Board of Regents of the University System of Georgia

For:  Georgia State University
       University Plaza
       Atlanta, Georgia

Gentlemen:

B-01  Having carefully examined the Specifications entitled _____Library North GSUNET II Data Cabling____ , and the drawings similarly entitled, numbered _________D1.0 to D5.3_ , all dated __12-15-99__________ , and Addendum (a) No. (s) _1,2,&3___N/A________ , as well as the premises and conditions affecting the work, the undersigned proposes to furnish all services, labor and materials called for by them for the entire work, in accordance with said documents, for the sum of :

______________________________________________ Dollars ($__________) which sum is hereinafter called the “Base Bid”.

B-02  The undersigned further proposes that should any of the following alternates be accepted and be incorporated in the contract, the Base Bid will be altered in each case as follows:

No Alternates on This Project.
For and in consideration of the sum of $1.00 the receipt of which is hereby acknowledged, the undersigned agrees that this proposal may not be revoked or withdrawn after the time set for the opening of bids but shall remain open for acceptance for a period of thirty (30) days following such time.

In case he be notified in writing by mail, telegraph, or delivery of the acceptance of this proposal within thirty (30) days after the time set for the opening of bids, the undersigned agrees to execute within ten (10) days a contract (on a form shown in Section D supplied by the Board of Regents when a stipulated sum forms the basis of payment) for the work for the above stated compensation and at the same time to furnish and deliver to the Owner a Performance Bond and a Payment Bond in accordance with the forms shown in Article E-30 of the General Conditions of the Contract, both in an amount equal to 100% of the contract sum.

The undersigned agrees to commence actual physical work on the site with an adequate force and equipment within ten (10) days of the date of notice to proceed by the undersigned and to complete fully all work in 60 days consecutive calendar days from and including said date.

Enclosed herewith is a bid bond (Certified checks not acceptable) in the amount of ________________ Dollars ($ ) (being not less than 5% of the Base Bid). The undersigned agrees that the above stated amount is the proper measure of liquidated damages to execute the contract and to furnish the Performance and Payment Bond in case this proposal is accepted, and further agrees to the following:

If this proposal is accepted within thirty (30) days after the date set for the opening of bids and the undersigned fails to execute the contract within ten (10) days after notice of such acceptance or if he fails to furnish both Performance and Payment Bond, the obligation of the bid bond will remain in full force and effect and the money payable thereon shall be paid into the funds of the Owner as liquidated damages for such failure; otherwise, obligation of the bond will be null and void.

The bidder submits the following statement of bidder’s qualifications for consideration of the Owner.
STATEMENT OF BIDDER'S QUALIFICATIONS

To accompany bids submitted for Construction of a ______________________

Project at _________________________________, Georgia.

Name of Bidder ________________________________

Telephone Number ______________________________

Business Address _______________________________

When Organized ________________________________

Where Incorporated ______________________________

How many years have you been engaged in the contracting business under the present firm name? ________________________________

Financial Statement ______________________________

Credit Available for this Contract $____________________

Contracts now in hand, Gross Amount $____________________

Plan of Organization (Proprietorship, Partnership, Corp.) ________________________________

Have you ever refused to sign a contract at your original bid? __________________

Have you ever been declared in default on a contract? __________________

Remarks: __________________

(The above statements must be subscribed and sworn to before a Notary public.)

Date __________________________

Firm Name __________________________

By __________________________

Title __________________________

(Notary Public)
Respectfully submitted,

Name ______________________

Address ______________________

By ______________________

Title ______________________

The full NAMES and addresses of persons and firms interested in the foregoing bids as principals are as follows:

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

The legal name of the bidder is:

____________________________________________________________________
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
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</thead>
<tbody>
<tr>
<td>Mechanical Specifications</td>
<td>15000</td>
</tr>
<tr>
<td>Electrical Specifications</td>
<td>16000</td>
</tr>
<tr>
<td>Power &amp; Data/Voice Raceways</td>
<td>16010</td>
</tr>
<tr>
<td>Cabling System-General</td>
<td>17010</td>
</tr>
<tr>
<td>Unshielded Indoor Twisted Pair Cables</td>
<td>17020</td>
</tr>
<tr>
<td>Fiber Optic Cabling</td>
<td>17024</td>
</tr>
<tr>
<td>Connecting Hardware &amp; Terminations</td>
<td>17030</td>
</tr>
<tr>
<td>Outlets</td>
<td>17031</td>
</tr>
<tr>
<td>System Furniture Data/Voice Feeds</td>
<td>17032</td>
</tr>
<tr>
<td>Racks</td>
<td>17040</td>
</tr>
<tr>
<td>Hardware &amp; Accessories</td>
<td>17041</td>
</tr>
<tr>
<td>Firestopping</td>
<td>17050</td>
</tr>
<tr>
<td>Labeling &amp; Charts</td>
<td>17070</td>
</tr>
<tr>
<td>System Testing &amp; Certification</td>
<td>17090</td>
</tr>
<tr>
<td>Unit Price Form</td>
<td>01026</td>
</tr>
</tbody>
</table>
PART 1—GENERAL

Provide the following unit prices in your bid. These prices will establish unit prices for work added or deleted to the contract documents or agreed upon contract.

Unit Price Items

<table>
<thead>
<tr>
<th>ITEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Data/Voice outlets: Unit price shall include cable, jacks, faceplates, system furniture inserts, extenders, termination at both ends, labeling, testing, miscellaneous items, labor, material costs, shipping, taxes, and margins.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ITEM</th>
<th>PRICE $/Each Installed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Type A Outlet</td>
<td></td>
</tr>
<tr>
<td>a. 10 to 125 ft in overall length</td>
<td></td>
</tr>
<tr>
<td>b. 126 to 290 ft in overall length</td>
<td></td>
</tr>
<tr>
<td>2. Type B Outlet</td>
<td></td>
</tr>
<tr>
<td>a. 10 to 125 ft in overall length</td>
<td></td>
</tr>
<tr>
<td>b. 126 to 290 ft in overall length</td>
<td></td>
</tr>
<tr>
<td>2. Type C Outlet</td>
<td></td>
</tr>
<tr>
<td>a. 10 to 125 ft in overall length</td>
<td></td>
</tr>
<tr>
<td>b. 126 to 290 ft in overall length</td>
<td></td>
</tr>
<tr>
<td>3. Type D Outlet</td>
<td></td>
</tr>
<tr>
<td>a. 10 to 125 ft in overall length</td>
<td></td>
</tr>
<tr>
<td>b. 126 to 290 ft in overall length</td>
<td></td>
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<tr>
<td>4. Type E Outlet</td>
<td></td>
</tr>
<tr>
<td>a. 10 to 125 ft in overall length</td>
<td></td>
</tr>
<tr>
<td>b. 126 to 290 ft in overall length</td>
<td></td>
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<tr>
<td>5. Type F Outlet</td>
<td></td>
</tr>
<tr>
<td>a. 10 to 125 ft in overall length</td>
<td></td>
</tr>
<tr>
<td>b. 126 to 290 ft in overall length</td>
<td></td>
</tr>
<tr>
<td>6. Type G Outlet</td>
<td></td>
</tr>
<tr>
<td>a. 10 to 125 ft in overall length</td>
<td></td>
</tr>
<tr>
<td>b. 126 to 290 ft in overall length</td>
<td></td>
</tr>
</tbody>
</table>
A. Data/Voice outlets: Unit price shall include cable, jacks, faceplates, system furniture inserts, extenders, termination at both ends, labeling, testing, miscellaneous items, labor, material costs, shipping, taxes, and margins.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>PRICE</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>$/Each Installed</td>
</tr>
<tr>
<td>7. Type I Outlet</td>
<td></td>
</tr>
<tr>
<td>a. 10 to 125 ft in overall length</td>
<td></td>
</tr>
<tr>
<td>b. 126 to 290 ft in overall length</td>
<td></td>
</tr>
<tr>
<td>8. Type J Outlet</td>
<td></td>
</tr>
<tr>
<td>a. 10 to 125 ft in overall length</td>
<td></td>
</tr>
<tr>
<td>b. 126 to 290 ft in overall length</td>
<td></td>
</tr>
<tr>
<td>9. Type K Outlet</td>
<td></td>
</tr>
<tr>
<td>a. 10 to 125 ft in overall length</td>
<td></td>
</tr>
<tr>
<td>b. 126 to 290 ft in overall length</td>
<td></td>
</tr>
</tbody>
</table>

B. Cabling Support/Management Hardware (Include Assembly, Installation, All associated hardware required for installation, etc.)

<table>
<thead>
<tr>
<th>ITEM</th>
<th>PRICE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$/Each Installed</td>
</tr>
<tr>
<td>1. 12&quot; wide cable tray, 10' section</td>
<td></td>
</tr>
<tr>
<td>2. 18&quot; wide cable tray, 10' section</td>
<td></td>
</tr>
<tr>
<td>3. 9&quot; wall hung tray, 10' section</td>
<td></td>
</tr>
<tr>
<td>4. J-hook assembly (Each) (1) ea. per 6' linear foot</td>
<td></td>
</tr>
<tr>
<td>5. Bridle ring &amp; clamp assembly</td>
<td></td>
</tr>
<tr>
<td>ITEM</td>
<td>PRICE</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
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</tr>
<tr>
<td>1. 30&quot; x 30&quot; x 7' tall enclosed cabinet (complete)</td>
<td></td>
</tr>
<tr>
<td>2. 19&quot; wide, 7' tall rack</td>
<td></td>
</tr>
<tr>
<td>3. 23&quot; wide, 7'tall rack</td>
<td></td>
</tr>
<tr>
<td>4. 6' vertical cable management</td>
<td></td>
</tr>
<tr>
<td>5. 19&quot; W horizontal cable management</td>
<td></td>
</tr>
<tr>
<td>6. 6' plug mold strip</td>
<td></td>
</tr>
<tr>
<td>7. 6' section of 12&quot; ladder rack</td>
<td></td>
</tr>
<tr>
<td>8. 19&quot; wide shelf for equipment racks</td>
<td></td>
</tr>
<tr>
<td>9. 29&quot; wide shelf for equipment cabinet</td>
<td></td>
</tr>
<tr>
<td>10. Patch Panels</td>
<td></td>
</tr>
<tr>
<td>a. 24 port category 5 RJ -45 data patch panel</td>
<td></td>
</tr>
<tr>
<td>b. 48 port category 5 RJ -45 data patch panel</td>
<td></td>
</tr>
<tr>
<td>c. 12 strand fiber optic patch panel</td>
<td></td>
</tr>
<tr>
<td>d. 48 strand fiber optic patch panel</td>
<td></td>
</tr>
<tr>
<td>11. Voice Hardware</td>
<td></td>
</tr>
<tr>
<td>a. 100-pair 19&quot;W rack-mountable unit</td>
<td></td>
</tr>
<tr>
<td>b. 200-pair 19&quot;W rack-mountable unit</td>
<td></td>
</tr>
<tr>
<td>c. 300-pair 19&quot;W rack-mountable unit</td>
<td></td>
</tr>
<tr>
<td>d. 600-pair 23&quot;W rack-mountable unit</td>
<td></td>
</tr>
<tr>
<td>12. Riser Cabling</td>
<td></td>
</tr>
<tr>
<td>a. CDR (50 pair data riser cable)</td>
<td></td>
</tr>
<tr>
<td>b. FDR 12 strand fiber optic data riser cable</td>
<td></td>
</tr>
<tr>
<td>c. CVR voice riser cable (fill in pair count)</td>
<td></td>
</tr>
</tbody>
</table>
### D. Labor Rates

<table>
<thead>
<tr>
<th>ITEM</th>
<th>PRICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Hourly rate</td>
<td></td>
</tr>
<tr>
<td>2. Overtime hourly rate</td>
<td></td>
</tr>
<tr>
<td>3. Supervisor Hourly Rate</td>
<td></td>
</tr>
</tbody>
</table>

END OF FORM
Mechanical Requirements:

Provide line voltage thermostat controlled exhaust fan in each data closet. Fan to exhaust 2 CFM for every square foot in size of the data closet. Connect fan to separate circuit from power receptacles installed in closet.

