NJ School Development Authority
Northern Region Office
375 McCarter HWY
Newark, NJ 07114
Phone: 973-648-8486
Fax: 609-656-4647

Date: 3/26/2009

PROJECT #: PA-0026-C01
DESCRIPTION: See attached

Addendum No. 3

This addendum shall be considered part of the Bid Documents issued in connection with the referenced project. Should information conflict with the Bid Documents, this Addendum shall supercede the relevant information in the Bid Documents.

The Bid Date has been revised from March 26, 2009 to April 8, 2009.

This addendum includes Volume 2 sections 17120, 17130, 17150, 17160, 17170, 17180, 17200, 17270, 17300, 17320, and SECTION PLYGRD – PLAYGROUND EQUIPMENT/PLAYGROUND SAFETY SURFACING, pages 1 – 4 inclusive.

The Addendum is issued for the purpose of amending certain requirements of the Contract Documents, as noted hereinafter, and is hereby made an integral part of the Contract Documents for the above referenced project. Statements made herein shall amend, supersede and take precedence over any made in previously issued documents including previously issued addenda, if any. Unless specifically noted or specified hereinafter, all work shall conform to the applicable provisions of the Contract Documents.

End of Addendum No. 3

3/26/09

NJSDA Date
PM Name: Hassan Eldessoky

Acknowledgement of Receipt of Addendum

Contractor must acknowledge the receipt of the Addendum by signing in the space provided below and returning via fax to (609-656-4647). Signed acknowledgement must be received prior to the Bid Due Date. Acknowledgement of the Addendum must be made in Section E.6 of the Price Proposal Submission.

Signature	Print Name
Company Name	Date

SECTION 17120
MDF AND SERVICE ENTRANCES

PART 1 – GENERAL

1.0 RELATED DOCUMENTS

A. Drawings, General Conditions, and Special Conditions related to this project are found in this Section, as well as the other Sections included in the Contract Documents.

a. It is the obligation and responsibiiity of the CONTRACTOR to carefully read all Sections and Divisions in order to ensure compliance with this specification.

1.1 SCOPE OF WORK

A. Refer to Section 17100 for details.

1.2 SCOPE OF SPECIFICATION

A. This section includes the minimum requirements for equipment, termination hardware and cable for the following:

1. Floor Mounted Relay Racks
2. Floor Mounted Cabinets
3. Cable Management Hardware
4. Ladder Rack
5. Patch Panels – Category 6
6. Rack Mounted 110 System Blocks

1.3 SUBMITTALS

A. The CONTRACTOR shall submit product data (manufacturer catalog cut sheets) for all equipment to be used as part of their solution to the engineer and shall not install any equipment until such product data sheets have been approved in writing.

B. See Sections 17030 for additional requirements.

1.4 FUNCTIONAL SYSTEM DESCRIPTION

A. Refer to Section 17100 for details.

PART 2 – PRODUCTS

2.1 FLOOR MOUNTED RELAY RACK

A. Racks shall meet the following physical specifications:

1. 19" EIA rack mounting space
2. 4 post construction
3. 7 foot high (nominal)
4. Lightweight, high strength aluminum construction
5. Self-supporting
6. Heavy duty top angles and cross bars.
7. Base shall be configured with four (4) ¾" bolt down holes.
8. Double sided 12/24 tapped holes and EIA universal rack 5/8" to 5/8"- ½" standard hole pattern (compatible with 11/4"" – ½" hole patterns)

B. Rack shall come equipped with vertical cable management that extends the full height of the rack to be located at each post.

C. Acceptable Manufacturers

1. Chatsworth
2. Hubbell
3. Datatel
4. Or approved equal

2.2 OOR MOUNTED CABINET

Deleted: F

A. Floor mounted cabinets shall meet the following specifications:

1. 19" EIA rack mounting space
2. Lightweight, high strength aluminum construction
3. 7 foot high (nominal)
4. Lockable perforated metal or Plexiglass, hinged door on front and solid metal, hinged door in rear.

5. Vented roof with dual 100 CFM muffin fans

6. Removable side panels.

7. Leveling feet

8. Vertical Cable Management

9. Double sided 12/24 tapped holes and EIA universal rack 5/8" to 5/8"- ½" standard hole pattern (compatible with 11/4"" – ½" hole patterns)

C. Acceptable Manufacturers, unless otherwise approved by ENGINEER:

1. Chatsworth

2. Hubbell

3. Datatel

4. Or approved Equal

2.3 CABLE MANAGEMENT HARDWARE

A. Cable Management Hardware shall meet the following specifications:

1. Cable management shall be constructed of aluminum with integral wire retaining fingers

2. Vertical cable management panels shall have front and rear channels

3. Vertical cable management panels shall have removable front and back covers

4. A horizontal crossover cable manager shall be provided at the top of each relay rack, with a minimum height of 2 rack units each.

