SECTION 27 05 28
LOW VOLTAGE RACEWAY SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. This Section includes raceway systems to support empty raceway and low voltage systems including but not limited to telephone, video, controls, data wiring and security systems.
2. Provide labor, materials, equipment and services equipment and transportation necessary for complete and operational raceway system including but not limited to the following:
   a. Raceways
   b. Outlet, pull and junction boxes
   c. Sleeves
   d. Backboards
   e. Grounding

B. Meet the following performance requirements:

1. Raceway systems shall be installed to meet the bending radius of the installed wiring so as to not degrade performance.

C. System Description

1. Provide a low voltage raceway system including all interior raceways, boxes, plywood backboards, outlets, fittings and all other appurtenances required, leaving the entire installation ready for installation of equipment and cables.

1.2 RELATED WORK

A. Section 26 00 10 - Basic Electrical Requirements, is an integral part of this section.

B. Section 26 05 00 – Common Work Results for Electrical.

C. Section 26 05 33 – Raceways and Boxes for Electrical Systems.

D. Section 26 05 43 – Underground Ducts and Raceways for Electrical Systems.

E. Refer to Division 27 and the Drawings for additional requirements.

F. Refer to Division 28 and the Drawings for additional requirements.

1.3 COORDINATION

A. Coordinate work under provisions indicated in Section 26 00 10.

B. Field verify measurements.

C. Verify routing and termination locations of conduit prior to rough-in.

D. Coordinate installation with installers of low voltage and telecommunications systems for exact placement and installation requirements.

1.4 QUALIFICATIONS/QUALITY ASSURANCE

A. Conform to requirements indicated in Section 26 00 10.

B. Toxicity: Materials shall comply with applicable codes and regulations regarding toxicity of combustion products.

C. Protect conduit from corrosion and entrance of debris. Provide appropriate cover.

D. Protect PVC conduit from sunlight.

1.5 REGULATORY REQUIREMENTS

A. Conform to requirements indicated in Section 26 00 10.

B. Codes and Standards in addition to Section 26 00 10:

1. ANSI/TIA/EIA 569 Commercial Building Standards for Telecommunications Pathways and Spaces.
2. TIA/EIA 606.
3. TIA/EIA 607.
4. BICSI Telecommunications Distribution Methods Manual.
5. ANSI/NECA

1.6 SUBMITTALS

A. Submit as required herein under Section 26 00 10.

B. Submit for review shop drawings for the following:

1. Raceways
2. Boxes
3. Multiple Duct Conduit
4. Inner Duct
5. Max Cell

1.7 EXTRA MATERIALS

A. Furnish under provisions indicated in Section 26 00 10.

1.8 PROJECT RECORD DOCUMENTS

A. Submit under provisions indicated in Section 26 00 10.

B. Accurately record actual dimensioned routings of conduits larger than 2 inches (50 mm) and conduits underground, in or under concrete slabs.

1.9 OPERATION AND MAINTENANCE DATA

A. Submit under provision indicated in Section 26 00 10.

PART 2 - PRODUCTS

2.1 MULTIPLE DUCT CONDUIT

A. Manufacturers: Subject to compliance with requirements, provide products by the manufacturer specified:

1. Carlon multi-guard multicell raceway system
2. George Ingram
3. Substitutions: Or equal, under provisions of Section 26 00 10.

B. Provide multiple duct conduits as indicated on the Drawings and specified herein.

C. Multiple duct conduits shall consist of four inch outer conduit with or four 1-1/4 inch pre-lubricated PVC inner ducts as indicated. Inner ducts shall each be a different color (3-cell white/gray/orange and 4 cell white/gray/orange/green), unless otherwise indicated.

D. Outer conduit material shall be as follows:

1. Underground - Schedule 40 PVC.
2. Underground connection to foundation or manholes - last ten feet shall be galvanized rigid steel with deflection joint.
3. Above-ground subject to abuse - galvanized rigid steel (GRC) including the first ten feet of exposed conduit.
4. Above ground not subject to abuse - Electrical Metallic Tubing (EMT).
5. Riser from underground - Galvanized rigid steel with expansion joint.