Part 1—General

1.1 Description

A. Work covered by these documents includes labor, material, products and services for, and incidental to, the complete installation of the heating, ventilating, and air conditioning systems.

B. Work shall be complete, tested, adjusted and ready for operation.

C. All new work and material shall be covered for defects for a period of 1 year after final acceptance.

D. Verify actual locations and conditions of existing equipment in field prior to beginning any work.

E. All electrical work (labor and material) shall be provided by the electrical contractor unless noted otherwise. The mechanical contractor shall coordinate all electrical requirements of the mechanical equipment with the electrical contractor and shall provide all necessary control wiring. Provide all necessary motor control devices to accomplish system operation.

F. Contractor shall be responsible for repair of any base building structure or finishes which are damaged by the installation of any work specified in this section.

G. Contractor shall be responsible for relocating sprinkler heads and piping to accommodate new wall and lighting layouts. Sprinkler system revisions and modifications shall be in accordance with NFPA 13 and all local codes.

1.2 Regulations and Requirements:

A. Install all work to comply with all applicable local, state and federal regulations. Secure all necessary permits and inspections and pay all costs and fees involved in the execution of the work. The contractor must be appropriately licensed to perform the work.

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C. All work shall comply with the building code, mechanical code, and plumbing code currently in effect at the project site, as well as with local amendments to and interpretation of these codes. Notify owner immediately if any discrepancies are found.

1.3 DEFINITIONS

A. Provide: Furnish, install and connect complete.

B. Wiring: Wire or cable, installed in raceway with boxes, fittings, connectors and supports.

C. Work: Materials completely installed.

1.4 ASBESTOS

A. No asbestos-containing materials of any type shall be used on this project.

B. The contractor agrees to hold harmless, defend and indemnify the Owner, Architect, and Engineer for all lawsuits, expenses or damages arising from or related to the handling, or use, storage, or disposal of asbestos products used by the contractor.

C. The contractor shall be responsible for being aware of and complying with Asbestos NESHAP regulations, as well as other applicable codes, laws, and regulations.

PART 2— HVAC

2.1 DUCTWORK:

A. Ductwork shall be constructed of galvanized sheet steel and shall conform to recommendations of the SMACNA HVAC Duct Construction Standards, 1985 edition.

B. Ductwork shall be constructed in accordance with the following pressure classifications:
1. Closet exhaust fans:
   2000 FPM, + 1/2 inches static pressure with class B seals. For purposes of this specification this shall be defined as low pressure ductwork.

C. Flexible Round Duct
   1. Flexible round duct shall be listed as a Class 1 air duct under UL Standard 181 and shall comply with NFPA Standards 90A and 90B. Medium pressure duct shall be rated at 10", low pressure duct shall be rated at 1-1/2".
   2. Flexible duct shall be preinsulated type with vapor barrier and coated spring steel wire helix. Aluminum wire helix is not acceptable.
   3. Insulation shall be 1-1/2" thick and conform to ASTM C 1071 Standard Specification for Thermal and Acoustical Insulation.
   4. Maximum length of flexible duct runs shall be 5 feet. Use additional round sheet metal duct for diffuser runouts requiring more than 5 feet of flexible duct.
   5. Flexible duct run outs shall be full size of diffuser neck.
   6. Flexible ductwork shall not be installed penetrating any fire rated walls or any walls to structure. Provide galvanized sheet metal ductwork only to penetrate all walls to structure.

D. Installation
   1. Install in accordance with standards in SMACNA Duct Manuals and NFPA 90A.
   2. Seal all joints and seams in ductwork with a water-based liquid applied duct sealant in accordance with pressure classifications above.
   3. Hangers for preinsulated flexible duct shall be 1" minimum wide band type on 3 ft. minimum centers. Install duct in fully extended condition, free of kinks and sags, and with center line turning radius approximating 1-1/2 times the duct diameter.

2.2 AIR DISTRIBUTION DEVICES:
A. Description: Provide supply, return, and exhaust air outlets/inlets as required to provide regulated, adjustable air distribution.

B. Performance: Air distribution devices shall be selected for proper throw with a maximum NC level of 35. Balance all diffusers to 2 CFM per square foot.

C. Install supply devices with spin-in tap with damper and flexible duct. Provide adapters (plenums with spin-in necks or square-to-round transitions) as required to connect flexible ducts to air distribution device necks.

D. Provide Ruskin CFD5 ceiling fire damper and thermal blanket or approved equivalent at all ceiling penetrations to maintain UL listed fire rating.

E. Manufacturers: Metal*aire, Carnes, Krueger, A nemostat, Titus, or Barber-Coleman.

F. Capacity: 2 CFM per square foot of closet space.

2.3 DATA CLOSET EXHAUST FANS:

A. Centrifugal in-line cabinet type for mounting in ductwork. (Ceiling mounted fans are not acceptable.)

B. Features:
   1. Statically and dynamically balanced centrifugal fan wheel.
   2. Direct drive motor with permanently lubricated sealed bearings and build-it thermal overload protection.
   3. A coustically insulated metal housing.
   4. Internal vibration isolation.
   5. Disconnect device with UL label.
   7. AMCA certified.
   8. Line voltage thermostat controlled.

C. Manufacturers: Greenheck CSP or equal by Penn, Carnes, or Acme.
D. Capacity: 2 CFM per square foot of closet space.

End of 15 000 Mechanical
Electrical Requirements:

Power Requirements:
Provide and install (1) quad receptacle for every 4’ of backboard in each data closet. Provide (1) 20A circuit for every (2) quad receptacles. Provide and install a 6’ section of plugmold to rear of every rack. Circuit plugmold sections to J-box on wall and provide (1) 20A circuit for every (2) sections of plugmold. Provide voltage surge suppressers for each circuit.

Lighting Requirements:
Provide and install fluorescent lighting to provide 50 foot-candles at 3’ A.F.F. in each closet. Do not install any lighting any closer than 2’ from any data cabling or cable raceway (future or existing). Relocate any lighting that is located within 2’ of any data cabling or raceway. Refer to communications partial plans for existing and future cable raceway locations.

Part 1—General

1.1 Description:

A. Work covered by these documents includes labor, material, products and services for, and incidental to, the complete installation of the electrical systems.

B. Work shall be complete, tested, and ready for operation.

C. Contractor shall cover all work and material provided under this contract for defects. Such coverage shall be for a period of one year after final acceptance.

D. Contractor shall be responsible for all coring in floors, walls, or roofs as required to route any electrical conduit. Install any below floor piping routed through occupied tenant spaces after hours and/or at a time approved by the Owner. Coordinate time of installation with the Owner. Contractor shall take appropriate measures to avoid coring through existing in-slab conduits or other functional components.

E. Contractor shall be responsible for repair of any base building structure or finishes that are damaged by the installation of any work specified in this section.

F. Schedule all renovation work in existing occupied space in advance. Work in one area at a time and replace any removed tiles, etc at end of each work day. Protect occupant’s equipment from all debris. Clean up debris at end of each work day. Replace any broken ceiling tiles with like tiles from storage rooms, etc. Furnish and install matching tiles in storage rooms.

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Revised: April 30, 1997
G. Except where the Architect, Engineer or manufacturer has specifically indicated dimensions, electrical drawings are diagrammatic and shall not be scaled. Visit project site, survey existing conditions, and coordinate work to comply with documents.

H. All material shall be new, except where engineer has specifically noted the re-use of equipment on the drawings. All material shall be listed by the Underwriters' Laboratories, Inc., as conforming to its standards in every case where such a standard has been established for the particular type of material in question or except as otherwise specified or implied herein.

I. Provide fire proofing for all openings in fire walls or floors.

1.2 DEFINITIONS

A. Provide: Furnish, install and connect complete.

B. Review of shop drawings: A service by the engineer to reduce the possibility of materials being ordered which do not comply with contract documents. The engineer's review shall not relieve the Contractor of responsibility for dimensions or compliance with the contract documents. The reviewer's failure to detect an error does not constitute permission for the contractor to proceed in error.

C. Wiring: Electrical power and/or lighting wire or cable, installed in raceway with boxes, fittings, connectors and supports.

D. Work: Materials completely installed.

1.3 COORDINATION

A. Prior to rough-in of any materials, coordinate with other subcontractors the physical clearances for any sequencing of Division 16 work as it interfaces with and relates to all other systems.

1.4 FIELD CONDITIONS

A. Prior to rough-in or ordering of any equipment, visit the site and notify engineer of any discrepancies between contract documents and actual field conditions. Any equipment installed contrary to contract documents is subject to replacement at contractor's expense.

1.5 SHOP DRAWINGS AND PRODUCT DATA SUBMITTALS
A. Submit at one time within 30 days of contract awarding, drawings and product data on all equipment. Check for compliance with contract documents and certify compliance with electrical Contractor's "APPROVED" stamp and signature.

B. Support all submittals with descriptive materials, i.e., catalog sheets, product data sheets, diagrams, performance curves, and charts published by the manufacturer. These materials shall show conformance to specification and drawing requirements. Model view shall contain all information to indicate compliance with equipment specified. Provide complete electrical characteristics for all equipment.

C. Surge suppression submittals shall also include:
   1. Dimensional drawing of each suppresser including installation instructions.
   2. Category C3 (20kV, 10kA, 8/20μs waveform) clamp voltage certified test results per ANSI C62.41-1991 and ANSI C62.45.
   3. UL1449 clamp voltage documentation.

1.6 REGULATIONS AND REQUIREMENTS:

A. Work covered by this section of the specifications shall conform to NFPA 70, the National Electrical Code, 1996 edition, The Standard Building Code, and all local regulations.

1.7 ASBESTOS

A. Use no asbestos-containing materials of any type on this project.

B. The contractor agrees to hold harmless, defend and indemnify the Owner, Architect, and Engineer for all lawsuits, expenses or damages arising from or related to the handling, or use, storage, or disposal of asbestos products used by the contractor.