5. A horizontal crossover cable manager shall be provided near the center and at the bottom of each relay rack, with a minimum height of 4 rack units.

6. Acceptable Manufacturers:

a. Siemon

b. Hubbell

c. Superior Modular

d. Or approved equal

2.4 LADDER RACK

A. Ladder Rack shall meet the following specifications:

1. The CONTRACTOR shall provide ladder rack in the MDF and IDF's as indicated on the attached drawings to allow a smooth transition from the cable tray to the vertical equipment cabinets.

2. The CONTRACTOR shall provide connecting and support hardware to complete the installation. Including but not limited to, rack to runway mount plate, wall angle support bracket, connect junction, grounding/bonding kit.

3. The ladder rack shall be capable of mounting to floors, walls, ceilings, equipment racks and cabinets.

4. The ladder rack shall be of modular construction to allow for future expansion.

5. Rack shall be a hollow or solid side bar nominally 3/8" thick by 1 ½" high with rungs 9" on center.

6. Side bars shall be painted black.

7. The ladder rack shall be capable of supporting 45 lbs/ft weight.

8. Acceptable Manufacturers:

   a. Datatel

   b. Hubbell

   c. Wiremold

   d. Or approved equal

2.5 PATCH PANELS - CATEGORY 6

A. Category 6 Patch Panels shall meet the following specifications:

1. The patch panels shall support the appropriate Category 6 applications and facilitate cross-connection and inter-connection using modular patch cords.

2. The patch panels shall be sized to fit an EIA standard, 19-inch relay rack, or be capable of mounting to a wall.

3. The patch panels shall accommodate at least 24 ports for each rack mount space (1rms = 44.5 mm [1.75 in.]).

4. The patch panels shall have circuit boards tested in both directions as required by ANSI/TIA/EIA-568-B.1 and ISO/IEC 11801.

5. The patch panels shall use modular ports that allow relocation of the port to a different panel without the need to reterminate the wire ends.

6. The patch panels shall have port identification numbers on both the front and rear of the panel.

7. The patch panels shall include rear cable management bars.

8. The patch panels shall have Category 6 jacks available in both T568A and T568B wiring schemes.

9. The patch panels shall allow for a minimum of 200 re-terminations without signal degradation below standards compliance limit.

10. The patch panels shall be made of a steel frame with black power coat finish.

11. The patch panels shall have paired punch down sequence to allow pair twist within ½" of the termination.

12. Acceptable Manufacturers:

    a. Siemon

    b. Hubbell

    c. Superior Modular

    d. Or approved equal

2.6 RACK MOUNTED 110 SYSTEM BLOCKS

A. Where the design as indicated on the attached drawings requires the use of wall mounted 110 System Blocks, this equipment shall meet the following specifications:

1. The connecting hardware block shall support the appropriate Category 6, applications and facilitate cross-connection and/or inter-connection using either approved cross-connect wire or patch cords.

2. Shall be 110 System IDC style blocks.

3. Be UL VERIFIED or equivalent for TIA/EIA proposed Category electrical performance.

4. Be ANSI/TIA/EIA-568-B.1 and ISO/IEC 11801 Category 6 compliant.

5. Be made of flame-retardant thermoplastic.

6. Blocks shall include means to identify cables/services per ANSI/TIA/EIA-606.

7. All connecting blocks shall have color-coded tip and ring designation markers and be of single piece construction.

8. Have connecting blocks with a minimum of 200 re-terminations without signal degradation below standards compliance limit.

9. Support wire sizes: Solid 22-26 AWG (0.64 mm - 0.40 mm), and 7-strand wires.

10. Be made by an ISO 9001 Certified Manufacturer.

11. Provide keep-off indicator buttons on all active cross-connected pairs used for alarm and security purposes. Coordinate the color and use with the owner's representative.

PART 3 – EXECUTION

3.1 CABLE SUPPORTS

A. Provide "D" rings on 2 ft. center for all exposed wall mounted vertical Category 6 cable runs.

B. Keep horizontal wall mounted cable runs to a minimum. In general horizontal runs shall be on wall mounted ladder rack.

C. Provide cable brackets 3' on center supported to building structure for all cable runs not supported by cable tray.

3.3 110 SYSTEM BLOCKS

A. Installed on plywood backboard so that top of 300 pair block is 5'6" AFF.

B. Mount Blocks with steel, zinc plated 5/16" slotted hex head #10 x 3/4" drill screws, minimum four screws per block.

C. Install designation strips color-coded in conformance with EIA/TIA 606 standard.

D. Install insulator clips (sometimes called keep-offs) on all Life and Safety special circuits in the Telecommunications Rooms (TRs), coordinate desired color code requirements with the owners representative.

