KAISER PERMANENTE LARGO MEDICAL CENTER RESTACK
MEDICAL OFFICE BUILDING
LARGO, MARYLAND

SECTION 27 05 33

CONDUITS, PULLBOXES AND BACKBOXES FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Applicable requirements of Division 27 - Communications shall be considered a part of this section and shall have the same force as if printed herein full.

B. This document describes the products and execution requirements relating to Conduits, Pull boxes and Backboxes for Communications Systems.

C. Product specifications, general design considerations, and installation guidelines are provided in this document. The successful vendor shall meet or exceed all requirements described in this document and on the drawings.

1.02 QUALITY ASSURANCE

A. Refer to Section 27 05 00 for requirements that shall be fulfilled as part of this specification section.

1.03 SUBMITTALS

A. Refer to Section 27 05 00 for requirements that shall be fulfilled as part of this specification section.

1.04 WORK INCLUDED

A. Refer to Section 27 05 00 for requirements that shall be fulfilled as part of this specification section.

PART 2 - PRODUCTS

2.01 CONDUIT

A. Rigid Steel Conduit
   1. Acceptable manufacturers:
      a. Allied Tube and Conduit
      b. Cal Pipe Industries
      c. Wheatland Tube Company
      d. Or approved equal
   2. Rigid steel conduit shall be hot dipped galvanized inside and outside conforming to ANSI and UL. Conduit shall have standard threaded type couplings and fittings.
   3. Threads on the uncoupled ends shall be covered by industry color-coded thread protectors.
   4. Teflon tape shall be used on all galvanized rigid steel conduit thread joints.

B. Electrical Metallic Tubing (EMT)
   1. Acceptable EMT conduit and fitting manufacturers:
      a. Allied Tube and Conduit
      b. Cal Pipe Industries
      c. Wheatland Tube Company
      d. Thomas & Betts
      e. Steel City
      f. Or Approved Equal
   2. EMT shall be hot galvanized steel O.D. with an organic corrosion resistant I.D. coating, and shall be listed and manufactured in accordance with UL Safety Standard 797 and ANSI C80.3.
   3. Electrical metallic tubing (EMT), couplings and connectors shall be steel. Malleable iron, pressure-cast or die-cast fittings are not permitted.
   4. Fittings for 2" EMT and smaller shall be steel set screw type, except where otherwise noted. Fittings for 2.5" and larger shall be steel set screw type with two (2) screws for connectors and four (4) screws for couplings. All connectors shall be insulated throat type.

C. Smart Conduit Body™
   1. Acceptable manufacturers:
      a. Madison Electric Products
      b. No exceptions
   2. Construction:
      a. Die-cast Aluminum
   3. Product shall be manufactured with internal bend radius to maintain minimum bend requirements of category cable and/or fiber optic cable.
   4. Size: Use with ¾”, 1”, 1-1/4”, 1-1/2” conduit sizes only.
   5. Installation: Accessible locations only where typical 6:1 bend radius cannot be achieved.
   6. Provide gasketed cover for wet locations.
   7. Rating: Plenum, Riser, General Purpose
   8. Compliance: UL/cUL, CSAUS/CSA, NEC 770 and 800, BICSI TDMM

D. Conduit Support
   1. Acceptable manufacturers:
      a. B-line
      b. Unistrut
      c. Or approved equal
   2. Supporting devices: Strut trapeze assemblies sized for the amount of conduit to be supported with minimum 3/8” threaded rods, clamps, conduit straps, C-clamps and retainers.
   3. Provide fittings and accessories that match with the strut of the same manufacturer.

2.02 METALLIC BACKBOXES

A. Acceptable manufacturers:
   1. Randl Industries
   2. Or Approved Equal

B. Provide 4-11/16” H X 4-11/16” W X 2-7/8” D outlet back boxes at all communications outlet locations shown on drawings.

C. Metallic outlet boxes and device covers shall be galvanized steel not less than 1/16" thick.

D. Provide single gang plaster ring on all communications outlet back boxes, unless indicated otherwise.

E. Plaster ring on all communications outlet back boxes shall be raised to compensate for the thickness of the wall finish.