E. Inner ducts shall have low co-efficient of friction (0.06 - 0.09).

F. Provide termination kits where entering or leaving manholes or buildings to seal inner ducts and outer ducts.

G. Provide cap at each end of duct with holes for innerduct to pass through.

2.2 CORRUGATED NON-METALLIC INNER DUCT

A. Manufacturers: Subject to compliance with requirements, provide products by the manufacturer specified:

1. Carlon
2. George Ingram
3. Innerduct.com
4. Allied Electrical Group
5. Substitutions: Or equal, under provisions of Section 26 00 10.

B. Corrugated non-metallic inner duct low co-efficient of friction (0.06 - 0.09).

C. Plenum rated where used in air plenums.

D. Color coded as required to identify system or destination.

E. Provide cap at each end of duct with holes for innerduct to pass through.

2.3 FABRIC MULTI-CELL INNER DUCT

A. Manufacturers

1. Max Cell

B. 3 inch (3) cell fabric Max Cell unless otherwise indicated.

PART 3 - EXECUTION

3.1 GENERAL

A. In general, the low voltage system raceways, outlets and terminal backboard locations shall be as indicated on the Drawings and specified herein.

B. All work and the entire installation of same shall be coordinated with the Owner, and the low voltage system Installers before the start of the construction and shall be in full conformance with their requirements and recommendations.

C. Verify service point with utility and owner, and provide service raceways to meet requirements and as indicated on the Drawings and Specifications.

D. At telecommunications rooms/closets provide 3/4 inch (19mm) thick type AA fir, fire rated plywood backboards with smooth finish for the mounting of equipment and cable terminations. The backboards shall be painted matte white with two coats of non-conductive fire resistive paint unless Architect specifies to be painted as part of the wall. Exact dimensions of the backboards shall be as indicated on the Drawings. Minimum size shall be 4 feet by 8 feet (1219mm x 2438mm) mounted 12 inches (305mm) above the floor and 8 feet (2438mm) high.

E. Grounding continuity shall be assured throughout raceway and pull box installation equal to electrical power raceway installation and EIA/TIA 607.

F. Raceways and outlets shall be separated from sources of EMI and RFI such as transformers, ballasts and power lines. Do not install raceways parallel to power raceways unless four foot (1219mm) distance is maintained. Cross other raceways at 90 degrees. Maintain minimum 12 inch (305 mm) clearance in all directions from lighting fixtures and power wiring rated over 20 A. Maintain a minimum 6 inch (153 mm) clearance elsewhere from raceways and outlets. Maintain 48 inch (1220 mm) clearance from transformers. Clearances are measured all around raceway and outlets including through walls and floors.

G. Non-metallic raceways or boxes are not allowed in interiors of buildings.

H. Provide insulated bushings with 360 degree coverage at all cable or pull string penetrations through steel studs.

I. No cabling to an outlet is to be installed exposed. Provide conduit to outlet where cabling would have to be installed exposed.

J. Innerduct joints shall be water and air tight to allow for blowing a pull line or fiber conductors.

K. Provide measure/pulling tape (with footage indicated) in all innerducts and conduits.

3.2 PROVISIONS

A. Provide a double duplex surge suppression outlet on an individual 20A/1P, 120 V circuit at each backboard.

B. Provide one multi-duct conduit in underground ductbanks and between Telcom room or closets where raceways are installed for non-stacked areas. Provide additional multiple duct conduits where indicated.

C. Provide 4 inch (103mm) conduits between telecommunications rooms, closets and backboards. As a minimum provide one conduit for telephone cables, one multiple duct conduit with three 1-1/2 inch inner ducts for data and one spare conduit for future use.

D. Provide direct raceway from outlet boxes to an accessible cable tray location above the finished ceiling, or in area with non-accessible ceilings directly to the nearest telecommunications closet/room on the same floor or as indicated on the Drawings.