3.4 GROUNDING

A. See Section 17100 Cable Plant for grounding requirements.

3.5 MISCELLANEOUS REQUIREMENTS

A. All cables shall be neatly "dressed out" in equipment rooms to comply with TIA/EIA standards.

B. The CONTRACTOR shall provide service loops on all cables terminated in the MDF and IDF's.

C. The CONTRACTOR shall fire-stop all sleeves and conduit openings after the cable installation is complete.

END OF SECTION 17120

SECTION 17130 - INTERIOR COMMUNICATIONS PATHWAYS

PART 1 - GENERAL

1.0 RELATED DOCUMENTS

A. Drawings, General Conditions, and Special Conditions related to this project are found in this Section, as well as Division 16 included in the Contract Documents.

1. It is the obligation and responsibility of the CONTRACTOR to carefully read all Sections and Divisions in order to ensure compliance with this specification.

1.1 SCOPE OF WORK

A. Refer to Section 17100 and Division 16 (Electrical) for details.

1.2 SCOPE OF SPECIFICATION

A. This section includes the minimum requirements for the following:

1. EMT Conduit and Cable Tray Systems
2. Surface Metal Raceway Systems
3. Wireless Access Boxes
4. Fire Stopping Materials

1.3 SUBMITTALS

A. The CONTRACTOR shall submit product data (manufacturer catalog cut sheets) for all equipment to be used as part of their solution to the ENGINEER and shall not install any equipment until such product data sheets have been approved in writing.

B. See Section 17030 for additional requirements.

C. As-Built Drawings

1.4 QUALITY ASSURANCE

A. All installation work for the interior telecommunications pathways shall be performed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated shall be subject to the control of the PMF; Architect; MEP and Technology Engineer.

B. Equipment and materials shall be of the quality and manufactures indicated. The equipment specified is based on the acceptable manufacturers listed. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval of the PMF, Architect, MEP and Technology Engineer based on submittals provided.

C. Materials and work specified herein shall comply with the applicable requirements of:

1. ANSI/NFPA 70 – National Electrical Code including; but not limited to, the following articles:
    a. 250 – Grounding
    b. 300 – Wiring Methods
    c. 314 – Outlet, Device, Pull, and Junction Boxes; Conduit Bodies; Fittings; and Manholes
    d. 358 – Electrical Metallic Tubing: Type EMT
    e. 386 – Surface Metal Raceways
    f. 392 – Cable Trays
2. ANSI/TIA/EIA-568-B.1 – Commercial Building Telecommunications Cabling Standard – Part 1: General Requirements, including applicable addendum
3. ANSI/TIA/EIA-569-A – Commercial Building Standard for Telecommunications Pathways and Spaces, including applicable addendum
4. ANSI/TIA/EA-606 – Administration Standard for Telecommunications Infrastructure of Commercial Buildings
5. ANSI/TIA/EIA-607 – Commercial Building Grounding and Bonding Requirements for Telecommunications
6. BICSI Telecommunications Distribution Methods Manual

1.5 FUNCTIONAL SYSTEM DESCRIPTION

A. Refer to Section 17100 and Division 16 (Electrical) for details.

B. Refer to Architectural Scaled drawings for lengths of cable trays.

PART 2 - PRODUCTS

2.1 EMT CONDUIT AND CABLE TRAY SYSTEMS

A. Electrical Metallic Tubing (EMT): Electro-galvanized steel tubing 1-1/4" and larger diameter per project requirements:

1. Conduit joint couplings and connectors: steel double set screw indenter fittings
2. Metal bushings for 1-1/4" and conduit
3. Insulated metallic bushings for 1-1/4" and larger conduit
4. Insulated metallic bushings with grounding lugs as required
5. Conduit sweeps: minimum 10 times the conduit inside diameter
6. Include required conduit straps, and hangers, heavy-duty malleable iron or steel. Perforated pipe strap, j-hooks, bridle rings, or wire hangers are not permitted.
7. LB fittings and plastic fittings are not permitted
8. Nipple runs from one outlet box to another outlet box are not permitted.

B. Outlet boxes: Galvanized steel sheet metal 4" x 4" x 2-1/8" deep minimum with single gang mud ring

C. Pull-boxes: Minimum 14 gauge galvanized steel with screw fastened cover and trim for flush or surface mounting as required for the project. Dimensions as required for the project.