F. Provide (1) 1” conduit from back box to accessible ceiling, cable tray, or nearest telecommunications room except as otherwise noted. Provide bushing on ends of all conduits.

G. Provide pull string in all conduits.

H. All connectors and couplings shall be zinc-plated steel set screw type.

I. Blank coverplates shall be provided for all metallic backboxes slated for future use.

J. Blank coverplates shall be provided for all locations where surface mount outlet housings will be located inside metallic backboxes.

2.03 PULL BOXES

A. Acceptable manufacturers:
1. B-line
2. Hoffman
3. Or Approved Equal

B. Indoor NEMA Type 1:
1. Enclosure and cover are fabricated from galvanized steel
2. Enclosure body has mounting holes on the back
3. Enclosures are available with knockouts on the sides, top and bottom ends
4. Cover is secured to the body with plated screws
5. Keyhole slots provided in the cover allow easy access to the inside without removing the screws
6. #10-32 tapped hole provision for ground lug kit
7. Gray acrylic electro coat finish inside and out.

C. Indoor/Outdoor NEMA Type 3R (IP66 rated) pull box for protection against windblown dust, rain, sleet, external ice formation and dripping noncorrosive liquids:
1. Enclosure and cover are fabricated from code gauge G-90 grade galvanized steel
2. All continuous welded seams are finished smooth
3. Cover is attached with gasket screws
4. Cover has a fixed, oil and water resistant gasket
5. #10-32 tapped hole provision for ground lug kit.

D. Pull boxes to be sized per BICSI TDMM requirements to accommodate the number of EMT conduits as shown on drawings with adequate clearances, access and cable management space.

E. Pull boxes shall have provisions for grounding.

PART 3 - EXECUTION

3.01 APPLICATION OF RACEWAYS

A. Rigid Steel Conduit:
   1. Where exposed to physical damage.
   2. Indoors where exposed to moisture.
   3. Where required by code.
   4. Exposed indoor installations within ten feet above finished floor.
   5. Exposed outdoor installations.

B. Electrical Metallic Tubing:
   1. General purpose devices, except where another conduit type is specifically required.
   2. Exposed indoor installations below ten feet above finished floor.

3.02 CONCRETE PENETRATIONS

A. Holes through concrete and masonry in new and existing structures shall be cut with a diamond core drill or concrete saw upon approval of the structural engineer of record for the project. Pneumatic hammer, impact electric, hand or manual hammer type drills shall not be allowed, except where permitted by the Project Manager as required by limited working space. X-ray all floor penetrations accordingly.

B. Holes shall be located so as not to affect structural sections such as re-bar or beams.

C. Openings through structural bearing walls, fire partitions, fire walls or walls and floors shall be laid out in advance and fully coordinated with other trades.

D. Fire rated penetrations: Where openings pass through fire partitions, fire walls or walls and floors provide a code compliant effective barrier against the spread of fire, smoke and gases.

E. No gaps or rough edges shall be allowed between concrete wall or slab and conduit/sleeve.

3.03 CONDUIT INSTALLATION

A. Conduits for Cat.5e/Cat.6/Cat.6A cable shall not exceed a total length that would prevent that cabling to exceed a total length of 295-ft (90m).

B. Install individual and multiple trapeze hangers and riser clamps as necessary to support the conduits. Provide U-bolts, clamp attachments and other necessary hardware for hanger assemblies and for securing hanger rods and conduits. Space supports for conduits on maximum 10-foot centers. Support individual conduits 1-1/2 inch and smaller with 1/4 inch threaded steel rods and use 3/8 inch rods for 2 inch and larger.

C. Conceal all conduits, except in unfinished spaces such as equipment rooms or as indicated by symbol on the Drawings.

D. Conduits shall be clearly labeled at both ends designating the opposite locations(s) served. The numbering scheme shall be room number plus a suffix to guarantee uniqueness, e.g., 143-1. Labeling must be machine generated.

