work

3.3 FIRE STOPPING

- A. Installation of Fire-stopping for Openings Through Fire and Smoke Rated Walls and Floor Assemblies shall be as follows:
1. Provide fire-stop system seals at all locations where piping, tubing, conduit, electrical busways/cables/wires, ductwork and similar utilities pass through or penetrate fire rated wall or floor assembly. Provide fire-stop seal between sleeve and wall for dry wall construction.
 2. Provide intumescent insert (Specified Technologies, Inc. Series EP Powershield Firestop Insert, or approved equivalent) in all electrical switch, outlet and junction boxes installed in a fire rated wall assembly. All boxes installed in such locations shall be galvanized steel and equipped with a metallic cover plate.
 3. The minimum required fire resistance ratings of the wall or floor assembly shall be maintained by the fire-stop system. The installation shall provide an air and watertight seal.
 4. The methods used shall incorporate qualities that permit the easy removal or addition of electrical conduits or cables without drilling or use of special tools. The product shall adhere to itself to allow repairs to be made with the same material and permit the vibration, expansion and/or contraction of any items passing through the penetration without cracking, crumbling and resulting reduction in fire rating.
 5. Provide rigid steel sleeves where non-armored cables pass through fire rated walls and barriers.
- B. Metal Pipe Through Sleeves in Concrete or Block
1. Floor or Wall Assembly:
 - a) Minimum 4 ½" thick lightweight or normal weight concrete floor or wall.
 - b) U.L classified concrete block wall (minimum 8" block)
 2. Penetrating Item to be one of the following:
 - a) Maximum 30" diameter steel pipe.
 - b) Maximum 6" nominal diameter copper pipe.
 - c) Maximum 6" nominal diameter steel conduit.
 - d) Maximum 4" nominal diameter EMT.
 3. Optional: Maximum 32" diameter steel pipe sleeve (Schedule 10 or heavier).
 4. Minimum 4" thickness mineral wool (min. 4 PCF density) recessed ¼" from top of sleeve.

5. Minimum ¼" depth high performance Intumescent firestop sealant.
 6. A generous bead of high performance Intumescent firestop sealant around outer perimeter of steel sleeve.
 7. Firestop sealant required on each side of wall assembly.
 8. Maximum diameter of opening shall be 32".
- C. One or More Cables Through Concrete or Block:
1. Floor or Wall Assembly:
 - a) Lightweight or normal weight concrete floor or wall (min. 2 ½" thick).
 - b) Any UL classified concrete block.
 2. Maximum 4" Diameter cable bundle to a combination of the following:
 - a) Maximum 300 Pair telephone cables with PVC jacket.
 - b) Maximum 500 KCM power cable with PVC jacket.
 - c) Maximum 7/C No. 8 AWG power cable with PVC jacket.
 - d) Maximum (24 Fiber) ½" diameter fiber-optic cable.
 3. Optional: Maximum 6" nominal diameter steel pipe sleeve (Schedule 40 or heavier).
 4. Minimum 2" thickness mineral wool (minimum 4 PCF density) tightly packed.
 5. Minimum ½" depth high performance Intumescent firestop sealant.
 6. Walls shall require ½" depth high performance Intumescent firestop sealant flush with sides.
 7. Cables shall fill minimum 20% to maximum 33% of area opening.
 8. Maximum diameter of opening shall be 6 5/8".
- D. Multiple Penetrating Items through Concrete Wall or Floor:
1. Concrete floor or wall assembly (minimum 4 ½" thick).
 2. Maximum 18"x6" aluminum or steel open ladder cable tray.
 3. Any of the following types of cable may be used with cable tray:
 - a) Maximum 350KCM single conductor power cables.
 - b) 7/C No. 12 AWG Copper conductor cables.
 - c) Maximum 100 Pair No. 24 AWG telephone cables.
 4. Penetrating item to be any one of the following: Max. 4" diameter steel or

copper pipe, steel, conduit, or EMT with 1 ½" glass-fiber pipe insulation.

