

SECTION 28 05 33

PATHWAYS FOR SECURITY SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section and Associated Drawings identify the Requirements, Technical Design, and Specifications for the Pathways for Security Systems for the 2025 Access Control Upgrades, located in Pflugerville ISD, ("Owner").
- B. The conduit and backboxes shall be in compliance with TIA-569 and the latest version of the NFPA 70 (NEC), with local amendments, and shall include all components needed to ensure proper system performance and code compliance as specified.
- C. Contractor shall include materials, equipment, and labor necessary to provide a complete and functional conduit system regardless of any items not listed or described in this Specification or Associated Drawings.

1.2 RELATED SECTIONS

- A. The Drawings, Specifications, General Conditions, Supplementary General Conditions, and other requirements of Division(s) 0 and 1 apply to the work specified in Division 28 and shall be complied with in every respect. The Contractor shall examine all the items which make up the Contract Documents and shall coordinate them with the work on the project.

1.3 QUALITY ASSURANCE

- A. Contractor Qualifications
 - 1. Subcontractors shall be identified at the time of bid and comply with the requirements and intentions of these specifications, associated drawings, and related contract documents.

1.4 COORDINATION

- A. Coordination with other Divisions and Sections
 - 1. Division 26 Electrical
- B. Preinstallation Meeting / Coordination with Owner
 - 1. After Bid and before Pre-Construction Submittals, request a Preinstallation Meeting with General Contractor, Consultant, and Owner regarding Work specified in this Section. This meeting is meant to:
 - a. Review Scope of work, schedule, and escalation procedures.
 - b. Establish Owner's preferences and expectations and provide direction for items noted as "Coordinate with Owner."
 - 2. Contractor shall document the meeting and send Meeting Minutes to Owner and Consultant for sign-off.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. For devices and equipment with no part number specified, submit product cutsheet for a product that meets the performance requirements of these specifications, industry standard practices, and intended application.
- B. All conduit, backboxes, equipment, and installation materials shall be new and of the highest quality.
- C. Labels on all conduit, backboxes, materials, and equipment must indicate a Nationally Recognized Testing Laboratory.

2.2 CONDUIT AND ACCESSORIES

- A. Schedule 40 and 80 PVC Conduit
 - 1. Listing: UL651
 - 2. Standard: NEMA TC-2
 - 3. Special: Sunlight Resistant
 - 4. Sizes: .5"-4"
 - 5. Approved Manufacturers:
 - a. Allied Tube and Conduit
 - b. Or Approved Equal
- B. Surface Mounted Raceway
 - 1. Material: Metallic
 - 2. Color: White
 - 3. Standard Length: 10'
 - 4. Accessories:
 - a. Tee Fittings
 - b. Junction Boxes – Single Gang/Double Gang
 - c. Elbows
 - d. Mounting Strap
 - e. Bushing
 - 5. Approved Manufacturers
 - a. Hubbell
 - b. Legrand
 - c. Or Approved Equal

2.3 ABOVE CEILING PATHWAYS

- A. J-Hooks
 - 1. Shall be listed as meeting UL 2239 requirements
 - 2. Plenum-rated
 - 3. Shall be designed and equipped with accessories (if needed) to be supported by the following methods:
 - a. Threaded rod from structure
 - b. Wall-mounted to concrete/CMU walls or wood or metal studs
 - c. Beam clamps
 - d. Optional "multi-tiered" mounting to bottom of J-hook
 - e. Optional Fastener to raised floor pedestal
 - 4. Equipped with retainer or strap over top of J-hook once cables are installed

5. Sized to support quantity of installed cables, plus 25% spare capacity
6. Approved Manufacturers:
 - a. Caddy
 - b. Panduit PanNet
 - c. Tomarco Series 200
 - d. Or Approved Equal

B. Hook & Loop Straps

1. Plenum-rated
2. Velcro construction with hook/loop strap
3. Color: black
4. Approved Manufacturers:
 - a. Panduit Tak-Ty Plenum Ties
 - b. VELCRO ONE-WRAP
 - c. Or Approved Equal

2.4 BOXES AND ACCESSORIES

A. Security Backboxes

1. Shall be steel
2. Shall be a minimum of 3 ¼" Deep
3. Shall have minimum (2) 1" knockouts
4. Shall have integral grounding screws
5. Approved Manufacturers:
 - a. Raco
 - b. Or Approved Equal