E. Leave all empty conduits with a 200-pound test nylon cord pull line.

F. Flattened, dented, or deformed conduits are not permitted and shall be removed and replaced.

G. Conduit shall be run parallel or at right angles to walls, ceilings, and structural members.

H. Provide appropriate fittings, flex conduit with slack for minimum movement as required and any expansion and deflection couplings needed where conduit passes over a building expansion joint.

I. Communications cables shall not occupy conduits with power cables.

J. Metallic conduits shall be grounded in accordance with ANSI/TIA-607-B and the NEC.

K. Article 344 of the National Electrical Code® (NEC) Rigid metal conduit (RMC) shall be used for entrance conduits that exceed 50-feet into the building.

L. Bond conduits to cable tray sections where conduits terminate to meet up with cable tray sections. Provide grounding and bonding for conduits and pull boxes as indicated by NEC code and instructed by manufacturer.

M. Conduit installations within concrete walls or floor slabs:
1. Conduit shall be run following the most direct route between points.
2. Conduit shall not be installed in concrete where the outside diameter is larger than 1/3 of the slab thickness.
3. Conduits shall not be installed within shear walls unless specifically indicated on the Drawings. Conduit shall not be run directly below and parallel with load bearing walls.
4. Protect each metallic conduit installed in concrete wall or slab or conduits 1-1/2 inch and smaller passing through a concrete slab against corrosion where conduit enters and leaves concrete by wrapping conduit with vinyl all-weather electrical tape.
5. Protect all conduits entering and leaving concrete walls or floor slabs from physical damage during construction.

N. Conduit routing, bends and radius guidelines
1. If the conduit has an internal diameter of 2 inches or less the bend radius must be at least 6 times the internal conduit diameter.
2. If the conduit has an internal diameter of more than 2 inches the bend radius must be at least 10 times the internal conduit diameter.

3. Conduit bends should be smooth, even, and free of kinks or other discontinuities that may have detrimental effects on pulling tension or cable integrity during or after installation.
4. Communications conduit system shall contain no condulets (also known as an LB) unless approved SmartLB or EZ LB.
5. If a conduit run requires more than two 90 degree bends then provide a pull box between sections with two bends or less.
6. If a conduit run requires a reverse bend (between 100 degrees and 180 degrees) then insert a pull point or pull box at each bend having an angle from 100 degrees to 180 degrees.
7. Consider an offset as equivalent to a 90 degree bend.
8. Achieve the best direct route with no bend greater than 90 degrees or an aggregate of bends in excess of 180 degrees between pull points or pull boxes.
9. Contain no continuous sections longer than 100 ft.
10. For runs that total more than 100 ft. in length, pull points or pull boxes should be inserted so that no segment between points/boxes exceeds the 100 ft. limit.
11. Rated to withstand the environment to which they will be exposed.
12. Conduits should not be routed through areas in which flammable material may be stored or over or adjacent to boilers, incinerators, hot-water lines and steam lines.
13. Keep conduits at least 6’ away from parallel runs of steam, hot water pipes or mechanical ductwork.
14. Provide firestopping according to UL-listing in openings between conduits and fire-rated floors or walls.
15. Label conduits with permanent, printed labels every 30-feet.
16. Provide a Greenlee 39244 3/8” high-strength measuring tape in each conduit.
17. Provide Hilti CFL-PL 4” Fire Stop Plugs at both ends of each conduit.

O. Conduit termination guidelines
1. Join conduits with fittings designed and approved for the purpose. Make the joints tight without protruding lips that can snag cable pulling inside the conduits.
2. Where conduits are terminated with locknuts and bushings align the conduit to enter squarely and install the locknuts with dished part against the box. Use two locknuts, one inside and one outside the box.
3. Ream all conduit ends and fit them with an insulated bushing to eliminate sharp edges that can damage cables during installation or service.
4. Conduits that enter a telecom room should terminate near the corners to allow for proper cable racking.
5. Terminate conduits penetrations through the floor slabs a minimum of 3-inches above the surface.