D. Metal Flex Conduit (1-1/4") and deep Cut-In Boxes where required.

E. Pull-rope: Polypropylene monofilament line with a minimum pull tensile strength of 200 pounds.

F. Cable Trays in Ceiling

1. Cable Trays shall be centered in the corridors and placement shall be coordinated with Division 16 (Electrical – MEP) specifications.
2. Welded wire mesh cable system, 12" wide x 4" deed
3. Depending on design cable tray shall accommodate minimum of 60 category 6 cables and maximum of 715 category 6 cables
3. Include components, and compatible fittings designed and manufactured by the cable tray manufacturer as required for a fully installed electrically continuous system
4. Include support kits, brackets, threaded rod hangers, lateral threaded rod braces, and other anchors and supports as required.
5. Acceptable manufacturers:
   a. Wiremold
   b. Snake Tray
   c. Hubble
   d. Or Approved Equal

G. "J"-Hooks or "D"-Rings in Ceiling Areas:

1. Shall be placed no more than four (4) feet apart on center.

H. Labels for conduit, pull-boxes, and cable trays: 1" x 2" yellow background with 3/8" lettering to read "TELECOM"

2.2 SURFACE METAL RACEWAY SYSTEMS

A. Two-piece either single or dual channel steel raceway with ivory color finish – Unless specific color finish is required.

B Include all parts and components: base and cover, compatible fittings, insulated bushings, and supports designed and manufactured by the raceway manufacturer as required for a complete installation.

2.3 WIRELESS ACCESS BOXES (If required by project)

A. Wall-mounted enclosure for Wireless Access Equipment

1. Vented Steel enclosure 11" x 8" x 3"
2. Finish matching wall plates

3. Continuous hinge swing door with keyed lock
4. Knockouts for cable entry/exit
5. Two 1" antenna openings 5" apart on top of enclosure
6. Include components and compatible fittings from the manufacturer as required for a complete installation

B. Ceiling Enclosure for Wireless Access Equipment

1. Plenum-rated enclosure
2. Mounts in standard 2' x 2' or 2' x 4' ceiling tile
3. Continuous hinge swing down door with keyed lock
4. Cable entry/exit opening with approved fire-rating foam kits
5. Two 1" antenna openings 5" apart on bottom of enclosure
6. Include components and compatible fittings from the manufacturer as required for a complete installation.

2.4 FIRE STOPPING

A. Fire Stopping materials used for this project shall comply with the following:

1. Products shall allow for normal expansion and contraction movement of the penetrating item without failure of the penetration seal.

2. Products shall emit no hazardous, combustible, or irritating by-products during installation or curing period.

3. Products shall not require special tools for installation.

4. Products shall provide penetration seal assemblies whose fire-resistance ratings have been determined by testing in the configurations required and which have fire-resistance ratings at least as high as that of the fire-rated assembly in which they are to be installed.

5. The CONTRACTOR shall use any tested assembly, which complies with the requirements of the specification.

6. All fire stopping shall be manufactured by the following:

   a. Bio Fireshield, Inc.

   b. Dow Corning Corp.

   c. GE Silicones, Hilti, Inc.

   d. 3M Ceramic Materials.

   e. Or approved equal

PART 3 - EXECUTION

3.1 PATHWAYS

A. Pathways shall be designed and installed to meet applicable local and national building and electrical codes or regulations and shall have no exposed sharp edges that may come into contact with data or telecommunications cables.

B. All wall penetrations shall be installed with sleeves that shall have no exposed sharp edges that may come into contact with data or telecommunications cables.

C. The number of cables placed in a pathway shall not exceed manufacturer specifications, nor, will the geometric shape of a cable be affected.

D. Pathways shall not be located in elevator shafts unless specifically approved by the ENGINEER in writing.

3.2 CABLE ROUTING

A. No cable runs of UTP cable shall exceed two-hundred and ninety (290) feet.

B. Cables run in underground conduit systems shall not exceed forty percent (40%) of the conduit space.

C. The number of horizontal cables placed in a cable support or pathway shall not exceed a 40% fill.

D. The combined length of jumpers, or patch cords and equipment cables in the MDF/IDF and the work area should not exceed 33 feet.

E. Horizontal pathways shall be installed or selected such that the minimum bend radius of horizontal cables is kept within manufacturer specifications both during and after installation.

F. Cable pathways, which run parallel with electric power or lighting that is less than or equal to 480 Vrms, shall be installed with a minimum clearance of 6 in.

G. Cabling shall be installed to maintain a minimum clearance of 10 feet from power cables equal to or in excess of 480 Vrms.

H. No cable cross-connects shall be physically located within 20 feet of electrical distribution panels, step down devices, or transformers, which carry voltages equal to or in excess of 480 Vrms.