C. The contractor shall be responsible for being aware of and complying with Asbestos NESHAP regulations, as well as other applicable codes, laws, and regulations.

PART 2—ELECTRICAL

2.1 FIXTURE OUTLETS, CONDUIT JUNCTION BOXES

A. Furnish and install all outlet boxes and junction boxes, as required. Requirements indicate the approximate number of outlets. The owner reserves the right to change the exact location of any outlet or lighting fixtures in any area before permanent installation. Contractor shall specifically verify all door swings and
B. Install all lighting switches on jam side of door. Securely attach boxes for fixtures and devices to the building structure, using wood screws for wood construction, expansion bolts for concrete, and bolts or clamps for steel construction. Secure boxes set in concrete or masonry in place with cement mortar.

C. Outlet boxes installed in tile or exposed masonry walls shall be square corner boxes equal to Steel City No.GW-135, GW-235, etc., as required. All other switch and receptacle outlet boxes concealed in walls shall be standard utility or gang boxes with standard device covers. Do not use sectional switch boxes. Provide one inch deep plaster cover for all outlet boxes installed in concrete or concealed masonry. Position the box so that concrete or mortar shall fill around the plaster cover. Install device plate flush with the finished surface. Install single switches in utility boxes without plaster covers.

D. Switch and receptacle boxes exposed on walls shall be cast iron type with threaded hubs and sheet steel covers. Boxes shall be Crouse-Hinds Type FS or FD or approved equal by Appleton.

E. Where existing junction or pull boxes fall in an area where inaccessible ceilings are installed under this contract, relocate boxes and wiring to an accessible area.

2.2 CONDUITS

A. Install all wiring in conduit unless otherwise specified herein. All conduit shall meet UL requirements.

B. Use intermediate steel conduit (IMC) where shown on the drawings or required by code or by other paragraphs in the specifications or for exposed locations subject to physical damage or moisture. All other conduit installed inside the building and above grade shall be galvanized steel electrical metallic tubing (EMT). Type MC (metal clad) cable with THHN conductors and internal bonding wire may be used for branch circuits #8 and smaller where allowed by all applicable codes.

C. Provide flexible metal conduit connection, to motors, transformers or other vibrating equipment. Provide seal tight flexible conduit for exposed to weather locations and under raised floor applications.

D. Provide supports for conduits on not more than 10' centers and within 3' of each box. Conduit supports shall be approved galvanized iron clamps or hangers, attached to masonry with inserts and bolts or lead expansion shields; or to structural members by means of approved galvanized iron clamps or hangers. Where installed exposed, conduits shall be parallel with, or at right angles to walls or ceilings.
E. Except where terminating in a threaded hub fitting, all conduits shall terminate in outlet boxes, junction boxes, pull boxes, cabinets, etc., with one locknut installed outside the box and one locknut and a bushing inside the box. The locknuts shall be tight to make a mechanical and electrical connection. Bushings for all rigid conduit shall be O.Z. Manufacturing Co., Type B insulating end bushing, and shall be grounding type where required.

F. EMT coupling and box connectors shall be set screw type when used inside the building and rain-tight compression type when used outside. Approved connector manufacturers include Appleton, Efcor, O.Z., Raco, Steel City, and T & B.

G. Provide pull cord in all empty conduits.

2.3 CONDUCTORS FOR CONDUIT SYSTEMS

A. Furnish and install all wire, cable and conductors required for the electrical installation. All conductors shall be copper. All sizes shall be AWG. Minimum size for power and lighting circuits shall be #12. Minimum size for low voltage (24 volts) control circuits shall be #18. Minimum size for 120 volt control circuits shall be #14. Minimum insulation rating on all conductors shall be 600 volts. Insulation shall be Type THHN/THWN. Conductors #10 and smaller shall be solid. Conductors #8 and larger shall be stranded. Use lubricants on all feeder cables and as otherwise required to facilitate the pulling of wires. Lubricant shall be Ideal Industries Yellow 77.

B. Conductor color coding shall be as follows or as required by local code:

<table>
<thead>
<tr>
<th></th>
<th>208Y/120V</th>
<th>480Y/277V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase A</td>
<td>Black</td>
<td>Brown</td>
</tr>
<tr>
<td>Phase B</td>
<td>Red</td>
<td>Orange</td>
</tr>
<tr>
<td>Phase C</td>
<td>Blue</td>
<td>Yellow</td>
</tr>
<tr>
<td>Neutral</td>
<td>White</td>
<td>Grey</td>
</tr>
<tr>
<td>Ground</td>
<td>Green</td>
<td>Green</td>
</tr>
</tbody>
</table>

C. Identify phase, circuit and voltage at each panelboard, pull box, junction box and switch.

2.4 WIRING CONNECTORS

A. Make all splices, joints and taps in outlet boxes, pull boxes, or wiring troughs with Ideal Industries "Wing Nut" connectors, or 3M Co.'s "Scotch-loc" electrical spring connectors for conductors #8 and smaller. Make all joints or taps in conductors
larger than #8 with Ideal Type GP/GT tin plated aluminum alloy set screw connectors with 600 volt insulating covers.

2.5 SUPPORTS

A. Provide and install supports for all equipment and materials installed under these specifications. Supports shall be steel angle or channel or Kindorf or Unistrut channel and fittings as approved. Minimum size rods shall be 3/8 inch.

2.6 PANELBOARDS

A. Enclosures shall be flush or surface as shown on the drawings, galvanized or equivalent rust-resistant steel, mounted complete with panel trim having hinged door with concealed hinges and trim mounting screws. Provide locking door with flush catch. Provide two keys for each panel. Make keys interchangeable for panels of same voltage.

B. Panelboards shall be 3 phase, 4 wire, solid neutral design with sequence style bussing and full capacity neutral, composed of an assembly of [bolt-in-place] molded case automatic air circuit breakers. Circuit breakers shall have thermal and magnetic trip and trip free position separate from either ON or OFF positions. Provide common simultaneous trip for 2 and 3 pole breakers. All panelboards shall have a 50% rated ground bus and a 100% rated neutral bus. Branch circuit panelboards shall have main lugs sized for each respective feeder and main bus equal to or greater in capacity than the rating of the respective overcurrent protective device serving the panelboard. Panelboards shall be of dead front construction.

C. Circuit breakers shall be bolt-on quick-make, quick-break, thermal-magnetic and trip indicating. Provision for additional circuit breakers shall be such that field additions of connectors or mounting hardware are not required to add circuit breakers to the panelboard. Alternately number branch circuits in phase sequence (i.e., circuits 1, 3, 5 to be connected to phase A, B, C respectively). Number the left side of a panel 1, 3, 5 reading down from top.

D. Panelboard bus structure shall be tin-plated aluminum with current ratings as shown on the drawings.

E. Each panelboard, as a complete unit, shall have a short circuit current rating equal to or greater than the rating shown on the plans.
F. Provide mounting brackets, bussbar drillings, and filler pieces for unused spaces. Prepare and affix typewritten directory to inside cover of panelboard indicating loads controlled by each circuit. Provide a minimum of three 3/4" conduits stubbed out into ceiling space above recessed panelboards for future expansion.

G. Approved panelboard manufacturers include Square D, Westinghouse, General Electric, and ITE.

2.7 CIRCUIT BREAKERS

A. Furnish and install all individually mounted circuit breakers as indicated on the drawings. Circuit breakers shall have NEMA-I enclosures, surface or flush mounted as indicated. Approved circuit breaker manufacturers include General Electric, ITE, Square D, and Westinghouse.

2.8 WIRING DEVICES

A. Wiring devices, switches, convenience outlets, and all other electrical outlets shall be Underwriters' Laboratory, Inc., listed. All devices shall be specification grade. Provide oversized type 430 stainless steel cover plates for grounding.

B. Switch shall be rated 20 amperes, 277V. Single pole switches shall be Hubbell #1221-I Series. Key-single pole switches shall be Hubbell #1221 Series. Duplex receptacle shall be specification grade, grounding type rated at 15 amperes, Hubbell #5252-I Series. Dimmers shall be Lutron Nova-T series. Color of devices shall match cover plates.

2.9 LIGHTING FIXTURES

A. Light fixture shall be equipped with proper accessories, lenses, louvers, reflectors, shields, hangers, clips, frames, lamps, ballasts, and other essentials for prior installation in or upon walls, ceiling or other construction features. Provide fixtures properly painted for protection and preservation appropriate to the installed location.

B. Install all lighting fixtures in accordance with manufacturer's recommendations, instructions contained herein or on the plans, and field conditions.

C. Provide all necessary accessories for the support or mounting of fixtures. Where necessary, provide bridging between structural members.

D. Mount all recessed fixtures with flanges tight to the finished ceilings. Provide facilities to eliminate light leaks. Include adequate means of support of fixtures by...
the ceiling superstructure or the building structural system. Provide plaster frames to support recessed incandescent fixtures directly from plaster ceiling. Fasten all recessed fluorescent fixtures mounted in lay-in ceilings to the adjacent T-bars by approved clips such as Caddy #515. Provide two ceiling supports at each diagonal corner of fixture.

E. Coordinate lighting fixture trim type with ceiling type prior to ordering.

F. All fixtures shall be underwriters' approved and bear IBEW labels. Ballasts for fluorescent fixtures shall be rapid start, UL approved, class P type, and CBM class "A" sound rated. Approved ballast manufacturers include General Electric, Jefferson, Westinghouse, Universal and Advance.

2.10 TRANSIENT VOLTAGE SURGE SUPPRESSORS

A. Furnish and install a transient voltage surge suppressor directly mounted to the panels indicated for the protection of circuits from lightning induced currents, substation switching transients and (building) internally generated transients resulting from inductive and/or capacitive load switching. Furnish and install a 60A/3P breaker within panel served by suppressor, and #6AWG minimum feeder. Feeder shall not exceed 18 inches in total length. Make connections per manufacturer's requirements.

B. Suppressor shall contain elements between each phase conductor and system neutral, between each phase conductor and system ground, and between the neutral conductor and ground. Suppressor shall have field replaceable hybrid suppression circuitry. Suppressor shall have LED indicator for each phase to indicate proper connection and operation.

C. Suppressor shall provide high frequency noise filtering to 50dB attenuation (100kHz - 100Mhz). Suppressor shall operate at 110% of rated line voltage minimum. Suppressor shall have an impulse current rating (lines to neutral and ground) of 80,000 amps minimum. Suppressor shall provide clamping voltages not to exceed the following:

<table>
<thead>
<tr>
<th>Voltage</th>
<th>L-N</th>
<th>L-G</th>
<th>N-G</th>
</tr>
</thead>
<tbody>
<tr>
<td>120/208</td>
<td>400V</td>
<td>400V</td>
<td>400V</td>
</tr>
<tr>
<td>277/480</td>
<td>800V</td>
<td>800V</td>
<td>800V</td>
</tr>
</tbody>
</table>

Approved suppressor manufacturers include EFI Electronics Corp., Titan BP Series; Liebert/Control Concepts, LG CxxxC 1-50 Series; and Current Technology, DPA Series.
END OF SECTION
PART 1—GENERAL

1.1 DESCRIPTION
A. Surface-mounted raceway systems will be used in certain spaces to route branch circuit power cabling and/or data network voice, video, and other low voltage wiring, and to provide power, and/or data/voice outlets at convenient locations. The surface raceway system shall consist of raceway base, cover, appropriate fittings and device mounting plates necessary to complete the installation in accordance to the electrical and data/voice drawings.