5. Penetrating item to be any one of the following: Max. 6" diameter steel pipe of steel conduit, or maximum 4" diameter EMT.
6. Maximum 2" diameter cable bundle to include the following:
 - a) Fiber-optic cable (maximum ½" diameter).
 - b) Romex (2/C No. 10+GND).
 - c) 25 Pair No. 24 AWG telephone cables.
 - d) 7/C No. 12 AWG Cables.
 - e) RG 62A Coaxial cables.
 - f) Metal-clad cable (maximum ¾" diameter).
 - g) Provide firestop brick (2" thick x 8' wide x 5" deep).
 - h) Install high performance Intumescent firestop sealant in any void that may exist around cable tray, cables, or pipe penetrations.
 - i) Maximum area of cables shall be 30% of cross-sectional area of the cable tray.

E. Metal Pipe Through Gypsum Wall Assembly:

1. Gypsum wall assembly (1Hr or 2 Hr fire rating).
2. Penetrating item to be one of the following:
 - a) Maximum 30" diameter steel pipe (Schedule 10 or heavier).
 - b) Maximum 6" diameter copper pipe.
 - c) Maximum 6" diameter steel conduit.
 - d) Maximum 4" diameter steel EMT.
3. High performance Intumescent firestop sealant:
 - a) Minimum 5/8" depth of sealant for 1 Hr fire rating.
 - b) Minimum 1 ¼" depth of sealant for 2 Hr fire rating.
4. Minimum ½" bead high performance firestop sealant at point of contact.

F. Cable Bundle Through 1 Hr or 2 Hr Fire-rated Gypsum Wall:

1. Gypsum wall assembly (1Hr or 2 Hr fire rating).
2. Cable bundle to consist of any of the following:
 - a) 7/C No. 12 AWG cables.
 - b) 12 Pair 24 AWG phone cables.
 - c) 25 Pair 24 AWG phone cables.
 - d) RG59 Coaxial cables.
 - e) 2/C + GND No. 14 AWG Metal-clad cables.
 - f) 2/C No. 8 AWG Metal-clad cables.
 - g) Maximum ½" diameter Fiber-optic cables.
3. Optional: Maximum 4" nominal diameter steel pipe sleeve (Schedule 40 or

thinner).

4. High performance Intumescent firestop sealant:
 - a) Minimum 5/8" depth of sealant for 1 Hr fire-rating.
 - b) Minimum 1 1/4" depth of sealant for 2 Hr fire-rating.
5. Maximum diameter of opening shall be 4 1/2".
6. Cables to fill maximum 33% of area of opening.
7. Annular Space = Minimum 1/4", Maximum 3/4".
8. Steel sleeve may be flush with wall surface or extend up to 18" beyond wall surface in any combination. When sleeve is flush with wall, apply firestop sealant onto wall surface. When sleeve is extended beyond one or both sides of wall, apply 1/2" firestop sealant to wall/sleeve interface.

G. Multiple Metal Pipe and Cable Through 2 Hr Gypsum Wall:

1. Gypsum wall assembly (2 Hr fire-rating).
2. Maximum 3" diameter EMT.
3. Maximum 25 pair No. 24 AWG (or smaller) telephone cables.
4. Maximum 3/C No. 10 AWG NM (with ground) power cable with PVC insulation.
5. Maximum 300 KCM (or smaller) power cable with PVC insulation and nylon jacket.
6. Maximum 2" diameter steel pipe, copper pipe, EMT, or steel conduit.
7. No. 8 steel wire mesh, 4 3/4" long (or standard metal drywall track screwed securely in place) centered in opening.
8. Minimum 4" thickness mineral wool (minimum 4 PCF density) tightly packed.
9. Minimum 1/2" depth high performance intumescent firestop sealant.
10. Maximum area of opening shall be 96 inches with a maximum dimension of 12".
11. Distance between items shall be a minimum of 1/2" and maximum of 7".
12. Distance from the edge of opening shall be a minimum of 1/2" and maximum of 7".