P. Conduit protection guidelines
1. Remove burrs, dirt and construction debris from conduits and pull boxes.
2. Conduits should be left capped for protection.
3. Provide final protection and maintain conditions in a manner acceptable to the Owners Representative to ensure that coatings and finishes are without damage or deterioration at completion. Repair damage to galvanized finishes with zinc-rich paint recommended by the manufacturer.

3.04 BACK BOXES

A. Exact locations of the outlet boxes shall be coordinated with the architectural drawings and other trades.

B. The approximate locations of the outlets are indicated on the Drawings. The exact locations shall be determined on site. The right is reserved to change, without additional cost, the exact location of any outlet, a maximum of 10' before it is permanently installed.

C. Orientation of outlet boxes (horizontal or vertical) shall be as indicated on the architectural elevations.

D. Install all outlet boxes in finished areas flush with the wall.

E. Outlet boxes shall be firmly anchored in place and shall not depend on the coverplate to hold it secure to the wall.

F. Outlet boxes installed back-to-back in fire-rated walls shall be separated horizontally by a minimum of 24".

3.05 PULL BOXES

A. Pull box support guidelines:
1. Secure pull boxes independent of the conduit entries into the box.
2. Pull boxes shall be secured to the building structure.
3. Structural braces and/or reinforcements are to be attached directly to structural framework and secondary structural members; do not attach braces and/or reinforcements to elements other than structural framework and secondary structural members.
4. Pull boxes shall not be supported with ceiling wires.
5. Install pull boxes level and square at proper elevations.

B. Conduits entering pull box guidelines:
1. Conduits entering pull boxes shall connect to pull boxes using die-cast zinc connectors.
2. Conduits should enter the pull boxes on the opposite short ends of a rectangular pull box.
3. Conduits that enter the pull box from opposite ends with each other should be aligned.
4. A pull box should not be used in lieu of a conduit bend.

C. Install pull boxes in easily accessible locations at heights to provide access to pull boxes for cable access. Ensure adequate working clearances and cable management.

D. Install pull boxes above suspended ceilings with no obstructions between the opening of the pull box and the ceiling system.

E. For direct access to a pull box located above inaccessible ceilings provide a suitable, marked, hinged access panel (or equivalent) in the ceiling. Access panel shall be submitted for approval by architect and engineer.

F. Pull boxes should be rated to withstand the environment to which they will be exposed.

G. Pull boxes shall be free from burrs, dirt and debris.

H. Pull boxes shall be installed in accordance with ANSI/TIA-569-B.

I. Pull boxes shall be grounded in accordance with ANSI/TIA-607-B.

J. Table for pull box sizing:

Conduit Trade Size (in.)	Pull box Width (in.)	Pull box Length (in.)	Pull box Depth (in.)	Increase for Additional Conduit (in.)
1	4	16	3	2
1 ¼	6	20	3	3
1 ½	8	27	4	4
2	8	36	4	5
2 ½	10	42	5	6
3	12	48	5	6
3 ½	12	54	6	6
4	15	60	8	8

3.06 CLOSEOUT AND ACCEPTANCE

A. No additional burden to the Owner regarding costs, network down-time and/or end user interruption shall result from the re-installation of specified components. Scheduling for reinstallation work shall be coordinated, in writing, with the Owner prior to beginning the work.

B. All specified Communications systems indicated on the drawings and specifications shall be complete.

C. Specified shop drawings and product submittals shall have been submitted for review and all review comments and deficiencies shall have been resolved. Final shop drawings and product submittals shall have been submitted, reviewed and found to meet the requirements of the specifications.

D. Issues and deficiencies identified in field reports and punch lists shall have been resolved. Final as-built drawings shall have been submitted, reviewed and found to meet the requirements of the specifications.

E. Contractor shall provide written notice of final completion of the telecom infrastructure. Upon receipt, the Owner’s Representative will review/observe the completed installation. Once the Owner’s Representative is satisfied that all work is in accordance with the Contract Documents, the Contractor will be notified in writing.

END OF SECTION