3.3 RACEWAYS

A. Empty Raceways and Raceways installed for Telecommunications Systems including telephone, data, security, alarm, CATV, sound, video, low voltage conductors, etc. shall be installed as required by the Electrical Code, as required for raceways specified in this Section and as indicated herein.

B. Provide 3/4 inch (21mm) conduit for single or dual jacks and 1 inch conduit for up to 6 jacks, unless otherwise indicated, from outlets indicated on the Drawings into the nearest partition, extended a minimum of 6 inches (150mm) above an accessible ceiling or to the backboard if there is no nearby accessible ceiling. Provide 90 degree bend at top of wall.

1. Unless otherwise indicated provide conduit from outlets indicated on the Drawings into the nearest partition, extended a minimum of 6 inches (150mm) above an accessible ceiling or to the backboard if there is no nearby accessible ceiling. Terminate with insulated throat fittings. Provide 90 degree bend at top of wall. Size of conduit shall be the larger of the following, unless otherwise indicated:
2. 3/4"C (21mm): one outlet or 3 cables maximum
3. 1"C (27mm): Two outlets or 6 cables minimum
4. 1-1/4"C (35mm): Three outlets or 10 cables maximum or connection to surface raceway. Provide one conduit per twenty feet (6M) of surface raceway not to exceed 10 cables (jacks) per conduit.

C. Provide 4 inch (103mm) conduits between telecommunications rooms, closets and backboards. As a minimum provide one conduit for telephone cables, one multiple duct conduit with three 1-1/2 inch (41mm) inner ducts for data and one spare conduit for future use.

D. DO NOT reduce the number of home runs indicated unless approved in writing by the Architect.

E. Terminate conduits with bushings. Provide grounding bushings for backbone and riser conduits and for conduits entering equipment rooms or wiring closets. Ground conduits, cable trays and raceways to the local Telecommunications ground bus using braided hollow copper conductor equal to Belden #8669 (60A ampacity). Bond data outlet boxes and conduit to adjacent power outlet with No.12 green conductor.

F. Bends shall be large radius, not exceeding 90 degrees and minimum size radius as follows:

1. 2 inch (53mm) trade size and less - 6 times conduit diameter.
2. 2-1/2 inch (63mm) trade size and larger - 10 times conduit diameter.
3. Conduits for fiber optics cabling - 10 times conduit diameter.
4. Surface raceways - 2 inch radius bends. 1 inch minimum interior bend radius.
5. Furniture system pathways - 1 inch minimum interior bend radius.

G. Install raceways and outlets for power and telecommunications in separate stud wall or block cavities maintain at least a 6 inch separation up to the outlets.

H. Provide a measure/pulling tape (with footage indicated) in each raceway. Leave 12 inches (305 mm) of exposed slack at each end. Secure pull line at each end to prevent it from slipping back into raceway. Refer to Section 26 05 00 for type requirements. Provide 1250 lbs rated tape. Provide 2500 lbs rated tape in conduits over 2 inches.

I. Raceways shall have insulated throat fittings.

3.4 PULL BOXES

A. Provide pull boxes each time raceway installation exceeds a 100 foot (30M) section or a total of 180 degrees in bends and offsets between pull boxes or a reverse bend (over 90 degrees). Do not install a pull box in lieu of a conduit bend. Align the corresponding conduits on opposite sides of pull box with each other.

B. Pull boxes with covers over 20 inches (508 mm) shall have piano hinged covers with pad locking capability Covers over 20 inches (508 mm) wide shall be split bulkhead type with piano hinges located on the long sides. Provide doors where one door can be secured to the pull box while the other is able to swing free.

C. Locate pull box so it is accessible and covers can be opened at least to 90 degrees. Where above ceiling or behind access door center pull box in access door or ceiling tile opening.

D. Pull boxes shall be securely mounted to building structure. Provide lamacoid engraved nameplate on door indicating use and raceway end points.