I. For voice or data applications, 4-pair UTP or fiber optic cables shall be run using a star topology from the telecommunications room/closet serving that floor to every individual information outlet.

J. The CONTRACTOR shall observe the bending radius and pulling strength requirements of the 4-pair UTP/ScTP and fiber optic cable during handling and installation.

K. Each run of UTP/ScTP cable between horizontal portion of the cross-connect in the MDF/IDF(s) and the information outlet shall not contain splices.

L. In the MDF/IDF(s) where cable trays or cable racking are used, the CONTRACTOR shall provide appropriate means of cable management such as reusable color-coded hook and loop cable managers (ties) to create a neat appearance and practical installation.

M. Continuous conduit runs installed by the contractor should not exceed 100 feet or contain more than two (2) 90 degree bends without utilizing appropriately sized pull boxes.

N. All horizontal pathways shall be designed, installed and grounded to meet applicable local and national building and electrical codes.

O. Horizontal distribution cables shall not be exposed in the work area or other locations with public access.

P. All conductors in a cable shall be properly terminated at both ends.

3.3. FIRE PROTECTION

A. All wall penetrations shall require properly installed firestop systems code compliant that shall be installed to prevent or retard the spread of fire, smoke, water, and gases through the building.

B. Sheathing installed for wall penetrations must also be firestopped.

C. Fire stops shall be done to applicable code using approved materials.

END OF SECTION 17130

SECTION 17150
BACKBONE CABLING REQUIREMENTS

PART 1 – GENERAL

1.0 RELATED DOCUMENTS

A. Drawings, General Conditions, and Special Conditions related to this project are found in this Division, as well as the other Divisions included in the Contract Documents.

1. It is the obligation and responsibility of the CONTRACTOR to carefully read all Sections and Divisions in order to ensure compliance with this specification.

1.1 SCOPE OF WORK

A. Refer to Section 17100 for details.

1.2 SCOPE OF SPECIFICATION

A. This section includes the minimum requirements for the following:

1. Backbone Cabling

1.3 SUBMITTALS

A. The CONTRACTOR shall submit product data (manufacturer catalog cut sheets) for all equipment to be used as part of their solution to the ENGINEER and shall not install any equipment until such product data sheets have been approved in writing.

B. See Section 17030 for additional requirements.

1.4 FUNCTIONAL SYSTEM DESCRIPTION

A. Refer to Section 17100 for details.

PART 2 - PRODUCTS

2.1 BACKBONE CABLING

A. Backbone Cabling is defined as the cabling and the associated connecting hardware that links the MDF in the equipment room to an IDF and Horizontal Cross-connects (HC) within the same building.

B. All Backbone Cable used for the transmission of data that exceeds the 290-foot limitation shall comply with the following specifications:

C. All Backbone Cable used for the transmission of data that does not exceeds the 290 foot limitation shall comply with the following specifications:

1. UTP Category 6 cable shall comply with the following specification:

   a. Pairs 4

   b. Insulation Teflon or approved equal

   c. Color Data – Yellow
      Voice – Blue

   d. Type 24 AWG Twisted

   e. Impedance 100 ohms ± 15% across the band

   f. Attenuation/100m
      5.6 db @ 10 MHz
      7.9 db @ 20 MHZ
      18.4 db @ 100 MHz
      27.0 db @ 200 MHz
      37 db @ 350 MHz

   g. Capacitance 4.4 nF/100m @ 100 MHz

   h. DC Resistance 8.9 Ohms/100m @ 100 MHz

   i. PS-NEXT
      68.0 db @ 10 MHz
      62.0 db @ 20 MHz
      51.0 db @ 100 MHz
      47.0 db @ 200 MHz
      43.0 db @ 350MHz

   j. SRL
      20.0 db @ 350MHz (Typical)
      23 db @ 100 MHz (minimum)

   k. ACR, NEXT Attenuation, SRL have to be specified and tested to 350MHz at the manufacturer location.

   l. Minimum ACR rating must show 10 dB at 250 MHz.

   m. Minimum SRL rating must show 20 dB at 350 MHz.

   n. Must be PS-NEXT performance ETL verified to TIA/EIA 568-B.1 and ISO/IEC 11801

2. Acceptable Manufacturers:

   a. Commscope

   b. General Cable

c. Hitachi

d. Mohawk

e. Or approved equal

D. All Backbone Cable used for the Audio/Video Systems shall comply with the following specifications:

1. The CATV backbone shall be plenum rated, single coaxial cable consisting of RG-11/U type center copper conductor coaxial cable for TV Video distribution. This RG-11/U type cable shall have the following specifications:

- Gauge: - 14
- Insulation & Nominal - FEP
- Jacket Color - White
- Core O.D.: - 0.27 inches
- Nominal O.D. - 0.387 inches
- Percent Shielding: - 95% minimum coverage
- Shield Material: - Duofoil and tinned copper braid
- Nom. D.C.R. - 1.5 ohms//M
- Nom. Imp. - 75 ohms
- Nom. Vel of Prep. - 82%
- Nom. Capacitance: - 16.5 PF/Ft. (54.1 PF/m)
- Nom. Attenuation: - .39 dB/100 ft @ 10 MHz

2. Acceptable Manufacturers

a. Commscope

b. Belden

c. Olympic

d. Or approved equal

E. The use of indoor/outdoor cabling manufactured by approved manufacturers that may not meet all the specifications provided above will be allowed following the review and approval of the ENGINEER is writing.

PART 3 - EXECUTION

3.1 CABLING METHODS

A. Cabling Methods shall with the specifications outlined in Section 17130.

3.2 PATHWAYS

A. All pathways established for the installation of backbone cabling shall comply with specifications outlined in Section 17130.

END OF SECTION 17150

SECTION 17160
HORIZONTAL CABLING REQUIREMENTS

PART 1 – GENERAL

1.0 RELATED DOCUMENTS

A. Drawings, General Conditions, and Special Conditions related to this project are found in this Division, as well as the other Divisions included in the Contract Documents.

1. It is the obligation and responsibility of the CONTRACTOR to carefully read all Sections and Divisions in order to ensure compliance with this specification.

1.1 SCOPE OF WORK

A. Refer to Section 17100 for details.

1.2 SCOPE OF SPECIFICATION

A. This section includes the minimum requirements for the following:

1. Horizontal Cabling

1.3 SUBMITTALS

A. The CONTRACTOR shall submit product data (manufacturer catalog cut sheets) for all equipment to be used as part of their solution to the ENGINEER and shall not install any equipment until such product data sheets have been approved in writing.

B. See Section 17030 for additional requirements.

1.4 FUNCTIONAL SYSTEM DESCRIPTION

A. The Voice/Data Horizontal Cabling will be run from the Intermediate Distribution Frame Room (IDF) located at the each floor of the building to the classrooms/offices. If it is determined that the LAN cabling for any run exceeds the 290 foot distance limitation, another IDF will have to be established. It is the Contractors responsibility to notify the Engineer of any distance limitation, prior to installing the cabling.

PART 2 - PRODUCTS

2.1 HORIZONTAL CABLING

A. The horizontal cabling subsystem is the portion of the cabling system that extends from the work area outlet/connector (wall jack) to the horizontal cross-connect in the Main or Intermediate Distribution Frame Room (MDF or IDF as applicable). It consists of the outlet/connector, the horizontal cables, consolidation point (if required), and that portion of the cross-connect in the MDF/IDF serving the horizontal cable. Unless otherwise indicated, each floor of the building is served by its own horizontal cabling subsystem

B All UTP and cables shall conform to ANSI/TIA/EIA-568-B.1 Commercial Building Telecommunications Cabling Standard (latest amendment and including all applicable addenda) and ISO/IEC 11801 (International) Generic Cabling for Customer Premises standard (latest amendment and including all applicable addenda).

1. UTP Category 6 cable shall comply with the following specification:

   a. Pairs 4

   b. Insulation Teflon or approved equal

   c. Color Data – Yellow
      Voice – Blue

   d. Type 24 AWG Twisted

   e. Impedance 100 ohms ± 15% across the band

f.	Attenuation/100m	5.6 db @ 10 MHz 7.9 db @ 20 MHZ 18.4 db @ 100 MHz 27.0 db @ 200 MHz 37 db @ 350 MHz
g.	Capacitance	4.4 nF/100m @ 100 MHz
h.	DC Resistance	8.9 Ohms/100m @ 100 MHz
i.	PS-NEXT	68.0 db @ 10 MHz 62.0 db @ 20 MHz 51.0 db @ 100 MHz 47.0 db @ 200 MHz 43.0 db @ 350MHz
j.	SRL	20.0 db @ 350MHz (Typical) 23 db @ 100 MHz (minimum)

   k. ACR, PS-NEXT, Attenuation, SRL have to be specified and tested to 350MHz at the manufacturer location.

   l. Minimum ACR rating must show 10 dB at 250 MHz.

   m. Minimum SRL rating must show 20 dB at 350 MHz.

   n. Must be PS-NEXT performance ETL verified to TIA/EIA 568-B.1 and ISO/IEC 11801

2. All horizontal cabling shall be manufactured by the following:

1. CommScope
2. General Cable
1. Hitachi
2. Mohawk
3. Or approved equal

C. The CATV drops shall be plenum rated, single coaxial cable consisting of RG-6/U type center copper conductor coaxial cable for TV Video distribution.