1.2 CODE REQUIREMENTS
A. Surface raceway shall only be used in dry interior locations as covered in Article 352 of the National Electric Code.
B. Use only parts approved by the Underwriters Laboratory (UL listed) for use in applications up to 600 volts between conductors, and up to 300 volts by the Canadian Standards Association.
C. The raceway system shall comply with the TIA/EIA regulations for low voltage cabling.

1.3 SUBMITTALS
1. Submittals shall be provided for any raceway part used in installing the system, and shall include product manufacturer specifications and descriptions.

1.4 WARRANTY
A. Provide a minimum 15 year warranty on any defects.

PART 2—PRODUCTS

2.1 PRODUCTS
A. Surface mounted raceway
1. The raceway shall be of a two piece design with a base and a snap-on cover.
2. Raceway shall have a divider in the middle, dividing the channel into two equal compartments.
3. The data/voice drawings will show the data/voice outlets located on the raceway. Each data/voice outlet shown shall also have a duplex power outlet at the same location. The raceway shall keep the power cabling separated from the data/voice cabling at all times. Use a raceway cover plate with a power duplex receptacle opening immediately next (or on top of) a single-gang opening for the installation of a hardwall data/voice faceplate. The cover plate must allow for the installation of a single-gang hardwall data/voice faceplate, and the raceway must allow the faceplate to be installed without interfering in any way with the power receptacle and plate.

4. A full line of raceway fittings should be used in the installation of the raceway, including (but not limited to) flat, internal and external elbows, couplings for joining raceway sections, wire clips, blank end fittings and a full compliment of device mounting brackets and plates.

5. The raceway cover plates shall typically be 5’ or more in length. Shorter cover plates will only be accepted when their installation is necessary (i.e., next to corners, near to an outlet, and other similar situations). Installing more than two short cover plates next to each other is unacceptable.

6. Gaps between raceway cover plates larger than 3/16” will not be acceptable. Cover any gap larger than 3/16” by using raceway cover separators in the gap.

7. Acceptable Manufacturers
   a) Walker Wiremold 4000 or better. If Wiremold raceway is used, two plates adjacent to each other will have to be used; one for power, and one accommodating a standard hardwall D/V faceplate (for example, use the V 4048B cover for power, and the V 4007C-1 for Data/Voice)
   b) Panduit Pan-Way Type T surface raceway or better, and appropriate cover plates.
   c) Equivalent or better manufacturers will be accepted.

**PART 3—Execution**

2.1 GENERAL
A. Refer to system layout and construction drawings for the routing and location of the system. Installer shall comply with the detailed manufacturer’s instruction sheets which accompany system components as well as complete system instruction sheets, whichever is applicable.

B. The top compartment shall be used to route the power cabling to duplex receptacles inside the raceway, and the bottom compartment shall be used to route the data/voice cabling.

C. The data/voice wiring and hardwall faceplates shall be installed by the data/voice contractor unless otherwise indicated.

D. Raceway channels and associated fittings shall maintain at all times the 1” bend radius required for category 5 compliance of data cabling.

E. All raceway systems shall be mechanically continuous and connected to all electrical outlets, boxes, device mounting brackets, and cabinets, also in accordance with the manufacturer’s installation sheets.

F. All metal raceway shall be electrically continuous and bonded in accordance with the National Electric Code for proper grounding.

G. Raceway shall be securely supported at intervals not exceeding 10 feet or in accordance with the manufacturer’s installation sheets. If the raceway is installed via adhesion, the surface peripheral to the raceway must be kept free of blemishes and stains, and the raceway must be evenly adhered to the surface at all points. No gaps shall exist between the raceway and the surface of installation.

H. Cable quantities must not exceed manufacturer’s recommendations for raceway supplied. Raceway feeds from wall or similar surfaces must at least be 1” in diameter; do not route more than (11) category-5 cables in a 1” feed, or more than (44) category 5 cables in a 2” feed. Feeds from walls must be in conduit stubbed up to the ceiling, and must include pull-strings.

I. All raceway systems shall be installed complete, including insulating bushings and inserts where required by the manufacturer’s installation sheets.

J. All unused raceway openings must be closed. Raceway cover plates shall not have any sizable seams between them, and “play” between cover plates must be minimized as much as possible.
PART 1—GENERAL

1.1 GENERAL SYSTEM DESCRIPTIONS

A. System Documents. In general these specifications and attachments shall be used for all building communications infrastructure upgrades as a generic specification and scope requirements. Along with this document are site specific drawings which include the following information and requirements:

1. Data/Voice outlet locations.
2. Cable tray and J-hook locations to be used when routing cable.
3. IDF closet locations.
4. Communications rooms.
5. Conduit poke thru lay-outs.

B. Data/Voice Network System

The Data/Voice network system shall provide data/voice services throughout the facility. In addition to data services, the system shall provide voice, fax, and personal modem connectivity to each outlet described as containing an Extended Category 5 cable as indicated on the floor plan. In addition, the outlet cabling shall be able to support a 350MHz Extended Category 5 data system, and be easily converted from voice to data service. In general, the cabling system shall have a high speed fiber optic redundant backbone for data services, and a copper voice riser for voice services. The system shall consist of the following:

1. The telecommunication rooms (IDF & MDF closets) shall serve to terminate data and voice outlet cables within 290’ cable distance from each IDF/MDF.
2. Intelligent hubs will be installed in racks in the communications room and the MDF/IDF closets by the owner and are not part of the contract. Refer to details for typical rack layouts.
3. Adjacent to the equipment racks in the communications room, data/voice racks shall be located to provide termination of the fiber-optic cables and copper voice riser cables to the MDF/IDF closets. These racks will also contain Extended Category 5 patch panels for terminating data and voice services.
outlet cables, and voice blocks for station cross-connects and copper riser termination.

4. One (1) Extended Cat. 5 data cable shall be routed from (1) RJ-45 data jack from each D/V outlet. Similarly, one (1) Extended Cat. 5 voice cable shall be routed from (1) separate RJ-45 data jack from each D/V outlet. Cables shall be routed via conduit, J-hooks, and/or cable tray and always supported a minimum of every 4'-0". Data and voice outlet cabling shall terminate in order to the rear of the Extended Cat. 5 patch panels. All cables shall be terminated at both ends with the TIA/EIA 568B pin-out configuration. Each voice outlet cable shall be terminated in the patch panel immediately following the data cable termination from the outlet. These patch panels shall be rack mounted with horizontal cable management between each patch panel. From the front of each patch panel, the owner will install a patch cable to a port on the intelligent wiring hub for data service or to a station cross-connect voice block in the rack for voice service. A fiber optic patch cable will also be installed by the owner between the intelligent wiring hub and the fiber optic patch panel. Fiber optic and copper patch cables will be provided by the owner and are not part of this contract.

5. A copper and fiber riser backbone will be routed between the MDF communications closet to each of the IDF's to provide network and voice connectivity.

6. Refer to the floor plans and detail drawings to identify exact cabling requirements to each outlet type.
1.2 OTHER

A. "By Others" is that which is furnished installed or provided by other contractors or owner. It is shown or indicated on the drawings and specifications.

B. Contractor is to coordinate & schedule his work with the "By Others" work.

C. The owner will furnish equipment as described on the drawings.

PART 2—PRODUCTS

2.1 GENERAL

A. In general, all products shall be UL listed. They shall meet EIA/TIA 568 and TSB 36 & TSB 40 standards.

PART 3—EXECUTION

3.1 GENERAL

A. In general, you shall provide a certified and tested 350 MHz data cabling system to each location.

B. The complete installation shall be installed with highly skilled and trained technicians providing a quality and professional system. Installers shall be trained and certified to install all materials which are specified and also certified to use all system test equipment.

C. The Contractor shall provide a supervisory work force sufficient to efficiently and effectively execute the Contractor's responsibilities.

D. The Contractor shall provide the level of manpower necessary to meet all construction schedules.

E. Generally accepted industry standards, as well as manufacturer's written installation instructions, will be used for in-process quality control and final acceptance of the work installation.

F. Craft personnel will be required to provide and use the proper tools and test equipment in the performance of each activity. Tools must be in good working order and test equipment must be properly calibrated. Contractor is responsible for safe storage of tools, and is responsible for their security.
PART 1—GENERAL

1.1 SUMMARY

This specification shall include all unshielded twisted pair cabling throughout the project. This will include the following types of cable:

A. Data outlet cable
B. Voice outlet cable
C. Data riser cable

1.2 REFERENCES AND QUALITY ASSURANCE

A. All cables shall be UL listed.
B. Cabling shall meet EIA/TIA 568A (Commercial Building Telecommunications Cabling Standard), and TSB 36 & TSB 40 standards.
C. BICSI Telecommunications Distribution Design Manuals.
D. Manufacturer’s instructions and recommendations.

1.3 SUBMITTALS

A. Contractor to provide submittals for all the cabling (both fiber and copper) indicating the following:

1. Cable description
2. Use of cable
3. Product data
4. Specifications outlining cable
5. Testing and qualification data sheets
6. Samples, approximately 12" long.
B. WARRANTY

1. All cables shall be warranted by the manufacturer for a minimum of 15 years from material breakdown and defects.

PART 2 - PRODUCTS

2.1 CABLES

The following is a brief description of each cable’s type along with associated approved manufacturers and part numbers.

A. Data outlet cables

1. Description: Enhanced Category 5, 4 pair, 24 AWG, UTP, green colored jacket, plenum rated

2. Purpose: To provide connectivity from the data jacks throughout the space to the Category 5 patch panels in the IDF/LAN rooms.


B. Voice outlet cables

1. Description: Enhanced Category 5, 4 pair, 24 AWG, UTP, white colored jacket, plenum rated.

2. Purpose: To provide connectivity from the voice jacks throughout the space to the Category 5 patch panels in the IDF/LAN rooms.


PART 3—EXECUTION

3.1 EXECUTION AND INSTALLATION

A. All cables shall be independently supported throughout the entire project.

B. Refer to plans for exact quantity and type of cabling to each outlet.

C. Cables shall be routed in groups of similar types. (E.g., data/voice outlet cables, voice riser cables and fiber optic cables grouped together.)
D. Cables shall be routed at least two feet from any fluorescent ballast or other low level sources of EMI and a least 40 inches from any motors or other high level sources of EMI.

E. The maximum allowable cable length from the outlet to the IDF/LAN room is 90 meters (295 feet).

F. Cables shall be routed in accordance with EIA TIA 568A (Commercial Building Telecommunications Cabling Standards) and TSB 36 & TSB 40 standards.