H. Multiple Penetrations Through 1 Hr or 2 Hr Gypsum Wall:

1. Gypsum wall assembly (1 Hr and 2 Hr Fire Rating).
2. Steel or Aluminum cable tray (maximum size: 18"x6").
3. Any of the following types of cable may be used with maximum 30% fill on the cable tray:
 - a) 500kcmil single conductor cable.
 - b) 7/C No. 12 AWG copper conductor cable.
 - c) 300 Pair No. 24 AWG Telephone Cable.

4. Maximum 3" diameter PVC plastic pipe (Schedule 40)(Closed or venting piping system).
5. Cable bundle (Maximum 2" diameter) to consist of any of the following:
 - a) Fiber Optic Cable
 - b) RG59 Coaxial Cable
 - c) 25 Pair No. 24 AWG Telephone Cable
 - d) 7/C No. 12 AWG Copper Conductor.
6. Firestop bricks (2"x5"x8" deep)
7. Penetrating items may also include a maximum 4" diameter steel or copper pipe, EMT, or steel conduit with a maximum 1 1/2" glass-fiber pipe insulation or non-insulated maximum 4" steel pipe, EMT, or conduit.
8. Annular space shall be minimum of 1".
9. Install high performance intumescent firestop sealant in any void that may exist (around penetrating items or between blocks).

3.4 BOXES AND CABINETS

- A. Consider location of outlets shown on drawings as approximate only. Study architectural, process piping, mechanical, plumbing, structural, roughing-in, etc., drawings and note surrounding areas in which each outlet is to be located. Locate outlet so that when fixtures, motors, cabinets, equipment, etc., are placed in position, outlet will serve its desired purpose. Where conflicts are noted between drawings, contact Owner's Representative for decision prior to installation. Comply with Article 314 of National Electrical Code relative to position of outlet boxes in finished ceilings and walls.
- B. Outlet boxes in separate rooms shall not be installed "back-to-back" without the approval of the Owner's Representative.
- C. Outlet boxes shall be sized to accommodate the wiring device(s) to be installed.
- D. Outlet boxes installed in plaster, gypsum board or wood paneled walls shall be installed with raised plaster covers or raised tile covers.
- E. Outlet boxes installed in tile, brick or concrete block walls shall be installed with extra-deep type raised tile covers or shall be 3-1/2" deep boxes with square corners and dimensions to accommodate conductors installed.
- F. Surface ceiling mounted outlet boxes shall be minimum 4" square, 1-1/2" deep, galvanized sheet metal.
- G. Surface wall mounted outlet boxes shall be cast type boxes having threaded hubs. Exterior boxes shall be cast type with threaded hubs and gasketed cover plates secured by non-ferrous screws.
- H. Floor outlet boxes shall be installed flush with finished floor, adjust level and tilt as

required. Where finished floor is terrazzo, provide boxes specifically designed for installation in terrazzo. Where floors are to receive carpet, provide floor outlet with carpet flange.

- I. Install junction and pull boxes in readily accessible locations. Access to boxes shall not be blocked by equipment, piping, ducts and the like. Provide all necessary junction or pull boxes required due to field conditions and size as required by the National Electrical Code.

3.5 OUTLET BOX ROUGH-IN HEIGHTS:

- A. Unless otherwise noted, mount devices and equipment at heights measured from finished floor to device/equipment centerline as follows:

1.	Toggle switches	46"
2.	Receptacle outlets	18"
3.	Receptacle outlets, above <u>hot water</u> or <u>steam</u> baseboard heaters.	30"
	NOTE: Do not install receptacle outlets above electric baseboard heaters.	
4.	Receptacle outlets, hazardous areas	48"
5.	Receptacle outlets, weatherproof, above-grade	24"
6.	Clock outlets	90"
7.	Telephone outlets	18"
8.	Telephone outlets, wall mounted	46"
9.	T.V. outlet	18"
10.	Fire alarm manual pull station	46"
11.	Fire alarm audio/visual, to bottom of device	80"
12.	Branch circuit panelboards, to top of backbox	72"
13.	Distribution panelboards, to top of backbox	72"
14.	Terminal cabinets, control cabinets	72"
15.	Disconnect switches, motor starters, enclosed circuit breakers	60"
16.	Where structural or other interference's prevent compliance with mounting heights listed above, consult Owner's Representative for approval to change location before installation.	