1. This RG-6/U cable shall have the following specifications:

- Gauge: - 18
- Insulation & Nominal - FEP
- Jacket Color - Blue
- Core O.D.: - 0.17 inches
- Nominal O.D. - 0.273 inches
- Percent Shielding: - 90% minimum coverage
- Shield Material: - Duofoil and tinned copper braid
- Nom. D.C.R. - 1.8 ohms//M
- Nom. Imp. - 75 ohms
- Nom. Vel of Prep. - 82%
- Nom. Capacitance: - 16.5 PF/Ft. (54.1 PF/m)
- Nom. Attenuation: - .66 dB/100 ft @ 10 MHz

2. All horizontal cabling shall be manufactured by the following:

1. CommScope
2. Belden
3. Mohawk
4. Or approved equal

D. The CCTV drops shall be plenum rated, single integrated Category 6 cable consisting of twisted pair copper conductor cable for CCTV cameras distribution.

1. This Integrated cable shall have the following specifications:

- Gauge: - 18 AWG
- Insulation & Nominal - FEP
- Jacket Color - Blue
- Core O.D.: - 0.17 inches
- Nominal O.D. - 0.273 inches

2. All horizontal cabling shall be manufactured by the following:

1. CommScope
2. General Cable
3. Hitachi
4. Mohawk
5. Or approved equal

PART 3 - EXECUTION

3.1 EXECUTION OF WORK

A. Cable Termination

1. All UTP/ScTP cables wired to outlet/connector shall have all pairs terminated.
2. The cable outlet/connector shall be securely mounted at planned locations.
3. All data faceplates shall be configured to house six (6) jack positions.
4. The CONTRACTOR shall provide six (6) foot long, terminated, jumper cables for use between the Patch Panels and the Switches.
   a. Jumper cables shall have the same jacket color as the system they support.
   b. The CONTRACTOR shall provide seven (7) and ten (10) foot long connection cables for connection of the OWNER'S PC's to their appropriate jack plates. The number of each provided shall be divided equally between the total number of drops.

B. Pulling Tension

1. The maximum cable pulling tensions shall not exceed manufacturer's specifications.
2. The use of winches to pull cable is NOT permitted.

C. Bend Radius

1. The maximum cable bend radii shall not exceed manufacturer's specifications. At a minimum the bend radius on 4-pair UTP/ScTP cable shall not exceed eight times the outside diameter of the cable and ten times for multi-pair cable. This shall be done unless this violates manufacturer specifications.

2. At cable terminations, the maximum bend radius for 4-pair UTP/ScTP cable shall not exceed four times the outside diameter of the cable and ten times for multi-pair cable. This shall be done unless this violates manufacturer specifications.

D. Slack

1. In the work area, UTP cables shall installed with a minimum of twelve (12) inches of slack.

2. In the MDF/IDF room(s) a minimum of ten (10) feet of slack should be left for all cable types. This slack must be neatly coiled or otherwise managed on trays or other support types.

E. Cable Tie Wraps

1. Tie wraps shall be used at appropriate intervals to secure cable and to provide strain relief at termination points. These wraps shall not be over tightened to the point of deforming or crimping the cable sheath.

2. Hook and loop cable managers should be used in the closet where reconfiguration of cables and terminations may be frequent.

END OF SECTION 17160

SECTION 17170
TESTING, IDENTIFICATION AND ADMINISTRATION

PART 1 – GENERAL

1. RELATED DOCUMENTS

A. Drawings, General Conditions, and Special Conditions related to this project are found in this Division, as well as the other Divisions included in the Contract Documents.

1. It is the obligation and responsibility of the CONTRACTOR/VENDOR to carefully read all Sections and Divisions in order to ensure compliance with this specification.

1.1. SCOPE OF WORK

A. Refer to Section 17100 for details.

1.2. SCOPE OF SPECIFICATION

A. This section includes the minimum requirements for the following:

1. Testing and Identification of equipment and materials provided under this contract.

1.3. SUBMITTALS

A. The CONTRACTOR/VENDOR shall submit product data (manufacturer catalog cut sheets) for all equipment to be used as part of their solution to the ENGINEER and shall not install any equipment until such product data sheets have been approved in writing.