G. The BICSI Telecommunications Distribution Manuals are to also be used as a guide for cable installations.

H. Horizontal cabling routed above ceilings shall be supported using the following methods.
   1. Routed in cable tray above lay-in ceilings. Refer to the floor plans for existing and new cable tray locations.
   2. Cables supported on J-hooks where indicated on the plans. Refer to the floor plans for existing and new J-hooks locations.
   3. Cables independently supported using cabling clips attached to the above ceiling slab.
   4. Do NOT support any cables to any suspended ceiling supports or suspended ceiling grid.

I. All outlet cables, when not installed in cable tray, shall be loosely bundled and tie wrapped together. Tie wrapping shall occur on three foot intervals throughout the space. Tie wraps should not bite into the cable installation, but should form loosely around the cables as not to depress the cable. Tie wrap 4 pair UTP cables in groups of 25 (maximum).

J. Cables routed vertically.
   1. All cable routed vertically shall be self supported using industry standard strain relief procedures and accessories.
   2. Cables routed vertically will be routed utilizing the telecommunications rooms.
3. Cables are to be supported onto cable rack trays located within the IDF closets.

4. Cable ties shall be used to tie wrap the cabling bundles to the cable rack trays.

5. Tie wrapping should occur on vertical cables to the cable rack trays at 3' 0" intervals.

K. All cables being pulled shall not exceed the manufacturers' recommendations for pulling tensions or 25 lbf which ever is lower. Cables shall not be stretched, stressed, tightly bundled, tightly coiled, kinked or cramped during or as a final installation product. The outside jacket after installation shall be free from nicks, cuts, abrasions, or damage.

L. All cables shall not exceed the manufacturer's recommendations for minimum bending radius upon pulling and completed installation.

M. Cables routed in conduit shall not exceed minimum bend radius or maximum pulling tensions.

N. Provide conduit sleeves around cables as they enter the IDFs, where required. All cores must be sleeved. Sleeves shall have at least a 1" lip into the space from the slab or wall. Provide fireproofing for all locations routed through fire-rated walls.

O. Cables will be routed through the cored openings in the IDF/LAN rooms as indicated on the drawings.

P. All cables shall be tested after installation is complete. Refer to Section 17090. All test results are to be documented. All cables shall pass acceptable test requirements and levels. Contractor will remedy any cabling problems or defects in order to pass or comply with testing. This includes the re-pull on new cable as required at no additional cost to the owner.

Q. Cables shall not be spliced.

R. Both ends of the cabling shall be properly terminated unless otherwise noted.

S. Provide proper temporary protection of cable after pulling is complete before final dressing and termination’s are complete. Do not leave cable lying on floor. Bundle and tie wrap up off of the floor until you are ready to terminate.

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Revised: December 15, 1999
T. Ensure that all cable support hardware (J-hooks and cable tray) are installed before cable installation. At no time shall cables be installed and left unsupported. At no time shall cable be supported by any structure in lieu of specified cable supports.

U. The contractor is responsible for the protection of all telecommunications equipment.

V. Provide labeling for all cables. See section 17070.

END OF SECTION
PART 1—GENERAL

1.1 SUMMARY
A. This specification shall include all fiber optic cabling throughout the project.
B. Quality Assurance and Reference Standards
   2. N.E.C. article 770
   3. BICSI Telecommunications Distribution Methods Manuals
   4. EIA/TIA 568
   5. Underwriters Laboratory

1.2 SUBMITTALS
A. Contractor to provide submittals indicating the following:
   1. Cable description
   2. Use of cable
   3. Product data
   4. Specifications outlining cable
   5. Testing and qualification data

1.3 WARRANTY:
A. All cables shall be warranted for a minimum of 15 years for material breakdown and defects.

PART 2—PRODUCTS

2.1 CABLE: All fiber optic cable used on this job will be 62.5/125 multimode indoor fiber optic cable, FDDI rated, tight buffered with 900 micron buffer plenum rated.
A. Description: 24 strand, 62.5/125 micron, plenum rated.

Minimum band width

160 MHz/kilometer at 850 nanometers
500 MHz/kilometer at 1300 nanometers

Maximum attenuation

3.75 decibels per kilometer at 850 nanometers
1.75 decibel per kilometer at 1300 nanometers

B. Purpose: Routed to provide a fiber optic riser system.

Acceptable manufacturers: Siecor, CommScope

**PART 3 — EXECUTION**

3.1 GUIDELINES

A. Provide fiber optic cable from each IDF to the data communications room. Strand count should consist of one pair of fiber per 24 station cables plus one additional “spare” fiber pair with a minimum of 12 strands to be used. Refer to building riser drawings for exact counts. Fiber optic cable shall be installed inside buildings using the same methods as twisted pair; however, the following guidelines should be observed:

1. Do not exceed maximum pulling tension.
2. Do not exceed minimum installed and long term bend radius.
3. Avoid sharp bends and corners.
4. Provide additional crush/mechanical protection in high risk environments.
5. Do not exceed maximum vertical rise specification unless intermediate tension relief is used.
6. Observe all governing building and fire codes (either by using a properly listed cable or suitable raceway).
7. Secure the fiber optic cable to existing supports or large cables wherever possible.

8. Do not deform the cable jacket, specifically when using cable fasteners or ties.

3.2 When installing fiber optic cable in cable trays or cable rack trays, the following special guidelines should be observed:

A. Install fiber optic cable so as to minimize potential damage when additional cables are installed or retrieved.

B. Maintain minimum bend radius around corners through the use of a fiberguide.

C. All fiber optic cabling shall be routed in innerduct or conduit

D. Secure cable to tray every 12” to 24.”

3.3 Vertical Runs: When installing fiber optic cable in vertical runs, the following special guidelines should be observed:

A. Work from the top down, when possible.

B. Secure the cable in innerduct every 24 to 36 inches to cable rack tray.

C. Install intermediate split wire mesh grip(s) wherever the maximum vertical rise is exceeded.

D. Secure the cable in the riser wiring closets with cable ties or straps as needed to prevent accidental damage to cable.

3.4 Termination Points: When installing fiber optic cable, the following guidelines should be observed at termination and splice points:

A. The amount of cable slack at termination points should allow the cable to be routed to the termination location with enough additional cable to reach a convenient location for the polishing, plus an additional 5 meters or to the furthest point in the communication room; whichever is greater.

B. Termination hardware should be located to allow convenient use, convenient termination, and facilitate routing of additional locations.
C. When routing cable into an equipment rack/cabinet, the minimum bend radius should be maintained in the transition from the floor or ceiling to the rack or cabinet with the use of flexible conduit and a box end connector.

D. In equipment racks, the cable should be secured to the frame with cable ties to prevent accidental snagging of the cable. The use of innerduct is required.

E. Fiber optic warning signs should be placed on all innerduct and conduits containing fiber optic cable. Warning signs can help prevent damage resulting from the cable being mistaken for something else.

3.5 Installation:

A. Yellow pulling compound should be used if making long or difficult pulls to reduce cable drag.

B. When pulling fiber optic cable by any mechanical device (winch etc.) a dynameter must be used to ensure the maximum tensile strength isn't exceeded.

C. The mechanical pulling device will be equipped with clutches or shear pins to ensure this.

D. The fiber cable will be attached to the pull line via the strength member or mesh grip.

E. At each end of a cable run approximately 5 meters of slack should be left for cable repairs, connecting and moving of equipment. Coil up and provide tie wrapping.

3.6 “SC” Terminations:

A. Provide and install an “SC” connector, onto each strand of each end of each cable.

B. Follow manufacturers instructions for installing each connector.

C. Use a 3 micron lapping film for light polishing as required.

D. Install the polished fiber connector onto the back side port of each patch panel.

E. Leave a minimum of 5'-0" of slack of each strand coiled carefully in patch panel tray.

3.7 Install accessories according to instructions packed with them.

A. Install outer door to complete installation.
B. Along with above specifications use 3M's installation product bulletins which accompany each product.

3.8 Labeling: Provide labeling of each cable and each termination. Submit method of labeling for approval. Refer to section 17070 for labeling details.

3.9 Testing

A. The fiber cables will be tested in both directions at 850 nanometers and 1300 nanometers.

B. All test results will be in writing giving all readings, date, tested by, and totals.

C. All testing will start by using an Optical Power Meter (Wilcom Model T339 or approved equivalent).

D. Each strand shall be tested and the following information be turned over to the owner in chart form:

1. From Point-To Point
2. Fiber I.D. Label No.
3. RX Level
4. Attenuation Total
5. Wavelength
6. Reference Level
7. Each strand shall not exceed a level of 3.0db of attenuation.
**PART 1—GENERAL**

1.1 **SUMMARY**

A. The following items will be described as connecting hardware:

1. 48 port, Category 5, UTP data patch panels utilized for terminating the data outlet cabling. Comply with EIA/TIA 568B cabling standard.

2. 100, 200, and 300-pair rack mountable (19”W) 110-block units used to terminate the voice riser in the intermediate communication closets (IDFs). Additional rack mountable blocks will also provide a field to cross-connect the station patch cables to the riser system.

3. 600-pair rack mountable (23”W) 110-block units used to terminate the voice riser system in high density main communication closets (MDFs), as shown on the drawings.

4. 72 and 12 port fiber optic patch panels utilized for terminating the fiber optic riser cable.

5. Fiber optic cable connectors for terminating cables at patch panels.

B. All products shall be UL listed.

1.2 **REFERENCES**

A. Underwriters Laboratories

B. BICSI Telecommunications Distribution Methods manuals

C. EIA/TIA 568, TSB 40

1.3 **SUBMITTALS**

A. Product data

B. One (1) sample of each

1.4 **WARRANTY**

All materials, hardware, components and terminations shall be warranted for a period of 15 years. Any defects in material or workmanship will be replaced in a timely manner by the contractor.

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Revised: April 3, 1998
**PART 2—PRODUCTS**

3.1 PRODUCTS

A. Cat. 5, UTP Data Modular Patch Panel
   1. Description: 48 port, Category 5, wired T568B with labels
   2. Purpose: To provide data outlet cabling termination at the IDF/MDF rooms.
   3. Acceptable products:
      
      | Description          | Part No. |
      |----------------------|----------|
      | ORTRONICS            | OR-852044159 |

B. Rack mountable (19”W) 110-block units
   1. Description: 110-block unit to be installed in the 19”W racks at the IDF. Blocks will be used to terminate the copper risers in the rack, and also to terminate station patch cabling.
   2. Sizes: 100, 200, and 300-pair counts.
   3. Acceptable products:
      
      | Description         | Part No.    |
      |---------------------|-------------|
      | Siemon 100-pair unit| S110D(X)1-100RFT |
      | Siemon 200 pair unit| S110D(X)1-200RFT |
      | Siemon 300 pair unit| S110D(X)1-300RFT |

C. Rack mountable (23”W) 110-block units
   1. Description: 110-block unit to be installed in the 23”W racks at MDFs with high density requirements. Blocks will be used to terminate the copper risers in the rack.
   2. Sizes: 600-pair unit (unit contains 2-300 pair blocks).
   3. Acceptable Products:
D. 72-port fiber optic patch panel, rack mounted

1. Description: 72-port with couplers, plates, blank plates and labeling configured as shown in the drawings for terminating all strands of each fiber optic riser cable.