3.6 EQUIPMENT PADS, BASES AND SUPPORTING DEVICES

- A. Hangers and Supports:
 1. Provide steel angles, channels and other materials necessary for the proper support and erection of motor starters, distribution panelboards, disconnect switches, pendant-mounted lighting fixtures, etc.
 2. Panelboards, cabinets, large pull boxes, cable support boxes and starters shall be secured to ceiling and floor slab and not supported from conduits. Small panelboards, etc., as approved by Owner's Representative, may be supported on walls. Racks for support of conduit and heavy electrical equipment shall be secured to building construction by substantial structural supports.
 3. Provide concrete bases for all floor mounted equipment. Provide 3,000 lb. concrete, chamfer edges, trowel finish, securely bond to floor by

roughening slab and coating with cement grout. Bases 3 1/2" high; shape and size to accommodate equipment, allowing 6" clear on all access sides of equipment. Set anchor bolts in sleeves before pouring and after anchoring and leveling, fill equipment bases with grout.

3.7 IDENTIFICATION

- A. Provide engraved lamicoid identification nameplates on main switchboard and on all panelboards using designation shown in panelboard schedule, or as provided by owner.
- B. Provide engraved lamicoid identification nameplates for each circuit breaker in the main distribution panel listing the panelboard or equipment connected to each device.
- C. Provide engraved lamicoid identification nameplate on individual circuit breaker enclosures, motor starters and disconnect switches, listing the equipment connected to the particular device, feeder panelboard and feeder circuit number.
- D. Provide complete type written directory for each panelboard listing room number, function, etc, for each circuit breaker. Provide type written updated panelboard directories for existing panelboards affected by this work.
- E. Nameplates shall be engraved black, with white core, with Helvetica medium 3/16" lettering. 1/8" lettering is acceptable where space for 3/16" is not available.
- F. Identify junction and pullboxes for particular service such as power, lighting, fire alarm, telephone, intercom, public address, nurse call, etc. using stencil lettering on cover.
- G. Using permanent means label all receptacle and switch coverplates, power poles, etc. listing panel designation and circuit number. Label shall be attached to inside of receptacle or switch coverplates. Dymo tape is not acceptable.

3.8 FLASHING AND SEALING

- A. Opening through roofs shall be flashed in manner not to affect roof guarantee or bond. Engage qualified Roofing Contractor licensed by the Roofing Manufacturer, as part of contract. Provide non-ferrous flashing pieces, skirts, hoods and collars as required to make ducts, pipes, conduits, and other penetrations watertight. Where curbs are called for with respect to rectangular openings in new roofs, flashing will be done by others unless specifically indicated otherwise. Caulk and waterproof with additional material so as to seal airtight and watertight.

3.9 CUTTING AND PATCHING

- A. Perform cutting, fitting and patching electrical equipment in all following cases:
 - 1. To uncover work for installation of poorly coordinated or ill-timed electrical work.

2. To remove and replace defective work.
 3. To remove and replace work not conforming to requirements of the Contract Documents.
 4. Remove samples of installed work as specified for testing.
 5. Install equipment and materials in existing structures.
 6. Cut, remove and legally dispose of all electrical equipment, components, and materials as called for and all other items not indicated on plans but made obsolete by the installation of new work.
 7. Protect the structure, furnishings, finishes and adjacent materials not being removed and maintain temporary
- B. All patching shall restore cut sections to match existing surrounding conditions, including fire rating.

END OF SECTION

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