B. Security Junction Box

1. Shall be a minimum of 4" W x 4" H x 4.3 D
2. Shall be NEMA 1 and IP30 Rated
3. Shall have a minimum thickness of 16GA for the Body/Cover
4. Shall have a minimum of (1) 1" connector and (2) 3/4" connectors
5. Approved Manufacturers:
 - a. Hoffman
 - b. Altronix
 - c. Or Approved Equal

2.5 FIRE-STOPPING

A. Rated Penetrations

1. Gyp or Stud Walls
 - a. Shall be F/T Rated to match penetrated wall
 - b. Shall meet ASTM E814 (UL1479)
 - c. Approved Manufacturers:
 - 1) Specified Technologies – UL System No. W-L-1222
 - 2) Or Approved Equal
2. Concrete
 - a. Shall be F/T Rated to match penetrated wall
 - b. Shall meet UL ASTM E814
 - c. Approved Manufacturers:
 - 1) Specified Technologies – UL System No. C-AJ-1353
 - 2) Or Approved Equal

3. Backboxes
 - a. Shall be F/T Rated to match penetrated wall
 - b. Shall meet ASTM E814 (UL1479)
 - c. STC sound rating – 64 or higher (related to specific construction)
 - d. Approved Manufacturers:
 - 1) Specified Technologies – SpecSeal Power Shield
 - 2) Or Approved Equal
- B. Non-Rated Penetrations
 1. Gyp or Stud Wall Sealant
 - a. Shall be F/T Rated to match penetrated wall
 - b. Shall meet ASTM E84
 - c. STC sound rating – 62 or higher (related to specific construction)
 - d. Approved Manufacturers:
 - 1) Specified Technologies – SpecSeal Smoke 'N' Sound
 - 2) Or Approved Equal
 2. Exterior Device Sealants
 - a. Shall be UL Listed
 - b. Strength: 350psi
 - c. Rating: STC44
 - d. Approved Manufacturers:
 - 1) Masterseal NP1
 - 2) Or Approved Equal

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

- A. Contractor shall comply with the requirements of local Authority Having Jurisdiction (AHJ), State of Texas, the National Fire Protection Association (NFPA), and the National Electrical Code (NEC). If the Contractor identifies any item in the plans or specifications that will not strictly comply with the laws, ordinances, and rules; the matter shall be referred to the Consultant for direction before proceeding with that part of the work.
- B. The Contractor shall install the materials in accordance with these specifications and the manufacturer's installation guidelines.
- C. No deviations from the plans or specifications shall be made without full consent in writing of the Consultant. The Contractor shall have written approval from the Consultant for any additional work beyond the Contract Documents prior to beginning such work. If the Contractor does not obtain written approval from the Consultant prior to proceeding with the work, the contractor shall not be reimbursed for the work.

3.2 SYSTEM REQUIREMENTS

- A. Conduit and Sleeves
 1. The minimum size conduit that shall be allowed will be 1-inch.
 2. EMT Conduit shall be used for all interior installations.
 3. Minimum of Schedule-40 PVC conduit shall only be installed in concrete or exterior of the building to include in slab, under slab, etc.
 4. Conduit shall be sized as indicated on the drawings. If no conduit size is indicated, then they shall be sized per TIA-569.