E. Provide one pull box per conduit when conduit serves multiple tenants or terminates in separate locations.

F. Pull boxes shall be sized according to the following table (as recommended by BICSI):

Minimum Space Requirements in Pull Boxes Having One Conduit Each in Opposite Ends of the Box

Maximum Trade Size of Conduit in Inches	Size of Box			For Each Additional Conduit Increase Width
	Width	Length	Depth	
21mm (0.75 in.)	102 mm (4 in.)	305 mm (12 in.)	76 mm (3 in.)	51 mm (2 in.)
27 mm (1.0 in.)	102 mm (4 in.)	406 mm (16 in.)	76 mm (3 in.)	51 mm (2 in.)
35 mm (1.25 in.)	152 mm (6 in.)	508 mm (20 in.)	76 mm (3 in.)	76 mm (3 in.)
41 mm (1.5 in.)	203 mm (8 in.)	686 mm (27 in.)	102 mm (4 in.)	102 mm (4 in.)
53 mm (2.0 in.)	203 mm (8 in.)	914 mm (36 in.)	102 mm (4 in.)	127 mm (5 in.)
63 mm (2.5 in.)	254 mm (10 in.)	1067 mm (42 in.)	127 mm (5 in.)	152 mm (6 in.)
78 mm (3.0 in.)	305 mm (12 in.)	1219 mm (48 in.)	127 mm (5 in.)	152 mm (6 in.)
91 mm (3.5 in.)	305 mm (12 in.)	1372 mm (54 in.)	152 mm (6 in.)	152 mm (6 in.)
103 mm (4.0 in.)	381 mm (15 in.)	1524 mm (60 in.)	203 mm (8 in.)	203 mm (8 in.)

NOTE: Width is measured perpendicular to conduit orientation. Length is measured parallel to conduit orientation.

3.5 SLEEVES

A. Provide conduit sleeves between stacked Telecommunication closets or rooms.

B. Provide sleeves for raceways and cable trays penetrating full height walls or floors. Install approved smoke and fire stop between sleeve in rated wall or floor. Install approved water tight seal between sleeve and wall or floor for penetrations to the exterior or underground. Sleeves shall extend three inches above the floor and shall be water tight.

C. Provide sleeves for telecommunications cabling at full height walls in path of cabling from outlet location to termination point in closet minimum size two inch except four 4 inch sleeves into telecommunications closets or rooms, [computer rooms, media center and equipment head end rooms]. In rated walls provide a 3”x3” fire rated sleeve (one per 4” conduit specified

or required) equal to EZ Path manufactured by Specified Technologies Inc. or Quick Pass Fire Barrier by 3M.

D. Provide four inch conduit sleeves between stacked Telecommunication closets or rooms. Provide a minimum of four sleeves per closet, provide more if indicated.

E. Align sleeves and conduits on opposite walls so there is a straight line between corresponding openings, parallel or perpendicular to Building Structure.

F. Refer to Section 26 05 00 – “Common Work Results for Electrical” for sleeve, fire stopping and sealing requirements.

3.6 OUTLETS

A. Provide blank device outlet cover plates for all outlets without device plates installed at time of Substantial Completion. All outlet cover plates shall be of the same finish material and by the manufacturer furnishing all other device and switch plates installed throughout the buildings. Provide blank plate or outlet plate as coordinated with the Telephone, Video and Data System Installer.

B. Provide 4-11/16 inch square by 2-1/8 inch (119mm by 54mm) deep box with single gang plaster ring for each outlet, unless otherwise indicated.

C. Outlet shall be spaced 6 inches (150mm) minimum from an electrical outlet. Install outlet in separate stud cavity from power wiring.

D. Provide 4-11/16 inch square by 2-1/8 inch (119mm by 54mm) deep box with single gang plaster ring for each outlet and for concealed connection to surface raceway, unless otherwise indicated. Provide with 3/4", 1" or 1-1/4" knockouts as required.

END OF SECTION