2. Purpose: For terminating fiber optic riser cables in the IDF/MDF rooms and the MDF room.

3. Acceptable products:

<table>
<thead>
<tr>
<th>Description</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Siecor Patch Panel Cabinet</td>
<td>CCH-04U</td>
</tr>
<tr>
<td>Blank Coupling Panels</td>
<td></td>
</tr>
<tr>
<td>6 port SC Multimode</td>
<td>CCH-CP06-56</td>
</tr>
</tbody>
</table>

E. 12-port fiber optic patch panel, rack mounted

1. Description: 12-port with couplers, plates, blank plates and labeling configured as shown in the drawings for terminating all strands of each fiber optic riser cable.

2. Purpose: For terminating fiber optic riser cables in the IDF rooms.

3. Acceptable products:

<table>
<thead>
<tr>
<th>Description</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Siecor Patch Panel</td>
<td>CCH-01U</td>
</tr>
<tr>
<td>6 port SC Multimode</td>
<td>CCH-CP06-56</td>
</tr>
</tbody>
</table>

F. Multi-Mode Fiber Optic Cable Connectors

1. Description: SC connector

2. Purpose: For terminating fiber optic cabling at the fiber optic patch panels.
3. Acceptable products:

<table>
<thead>
<tr>
<th>Description</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Siecor UniCam SC Connector</td>
<td>95-000-40</td>
</tr>
</tbody>
</table>

**PART 3—EXECUTION**

3.1 GENERAL

A. Provide all hardware and terminations as described to form a complete system.

B. All connecting hardware shall be installed per manufacture’s instructions and recommendations.

C. All terminations shall be as specified or configured as shown on the drawings.

D. All cable/connecting hardware terminations shall meet:

1. EIA/TIA 568 and TSB 36 & 40.
2. BICSI Methods Manual.
3. Industry standards and methods.

E. Fiber optic cable termination shall be field installed. All patch cable (cable assemblies) terminations shall be factory installed.

F. All copper/UTP terminations shall be in proper order and sequence.

G. Proper tools shall be utilized when performing terminations.

H. Terminations onto 110 hardware shall seat properly to maintain the best possible termination.

I. Bring fiber optic cables into patch panels or cabinets at one location. Innerduct around cables shall extend to patch panel or cabinet entrance. Secure cables inside patch panel or cabinet at entrance point by tying Kevlar® fibers, fiber jacket and or strength members. Break out individual fiber cables inside of panel or cabinet. Coil up approximately 6 feet of spare cable before applying SC connector.

3.2 110-BLOCKS CABLE INSTALLATION

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Revised: April 3, 1998
A. Provide necessary quantity of 110 connector block units in the rack for the copper data riser system. Provide labeling on all blocks. Provide wire management for cables.

B. Provide 110 connector block units in the rack for patching station cabling patch cables to the voice riser system. Provide labeling on all blocks. Provide wire management for cables.

C. Coordinate with owner for exact labeling requirements.

D. Refer to the drawings for the exact location. Coordinate exact location with L.E.C. and owner.

E. Labeling type and style shall be per section 17070 and the drawings

F. Punch down individual cable pairs utilizing 110 punch down tool.

3.3 48 PORT CATEGORY 5, UTP, DATA PATCH PANELS

A. Provide the necessary patch panel to terminate all data outlet cables. Mount onto equipment racks and cabinets as indicated in elevations on the drawings.

B. Route individual (4) pair cable to the backside of each patch panel. Punch down cable onto proper port on the backside. Use EIA/TIA 568B standard.

C. Label each port on the front and rear of each panel. Label per section 17070 and the drawings.

D. Maintain twists of each cable pair to the punch down point. Do not strip insulation from each terminating cable more than one half inch.

3.4 FIBER OPTIC PATCH PANELS

A. Provide the necessary quantities of patch panels to terminate all fiber optic cable or mount onto equipment racks and cabinets as indicated in the elevations on the drawings.

B. Terminate fiber optic data riser cables (FDR) onto the back side of duplex couplers using SC connectors.

C. Fiber optic cable connectors

D. Provide a SC connector on each individual strand of each fiber optic cable.
E. Field install SC connector using field termination kit per manufacturer’s instructions.

F. Polish tip of each connector for a maximum dB loss of .3 dB. Polish per manufacturer’s instructions.

END OF SECTION
PART 1—GENERAL

3.1 SUMMARY

A. Data/voice outlets will be located in system furniture at specific locations shown on plans. Feeds to the furniture shall allow for easy pulling of the data/voice cabling, protect and hide all the cabling, and have enough capacity for additional data/voice cabling in the future.

3.2 WARRANTY

A. Provide a minimum 15 year warranty. Contractor shall replace and re-install any defective material within this warranty period.

3.3 REFERENCES AND STANDARDS

A. System furniture feeds shall conform with EIA/TIA and TSB standards.

B. All products and components shall be UL listed.

PART 2—EXECUTION

3.1 GENERAL

A. Provide all system furniture feeds in accordance with construction drawings.

3.2 TYPES

A. Wall system furniture data/voice feeds

1. Data/voice system furniture feeds shall be installed next to the power feeds where possible, but shall be kept separate in the furniture raceway.

2. The wall feed shall consist of a double gang steel backbox in the wall. Two 1.5” conduits shall be routed from the double gang box inside the wall and stubbed up above the ceiling. The box shall be located at the same height as the power feed box, or centered at 6” A.F.F.

3. The backbox shall have a double-gang stainless steel cover plate with a 2” opening on the center to allow the cabling to exit the wall.
4. All cabling exiting the cover plate shall be routed inside a plastic or rubber whip, which must be no longer than 4 feet (i.e. the furniture feed must not be located more than 4 feet from the system furniture cable entrance).

5. The whip must be permanently attached to the wall cover plate, and no gap between the cover plate and the whip shall be visible from the outside. Similarly, the whip should go into the system furniture raceway without any visible gaps between the whip and the furniture, and it shall be permanently attached to the raceway.

6. No more than 30 category-5 cables shall be routed via a system furniture feed. Use additional system furniture feeds for additional cable capacity.

7. If the contractor installing the furniture feed system will not install the data/voice cabling at the same time, pull strings must be provided from the conduit in the ceiling in the backbox, whip, and to the system furniture outlet openings, as to allow easy installation of the cabling by the installers. If the drawings do not indicate any data/voice outlets to be installed in the furniture, the contractor shall prepare at least two outlets in the furniture for future use (i.e. route the pull-strings, and leave two knockouts in the raceway free for use).

8. Contractor shall ensure that the cabling path from the ceiling to the conduits, backbox, whip, and furniture at all times maintains a 1” bend radius in accordance with TIA/EIA category 5 standards.

END OF SECTION
PART 1—GENERAL

1.1 DESCRIPTION
   A. Open, self supporting equipment racks.

1.2 SUBMITTALS
   A. Provide the following submittals:
      1. Product data

1.3 WARRANTY
   A. Provide a minimum 15 year warranty on any defects.

PART 2—PRODUCTS

2.1 PRODUCTS
   A. 19” W Data racks:
      1. Description: Universal self-supporting rack 19” wide hole pattern, 7’-0” high, clear color.
      2. Purpose: For supporting data and voice patch panels and hardware.
         Acceptable manufacturers: CPI, P/N 55053-503
   B. 23” W Data racks:
      1. Description: Universal self-supporting rack 23” wide hole pattern, 7’-0” high, clear color.
      2. Purpose: For supporting high density voice riser blocks and cabling.
         Acceptable manufacturers: CPI, P/N 48383-503

PART 3—Execution

3.1 GENERAL
A. Provide racks in location shown on the drawings. Provide in all IDF closets, MDF room, and Data communications room. Refer to drawings and details.

B. Secure racks to concrete slab using (4) anchor/expansion bolts of 1/2" diameter.

C. Mount racks and cabinets straight and perpendicular to walls.

D. Install with a minimum of 3’0” clearance in front and 4’0” behind the rack.
PART 1—GENERAL

1.1 SUMMARY

A. This section includes:

1. Cable rack tray
   a) Horizontal
   b) Vertical
   c) Accessories

2. J-Hooks

3. Vertical cable management rail

4. 19" cable management unit

5. Cable support bracket and ring

6. Tie Wraps

7. Distribution rings

8. Innerduct

9. Cable rack tray drop out shield

10. Rack Shelf

1.2 REFERENCE

A. BICSI Telecommunications Distribution Methods Manuals

1.3 SUBMITTALS

A. Product data

1.4 WARRANTY

A. Provide a 5 year warranty on all materials and installation methods.
PART 2—PRODUCTS

2.1 CABLE RACK TRAY (HORIZONTAL AND VERTICAL) AND ACCESSORIES.
   A. Description:
      1. 12" and 18" wide ladder style tray
      2. 1-1/2" side rails
      3. 9" rung spacing
      4. Gray color
      5. Mounting accessories (i.e. end supports, wall support brackets, cable drop outs, etc.)
   B. Purpose: For supporting cables in the IDF closets and data communication rooms.
   C. Acceptable Products:
      1. Saunders
      2. Chatsworth

2.2 J-HOOKS
   A. Description: A “J” style hook specifically manufactured for hanging communications cable.
   B. Purpose: To support station outlet cable horizontally above lay-in ceilings.
   C. Acceptable products: Caddy “CableCat” Hanging system.

2.3 VERTICAL CABLE MANAGEMENT RAIL
   A. Description: 7' high x 6" wide cable management rail with rungs on front and rear.
B. Purpose:

1. To support and manage patch cables on front of rack and cabinets.

2. To support and manage cables on back side of equipment racks that terminate onto back side of patch panels.

C. Acceptable Products:

1. Chatsworth part no. 11729-503

2.4 19" HORIZONTAL CABLE MANAGEMENT UNIT

A. Description: 19" wide x 3" high cable management unit. Unit shall have management fingers and covers for front and back sides.

B. Purpose: To support and manage patch cables on front of equipment racks or cabinets.

C. Acceptable products: Superior Modular COMB 3519

2.5 TIE WRAPS

A. Description: Locking straps, plenum and non-plenum rated, sized adequately to properly bundle tie and support cable. Provide plenum rated type in all air plenum spaces.