5. Conduits shall not have more than the equivalent of (2) 90-degree bends or 180 degrees without the installation of a pull-box or hand hole.
6. For Interior Installations – conduits shall have a pull-box installed when the conduit exceeds 100 feet.
7. For Exterior Installations – conduits shall have a hand hole or vault installed when the conduit exceeds 450 feet.
8. All conduits and sleeves shall be reamed after cutting to ensure there are no sharp edges or burrs on the conduit that could damage the cable.
9. All conduits and sleeves shall have a nylon bushing installed on the open end of the conduit.
10. Conduits and sleeves shall not be shared with any other discipline unless specifically approved in writing by the Consultant.
11. Contractor is responsible for field coordination to ensure conduits and sleeves are separated from electrical conduits, and steam or hot water pipes.
12. Unless indicated otherwise, all conduits shall be concealed under or within floor slabs, within finished walls, or above ceilings.
13. All conduits shall be installed parallel with or at right angles to ceilings, walls, and structural members.
14. Restrictions Applicable to EMT
 - a. Do not install underground.
 - b. Do not encase in concrete, mortar, grout, or other cementitious materials.
 - c. Do not use in areas subject to severe physical damage including but not limited to equipment rooms and parking garages where moving or replacing equipment could physically damage the EMT.
 - 1) In those locations, provide IMC or RMC.
 - d. Do not use outdoors.
15. Restrictions Applicable to PVC
 - a. Do not install in the interior of a building.
 - b. Do not install in plenum spaces.
 - c. PVC conduit shall be Schedule 40 or 80 as indicated on the technology drawings.
 - d. Convert nonmetallic conduit to plastic-coated rigid before rising through floor slab. Plastic coating shall extend maximum of 4 inches above floor.
16. Install and ground in accordance with NFPA 70 and TIA-569. In addition, bond conduit in accordance with TIA 607.
17. Conduit Through Floor Slabs - Where conduits rise through floor slabs, curved portion of bends shall not be visible above finished slab.
18. Directional Changes in Conduit Runs
 - a. Make changes in direction of runs with symmetrical bends.
 - b. Make field-made bends and offsets with hickey or conduit-bending machine. Do not install crushed or deformed conduits.
 - c. Prevent plaster, dirt, or trash from lodging in conduits, boxes, and fittings during construction. Free clogged conduits of obstructions.
19. Sleeves through floors shall be rigidly supported utilizing a cast in place as the preferred method or using a Unistrut rack system and shall extend through either side of the ceiling/floor a minimum of 4-inches.
20. Sleeves through walls shall be rigidly fastened to the studs and extend a minimum of 4-inches on either side.

B. Conduit and Sleeve Supports

1. Support conduit and sleeves in underground installations using 2-inch duct spacers.
2. Support conduit and sleeves in interior installations using pipe straps, wall brackets, hangers, or ceiling trapeze.
3. Fasten by wood screws to wood; by toggle bolts on hollow masonry units; by concrete inserts or expansion bolts on concrete or brick; and by machine screws, welded threaded studs, or spring-tension clamps on steel work.

4. Do not support conduit by ceiling support system. Conduit and box systems shall be supported independently of both tie wires supporting ceiling grid system, and ceiling grid system into which ceiling panels are placed.
5. Supporting means shall not be shared between raceways and electrical raceways, mechanical piping, or ducts.
6. Installation shall be coordinated with above-ceiling electrical and mechanical systems to assure maximum accessibility to all systems.
7. Conduit and sleeves shall be supported by a trapeze or wall support brackets.
8. A minimum of 3/8" threaded rod shall be used for trapeze supports.
9. Support in accordance with NFPA 70 at intervals not to exceed 3' from the box and every 10' afterwards.
10. Conduit and sleeves shall be no less than 3" above a lay-in ceiling.
11. Conduit and sleeves shall be rigidly supported and level.
12. All supports shall attach to structure or a rigid surface.
13. Supports shall not be shared with any other discipline unless specifically approved by the Consultant.

C. Backboxes and Junction Boxes

1. Locknuts and Bushings
 - a. Fasten conduits to sheet metal boxes with two locknuts where required by NFPA 70, where insulated bushings are used, and where bushings cannot be brought into firm contact with the box; otherwise, use at least minimum single locknut and bushing.
 - b. Locknuts shall have sharp edges for digging into wall of metal enclosures. Install bushings on ends of conduits and provide insulating type where required by NFPA 70.
2. Provide overhead pull boxes in raceway systems at least every 100' and /or when 180 degrees in bends are exceeded when installing conduit on the interior of a building. Size per the following table:

Conduit Trade Size	Width	Length	Depth	Width Increase for Additional Conduit (of same size)
1"	4"	4"	3"	Same size, up to (2) conduits
1-1/4"	6"	20"	3"	3"
1-1/2"	8"	28"	4"	4"
2"	8"	36"	4"	5"
2-1/2"	10"	42"	5"	6"
3"	12"	48"	5"	6"
4"	16"	60"	8"	6"

3. Boxes for metallic raceways shall be cast-metal, hub-type when located in wet locations, when surface mounted on outside of exterior surfaces, or when surface mounted on interior walls exposed up to 7 feet above floors and walkways, and when specifically indicated.
4. Boxes in other locations shall be sheet steel, except that aluminum boxes may be used with aluminum conduit, and nonmetallic boxes may be used with nonmetallic conduit system.
5. Wall Boxes for shall be minimum 4 11/16" square and 2 1/8" deep, unless otherwise noted.
6. Boxes for use in masonry-block or tile walls shall be square-cornered, tile-type, or standard boxes having square-cornered, tile-type covers.
7. Provide gaskets for cast-metal boxes installed in wet locations and boxes installed flush with outside of exterior surfaces.

D. Backbox and Junction Box Supports

1. Backboxes installed in a sheet rock wall shall be supported using the Caddy box mounting bracket.
2. Support boxes on suspended ceilings independently of ceiling supports.
3. Fasten boxes and supports with wood screws on wood, with bolts and expansion shields on concrete or brick, with toggle bolts on hollow masonry units, and with machine screws or welded studs on steel. Threaded studs driven in by powder charge and provided with lock washers and nuts or nail-type nylon anchors may be used in lieu of wood screws, expansion shields, or machine screws. In open overhead spaces.
4. Support sheet metal boxes directly from building structure or by bar hangers.
5. Boxes installed in a wall shall be flush with the wall upon completion.
6. Extension Rings – Extension rings are not permitted for new construction unless specifically approved in writing by the Consultant.
7. Mounting Heights of Boxes
 - a. Mount outlets at height(s) as indicated on the Drawings.

E. System Labeling

1. All interior conduits exceeding 50' shall be permanently labeled at each end and every junction box/pull box.
2. All exterior conduits whether buried or under structure shall be permanently labeled at each end.
3. All Maintenance Holes, Hand Holes, junction boxes or pull points shall be permanently labeled.
4. Labels shall be machine-printed.

F. Rated Pathways

1. Labeling: Affix adhesive wall label immediately adjacent to devices / conduits on both sides of wall/floor to communicate to future cable technicians, authorities having jurisdiction and others the manufacturer of the device and the corresponding UL System number installed.
2. Fire-Rated Pathway Devices
 - a. Provide Fire-Rated Pathway Devices wherever Division 27 Cabling needs to pass through a Fire-Rated wall, whether the device sizes and quantities were identified on the Drawings or not. Devices shall be sized for installed cable size and quantity, plus 25% spare capacity.
 - b. Where multiple devices are required or noted being adjacent to each other, provide manufacturer accessories to "gang" the devices together.
3. Smoke-Rated Pathway Devices
 - a. Provide Smoke-Rated Pathway Devices wherever Division 27 Cabling needs to pass through a Smoke-Rated wall, whether the device sizes and quantities were identified on the Drawings or not. Devices shall be sized for installed cable size and quantity, plus 25% spare capacity.
 - b. Where multiple devices are required or noted being adjacent to each other, provide manufacturer accessories to "gang" the devices together.
4. Rated Penetrations
 - a. For all provided conduit sleeves, pathways, and penetrations through a rated assembly, provide all required sleeves and sealants to maintain rating of penetrated surface or floor.
 - b. For all backboxes supporting items within a rated way, provide proper accessories to maintain rating.
5. Testing Requirements
 - a. Conduit System

- 1) Each outside plant conduit shall have a 6" -long mandrel $\frac{1}{2}$ "-smaller than the inside diameter of the conduit passed from each end to ensure the conduit is not damaged.
 - 2) The Consultant shall be notified in order to be present for this testing. Any failure shall be corrected by removing and reinstalling new conduits.
6. Project Closeout Documentation
 - a. As-Built Drawings
 - 1) Drawings shall be provided to the Consultant at the time of substantial completion. Final payment will not be recommended until drawings are received and approved by the Consultant.
 - 2) As-Built drawings shall be produced in AutoCAD/Revit in the most current or compatible version and provided electronically in .dwg and/or .pdf format.
 - 3) Drawings shall be provided utilizing the original scale and shall include the exact dimensions and locations of all cable pathways, and labeling scheme.

END OF SECTION 28 05 33