B. Purpose: To bundle and support cables. Used to provide a neat and orderly cabling installation.

C. Acceptable products: Those which meet the specifications.

2.6 CABLE SUPPORT BRACKET AND RING

A. Description: Offset bracket and threaded bridle ring combined. Bracket is fastened to concrete deck.

B. Purpose: To support cables above lay-in ceilings when not supported by J-Hooks.
C. Acceptable products:

<table>
<thead>
<tr>
<th>Description</th>
<th>Manufacturers</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bracket</td>
<td>&quot;Caddy&quot;</td>
<td>4-TI-B</td>
</tr>
<tr>
<td>Threaded Ring</td>
<td>&quot;Caddy&quot;</td>
<td>4BRT-20</td>
</tr>
</tbody>
</table>

2.7 DISTRIBUTION RINGS

A. Description: An open bracket that can be screw mounted to a plywood backboard.

B. Purpose: To support and dress out cables at plywood backboards.

C. Acceptable products:

<table>
<thead>
<tr>
<th>Description</th>
<th>Manufacturers</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-1-3/4&quot; w ring</td>
<td>Siemon Co.</td>
<td>13B</td>
</tr>
<tr>
<td>3-1-3/8&quot; w ring</td>
<td>Siemon Co.</td>
<td>13C</td>
</tr>
</tbody>
</table>

2.8 INNERDUCT

A. Description: Flexible corrugated duct in plenum and non-plenum versions. Sizes shall be 2", 1-1/4", and 1" diameter.

B. Purpose: To be used to protect fiber optic cabling.

C. Acceptable products:

<table>
<thead>
<tr>
<th>Description</th>
<th>Manufacturers, Inc.</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2&quot; dia. non-plenum rated</td>
<td>Endot Industries</td>
<td>1050</td>
</tr>
<tr>
<td>1-1/4&quot; dia. non-plenum rated</td>
<td>Endot Industries</td>
<td>1250</td>
</tr>
<tr>
<td>1&quot; dia. non-plenum rated</td>
<td>Endot Industries</td>
<td>2000</td>
</tr>
<tr>
<td>1-1/4&quot; dia plenum rated</td>
<td>Endot Industries, Inc.</td>
<td>PL/1250</td>
</tr>
<tr>
<td>Endoclip Connector</td>
<td>Endot Industries, Inc.</td>
<td>Sized for dia. of duct.</td>
</tr>
</tbody>
</table>

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Revised: December 15, 1999
2.9 CABLE RACK TRAY DROP OUT SHIELD

A. Description: Custom made sheet metal drop out shield.

B. Purpose: Drop out shield to protect cables as they are routed out of the cable rack tray and into rack.

C. Acceptable Products: Star Sheet Metal, Phone No. (214) 438-5056

2.10 RACK SHELF

A. Description: 19" wide self supporting shelf.

B. Acceptable Products: Saunders no. SB-596-19-D

PART 3—EXECUTION

3.1 GENERAL:

A. Cable tray

1. Install straight, level and perpendicular to walls and ceiling slabs.

2. Provide accessories to hang, connect and support cable as required. Cable tray to support a minimum of 250 lbs.

3. Support at a maximum of 4'-0" intervals. Provide sufficient support methods to support three times the weight of the cable.

4. Utilize accessories listed. Provide additional accessories, fasteners, concrete anchors, threaded rods, galvanized channels, etc. necessary to support and install the cable rack tray.

5. Provide per the drawings to provide support and cable management of cables.

B. J-Hooks

1. Provide J-hook assemblies on minimum of 4'-0" centers to support all D/V cables. Use J-hooks to support more than six cables.
2. Secure J-hooks (where applicable) to concrete slab using threaded expansion anchor bolts. Drill slab and install expansion bolt.

3. Secure J-hooks (where applicable) to ceiling, slab or roof bar joists.

C. Vertical Cable Management Rail
   1. Provide unit and bolt in between or on each side of equipment racks, or as shown on the elevation details.
   2. Bolt to inside of equipment cabinets (if used) as indicated on the drawings.

D. 19" cable management unit
   1. Provide one unit per data patch panel. Bolt and secure to equipment racks and cabinets as indicated on the drawings.

E. Tie Wraps
   1. Provide around cables and wires to dress-out, manage and support. Use on 12" centers in IDF closets, and data communication room.
   2. Provide tight around riser cables in an "X" fashion for support.
   3. Provide loosely around D/V outlet cables. When installing do not distort the original shape of any individual cable.

F. Cable support brackets and rings:
   1. Combine components to form a support unit. Provide above lay-in ceiling to support cables when cables are not supported by J-hooks. Use to support six or less D/V outlet cables.
   2. Provide on a maximum of 4' intervals. Install above every hardwall D/V outlet location.

G. Distribution Rings
   1. Provide to support cables vertically and horizontally at plywood backboards.
2. Install at approximately 12" on centers. Install at approximately 6" on centers at cable bends.

H. Innerduct

1. Provide around all fiber optic cable.

2. Provide plenum rated duct in plenum rated spaces (i.e. above lay-in ceilings or in cable tray).

3. Support and tie wrap innerduct to cable rack trays (vertical and horizontal), equipment racks and cabinets, raised floor pedestals. Tie wrap at 48" intervals.

4. Leave or provide a pull string in each duct.

5. Support vertical fiber optic cable inside innerducts at a minimum of 8'-0" intervals. Cut an opening in the innerduct and tie wrap cable to cable rack tray.

I. Cable rack tray drop out shield

1. Provide in cable rack tray above racks to support cable as it is routed down to racks. See indications on drawings.

J. Rack Shelf

1. Provide as indicated on the typical drawings of rack elevations.

END OF SECTION
PART 1—GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Through-penetration firestopping in fire rated construction.

1.2 REFERENCES

A. Underwriters Laboratories
   1. UL Fire Resistant Directory
      a) Through-penetration firestop devices (XHCR)
      b) Fire resistance ratings (BXUV)
      c) Through-penetration firestop systems (XHEZ)
      d) Fill, void, or cavity material (XHHW)

B. American Society For Testing And Materials Standards:

C. Local, State, and National Building Codes.

1.3 DEFINITIONS

A. Assembly: Particular arrangement of materials specific to given type of construction described or detailed in referenced documents.

B. Barriers: Time rated fire walls, smoke barrier walls, time rated ceiling/floor assemblies and structural floors.

C. Firestopping: Methods and materials applied in penetrations and unprotected openings to limit spread of heat, fire, gasses and smoke.
D. Penetration: Opening or foreign material passing through or into barrier or structural floor such that full thickness of rated materials is not obtained.

E. System: Specific products and applications, classified and numbered by Underwriters Laboratories, Inc. to close specific barrier penetrations.

F. Sleeve: Metal fabrication or pipe section extending through thickness of barrier and used to permanently guard penetration.

1.4 SYSTEM DESCRIPTION

A. Design Requirements

1. Fire-rated construction: Maintain barrier and structural floor fire resistance ratings including resistance to cold smoke at all penetrations, connections with other surfaces or types of construction, at separations required to permit building movement and sound or vibration absorption, and at other construction gaps.

2. Smoke barrier construction: Maintain barrier and structural floor resistance to cold smoke at all penetrations, connections with other surfaces and types of construction and at all separations required to permit building movement and sound or vibration absorption, and at other construction gaps.

3. All cores into the space must have a sleeve with at least a 1” lip from the slab or wall.

1.5 SUBMITTALS

A. Product data: Manufacturer’s specifications and technical data including the following:

1. Detailed specification of construction and fabrication.

2. Manufacturer’s installation instructions.

B. Shop drawings: Indicate dimensions, description of materials and finishes, general construction, specific modifications, component connections, anchorage methods, hardware, and installation procedures, plus the following specific requirements.

1. Details of each proposed assembly identifying intended products and applicable UL System number, or UL classified devices.
2. Manufacturer or manufacturers representative shall provide qualified engineering judgments and drawings relating to non-standard applications as needed.

C. Quality control submittals:


1.6 QUALITY ASSURANCE

A. Installer's qualifications: Firm experienced in installation or application of systems similar in complexity to those required for this project, plus the following:

1. Acceptable to or licensed by manufacturer, state or local authority where applicable.

2. At least 2 years experience with systems.

B. Local and state regulatory requirements: Submit forms or acceptance for proposed assemblies not conforming to specific UL Firestop System numbers, or UL classified devices.

C. Materials shall have been tested to provide fire rating at least equal to that of the construction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Packing and shipping:

1. Deliver products in original unopened packaging with legible manufacturer's identification.

2. Coordinate delivery with scheduled installation date, allow minimum storage at site.

B. Storage and protection: Store materials in a clean, dry, ventilated location. Protect from soiling, abuse, moisture and freezing when required. Follow manufacturer's instructions.
1.8 **PROJECT CONDITIONS**

**A. Existing conditions:**

1. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.

2. Proceed with installation only after penetrations of the substrate and supporting brackets have been installed.

**B. Environmental requirements:**

1. Furnish adequate ventilation if using solvent.

2. Furnish forced air ventilation during installation if required by manufacturer.

3. Keep flammable materials away from sparks or flame.

4. Provide masking and drop cloths to prevent contamination of adjacent surfaces by firestopping materials.

5. Comply with manufacturing recommendations for temperature and humidity conditions before, during and after installation of firestopping.

1.9 **GUARANTEE**

**A.** Submit copies of written guarantee agreeing to repair or replace joint sealers which fail in joint adhesion, co-adhesion, abrasion resistance, weather resistance, extrusion resistance, migration resistance, stain resistance, or general durability or appear to deteriorate in any other manner not clearly specified by submitted manufacturer's data as an inherent quality of the material for the exposure indicated. The guarantee period shall be one year from date of substantial completion.

**Part 2—Products**

2.1 **THROUGH-PENETRATION FIRESTOPPING OF FIRE-RATED CONSTRUCTION**

**A.** Systems or devices listed in the UL Fire Resistance Directory under categories XHCR and XHEZ may be used, providing that it conforms to the construction type, penetrate type, annular space requirements and fire rating involved in each separate instance, and that the system be symmetrical for wall applications. Systems or devices must be asbestos-free.
1. Additional requirements: Withstand the passage of cold smoke either as an inherent property of the system, or by the use of a separate product included as a part of the UL system or device, and designed to perform this function.

2. Acceptable manufacturers and products.
   a) Those listed in the UL Fire Resistance directory for the UL system involved and as further defined in the systems and applications schedule in Part 3.06 of this section.

3. All permanent firestopping products must be manufactured by 3M company. All trades shall use products from the same manufacturer.

2.2 SMOKE-STOPPING AT SMOKE PARTITIONS
   A. Through-penetration smoke-stopping: Any system complying with the requirements for through-penetration firestopping in fire-rated construction, as specified in the Systems and Applications Schedule in Part 3.06 of this section, is acceptable, provided that the system includes the specified smoke seal or will provide a smoke seal. The length of time of the fire resistance may be disregarded.

2.3 ACCESSORIES
   A. Fill, void or cavity materials: As classified under category XHHW in the UL Fire Resistance directory.
   B. Forming materials: As classified under category XHKU in the UL Fire Resistance directory.

2.4 TEMPORARY FIRESTOPPING
   A. Utilize firestopping pillows for temporary firestopping floor sleeves in the IDF closets.

2.5 MATERIALS TO BE USED SHALL BE MANUFACTURED BY 3M CO.

2.6 Below is a list of materials which should be utilized to form the various firestopping systems. The below list is given for information and price estimating purposes. The contractor must determine the proper firestopping method for each system and utilize required materials and products.

<table>
<thead>
<tr>
<th>Description</th>
<th>3M Part No.</th>
</tr>
</thead>
</table>

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Revised: May 10, 1999
PART 3—EXECUTION

3.1 EXAMINATION

A. Verification of conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.

1. Verify barrier penetrations are properly sized and in suitable condition for application of materials.

2. Do not proceed until unsatisfactory conditions have been corrected.

3.2 CLEANING AND PREPARATION

A. Clean surfaces to be in contact with penetration seal materials, of dirt, grease, oil, loose materials, rust, or other substances that may affect proper fitting, adhesion, or the required fire resistance.

3.3 INSTALLATION

A. Have approved shop drawing of all proposed fireproofing systems from local building inspector and fire Marshall before commencing any work.

B. Provide penetration seal materials in accordance with printed instructions of the UL Fire Resistance directory and in accordance with manufacturer’s instruction.

C. Seal holes or voids made by penetrations to ensure an effective smoke barrier.

D. Where floor openings without penetration items are more than four inches in width and subject to traffic or loading, install firestopping materials capable of supporting same loading as floor.

E. Protect materials from damage on surfaces subject to traffic.

Caulk CP25WB
Intumescent wrap strip FS-195
Mineral wool ---
Moldable putty MPP-2
Composite sheet CS-195
Wrap Strip FS-195
F. Where large openings are created in walls or floors to permit installation of pipes, ducts, cable tray, bus duct or other items, close unused portions of opening with firestopping material tested for the application. See UL Fire Resistance directory.

G. Install smoke stopping as specified for firestopping.

H. Provide temporary firestopping pillows in floor sleeves in IDF closet during construction and before permanent firestopping is installed.

3.4 FIELD QUALITY CONTROL

A. Examine penetration sealed areas to ensure proper installation before concealing or enclosing areas.

B. Keep areas of work accessible until inspection by applicable code authorities.

C. Perform under this section patching and repairing of firestopping caused by cutting or penetration by other trades.

3.5 ADJUSTING AND CLEANING

A. Clean up spills of liquid components.

B. Neatly cut and trim materials as required.

C. Remove equipment, materials and debris, leaving area in undamaged, clean condition.

END OF SECTION
**PART 1—GENERAL**

1.1 **SUMMARY**

A. In general the following items shall receive labeling:

1. Outlets
2. Outlet cables
3. Riser cables
4. Patch panels
5. Patch panel ports
6. Equipment racks and cabinets
7. Voice 110 LAN room blocks
8. Data Riser 110 blocks
9. Ground wires
10. Active hardware and multiplexers

1.2 **REFERENCE**

A. TIA/EIA 606.

1.3 **SUBMITTALS**

A. Provide the following submittals:

1. Product data
2. Product samples
3. Label sample showing example and text size for each item listed in section 1.1 A. above
4. Software program sample
1.4  WARRANTY

A. Contractor shall replace labels within 5 years upon the following defects or faults:

1. Label does not remain adhered to surface because of adhesive failure.

2. Label print fades or becomes unreadable.

PART 2—PRODUCTS

2.1  GENERAL

A. All labels shall be vinyl.

B. All labels shall have an adhesive backing for permanent attachment.

C. All labels shall be of sufficient size. Minimum sizes shall be as follows:

1. 1-1/2"W x 3/16"H for:

   a) Outlets
   b) Outlet cables
   c) Patch panels
   d) Ground wires
   e) Riser cable pairs

2. 4"W x 1"H for:

   a) Riser cables
   b) Equipment racks
   c) MDF frames
   d) Active hardware and multiplexers
2.2 LABEL HOLDERS

A. Labels attached to riser cable bundles shall be installed on a label holder of sufficient size. Label holder to be plastic and have tie wrapping provisions.

2.3 SOFTWARE PROGRAM

A. Software program shall be of the following types or similar:

1. PANDUIT labeling program
2. Brady labeling program
3. T&B labeling program
4. Excel, customized

2.4 TEMPORARY LABELS

A. Vinyl labels, hand written, with permanent marker.

2.5 CHARTS

A. Provide printed charts containing required punch down and cross-connect information. Charts to be computer generated. File information shall be turned over to owner in printed format and on 3.5" disc in an ASCII format 4 weeks prior to job completion.

2.6 “AS-BUILT” PLAN MOUNTED IN FRAME

A. Description: At the completion of the project you shall provide an “as-built“ floor plan of each floor. This plan shall be similar to the contract document floor plans. The plans shall be sandwiched between two (2) sheets of clear Plexiglas approximately 44" W x 38" H. The Plexiglas shall form a frame for the drawing. This frame shall be fabricated to hold drawing securely in place once installed. It must also be constructed to allow the drawing to be easily removed and replaced.
PART 3—EXECUTION

3.1 GENERAL

A. Provide and generate all labeling (no labels will be furnished by the owner).

B. Labels shall be developed and printed using a software program.

C. Software program and all inputs shall be turned over to the owner at the end of the project.

3.2 INSTALLATION

A. All labels shall be installed straight.

B. Provide labels at locations as indicated on the drawings and as follows:
   1. Outlet face plates
   2. Inside of outlet boxes
   3. Outlet cable inside box
   4. Outlet cable in ceiling above outlet
   5. Outlet cables at poke through entrance on both sides
   6. Outlet cable at rear of patch panel.
   7. Port at rear of patch panel
   8. Port on front of patch panel
   9. Individual fiber strands at rear of patch panel
   10. Riser cables whenever exposed on minimum 10' intervals
   11. Riser cable at point of termination
   12. LAN room and MDF punchdown blocks (Voice Outlet and Data Riser blocks)
   13. Ends of any cored cable put in place that is not terminated
14. On front of racks, cabinets frames, active hardware, multiplexers

3.3 TEMPORARY LABELS
A. Provide temporary labels on all outlet cable as it is roughed-in. The bid documents will not show outlet/cable labeling at the time of the cable rough-in. After contract documents have been revised, then replace temporary labels with permanent labels.

3.4 TEXT SIZE AND INFORMATION
A. Text size should be as large and as bold as possible.
B. Exact text required information is shown on the drawings.
C. Refer to drawings for all outlet, outlet cables, and riser cables labels.
D. Refer to the Cover Drawing for exact labeling coding schemes.

3.5 LABELING REFERENCE CHARTS
A. Contractor to provide a labeling reference chart(s) indicating the following:
   1. Voice riser termination of pairs at the IDF and MDF.
   2. Voice outlet cable pair termination at the IDF.
   3. Data patch panel outlet port termination.

3.6 "AS-BUILT" PLAN & FRAME
A. Provide and mount frame with “as-built” on IDF wall, PBX wall and File Server room wall near the data racks or voice blocks, or as indicated on the plans.

END OF SECTION
PART 1—GENERAL

1.1 SUMMARY

1.2 The following systems or cabling shall be tested after the installation is fully completed.

1. Data outlet cabling from outlet to patch panel port.
2. Data riser cables, from each 110 block at IDF/LAN room
3. Fiber optic cabling.
   a) Refer to section 17 024 for fiber optic cabling test requirements

1.3 SUBMITTALS

A. Submit product data of test equipment to be used.
B. Submit sample of reports that will be generated to document test and performance.
C. Submit a document detailing proposed test methods, steps, and sequence of operation.

1.4 REFERENCES AND STANDARDS

A. TIA/EIA 568A, TSB 36, TSB 40, ASTM D 4-566-90, sec.18.
C. Test equipment instructions, recommendations and guidelines.
D. TIA/EIA TSB-67.
E. National Electrical Code, 1996 Edition
PART 2—PRODUCTS

2.1 TEST UNIT

A. In general, test/certification units for all horizontal station cabling shall be capable of performing certification tests on UTP cable and produce test results in hard copy (printed) and disk format.

B. The test/certification unit must be capable of certifying 150 MHz, UTP cable for 100% compliance with EIA/TIA 568 and U.L. specifications for Category 5 cabling.

PART 3—EXECUTION

3.1 CAT. 5 DATA/VOICE OUTLET CABLING SYSTEM CERTIFICATION

A. Each outlet/cable shall be tested and certified in accordance with draft 9 of TIA/EIA TSB-67 and in accordance of the manufacturers instructions and test procedures. Each pair of the end to end system shall be tested. End to end is from the outlet RJ-45 port through the RJ45 port at the category 5 data/voice patch panel. A launch cable shall be used at the test unit end, so that the outlet, outlet termination, cable, patch panel termination, patch panel port and patch cable can be examined in the test. Testing shall occur in both directions (bi-directional). The test requirements for this installation shall comply with, and exceed, EIA/TIA Category 5 specifications.

B. Testing shall use a Microtest PentaScanner unit capable of testing up to 350 MHz.

C. The system, per outlet shall pass the following basic test:

1. Wire map
2. Length
3. Attenuation
4. Near End Cross Talk (NEXT)
5. Structural Return Loss (SRL)
6. Propagation Delay
7. Pentascanner 155Mhz “ATM” test.
D. Test performance. Refer to table at end of section.

E. Test results shall all be positive and favorable. End to end attenuation loss and near end cross talk shall exceed category 5, EIA/TIA 568, TSB36 requirements. Those requirements are as indicated in the table at the end of this section.

F. Successful Test/Certification

1. Contractor shall download results of the certification test unit measurements to a computer program. You shall tabulate individual test results. You shall analyze test results to assure cabling system meets end to end requirements. You shall sign and date each outlet/cable test, documenting a certified and tested 350 MHz system.

2. If a problem or failed test occurs, the contractor shall evaluate and remedy the problem.

3. After a problem has been remedied, the contractor shall re-test circuit and analyze test results and certify. The contractor is to continue this process until required results are achieved and all outlet cabling is 100% certified for 350 MHz transmission.

4. After all problems are remedied, forward all test results to owner. Provide test results in a bound hardcopy format and in an approved, tabulated computer format on disk.

3.2 OTHER COPPER CABLING SYSTEM TESTING

A. Each pair of all other copper cabling shall be tested. Each test shall be performed for end to end results.

B. Testing shall use the Microtest PentaScanner unit. Each outlet/cable test shall include:

1. Overall cable length
2. System continuity
3. Proper connectivity
4. Open pairs
5. Short circuits
6. Reversed pairs

7. EMI noise induction

8. Damaged cable

9. Stretched, chinked or crimped cable

10. Attenuation loss in dB

11. Near end cross talk in dB

C. Successful Test/Certification

1. Contractor shall download results of test unit measurements to a computer program. You shall tabulate individual test results. You shall analyze test results to assure cabling system meets end to end requirements.

2. If a problem or failed test occurs, the contractor shall evaluate and remedy the problem.

3. After a problem has been remedied, the contractor shall re-test circuit and analyze test results. Contractor is to continue this process until required results are achieved.

4. After all problems are remedied, forward all test results to owner. Provide test results in a bound hardcopy format and in an approved, tabulated computer format on disk.
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