B. See Section 17030 for additional requirements.

1.4. FUNCTIONAL SYSTEM DESCRIPTION

A. Refer to Section 17100 for details.

PART 2 - PRODUCTS

(Not Used)

PART 3 - EXECUTION

3.1. EQUIPMENT/MATERIALS TESTING

A. COPPER CABLE

1. All Category 6 UTP cable shall be tested to a frequency of 350MHz to demonstrate compliance with the individual manufacturers advertised electrical characteristics.

2. All Category 6 UTP cable shall be field-tested with connectivity products installed to a frequency of 250MHz to demonstrate performance equal to or better than the minimum requirements as specified in ANSI/TIA/EIA-568b.2.1 and as listed in Table 1.

3. The Test Model shall be Permanent Link

TABLE 1 - Category 6 Permanent Link Limits in dB per ANSI/TIA/EIA-568B.2-1

Parameter	Performance @ 100MHz	Performance @ 200MHz	Performance @ 250MHz	Performance @ 300MHz
Insertion Loss	19.0 dB	27.4 dB	30.9 dB	34.1 dB
NEXT Loss	43.9 dB	39.3 dB	37.8 dB	36.6 dB
PS NEXT Loss	41.9 dB	37.3 dB	35.8 dB	34.6 dB
ACR	24.9 dB	11.9 dB	6.9 dB	2.5 dB
PS ACR	22.9 dB	9.9 dB	4.9 dB	0.5 dB
ELFEXT	26.3 dB	20.3 dB	18.3 dB	16.8 dB
PS ELFEXT	23.4 dB	17.3 dB	15.4 dB	13.8 dB
Return Loss	14.7 dB	11.7 dB	10.7 dB	9.9 dB
Propagation Delay	528 ns	527 ns	526 ns	526 ns
Delay Skew	40 ns	40 ns	40 ns	40 ns

4. All testing shall be performed with a UTP/ScTP field test device that has been factory calibrated each calendar year by the field test equipment manufacturer as stipulated by the manuals provided with the field test unit. The calibration certificate shall be provided for review prior to the start of testing.

5. Autotest settings provided in the field tester for testing the installed cabling shall be set to the default parameters.

6. Test settings selected from options provided in the field testers shall be compatible with the installed cable under test.

7. UTP horizontal and backbone cables shall be 100 percent tested according to ANSI/TIA/EIA-TSB-67 and ANSI/TIA/EIA-568-B.2.1. Test parameters include wire map plus shield continuity (when present), length, NEXT loss (pair-to-pair), NEXT loss (power sum), ELFEXT loss (pair-to-pair), ELFEXT loss (power sum), return Loss, attenuation, propagation delay, and delay skew.

3.2. EQUIPMENT/MATERIALS LABELING

A. See Section 17100

3.3. EQUIPMENT/MATERIALS ADMINISTRATION

A. The administration of the cable network and equipment shall be managed by the OWNER; however the CONTRACTOR/VENDOR shall be responsible for assisting the OWNER in configuring the network to meet their needs.

END OF SECTION 17170

SECTION 17180
CUTOVER AND TRAINING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, tools, and equipment required for the complete installation of work called for in the Contract Documents

1.2 SCOPE

A. This section includes:

1. Cutover Support Requirements
2. Training Requirements

PART 2 - PRODUCTS

NOT INCLUDED IN THIS SECTION

PART 3 – EXECUTION

3.1 CUTOVER

A. The contractor shall place cross connects at Telecommunication Equipment Rooms.

B. The cabling contractor shall provide a minimum of two (2) technicians onsite for a total of 40 hours each to assist as required with system(s) activation.

C. Activities shall include, but will not be limited to:

1. Set/Device Placement and testing for 100 devices
2. Placement of required patch cables and
3. Placement of required cross connects
4. Troubleshooting of installed cable plant
5. Installation of additional cables.
6. Trouble ticket resolution

3.2 TRAINING

A. Contractor shall provide 40 hours of training and orientation of customer Technology personnel to new cable plant.

B. Training shall include, but will not be limited to:

1. Physical review of installed cable plant.
2. Review of cable plant documentation and test results.
3. Instructions on industry standard termination and testing methods to enable customer personnel to successfully terminate and test cabling.
4. Additional customer requirement defined during the project.

END OF SECTION 17180

SECTION 17200
LOCAL AREA NETWORK

1.1 TOPOLOGY

A. The servers for the Local Area Network are physically located in the Roberto Clemente School (main building) across the street from the annex.
B. Connection to the Local Area Network will be achieved by means of a Wireless Bridge.
C. The Local Area Network specified herein will use a star Topology.
D. The network will consist of a Main Distribution Frame (MDF). The MDF contains a wireless transceiver and the 10/100/1000 Ethernet switches that are connected to the fiber backbone that feeds the network core. See Diagram A.
E. The network backbone shall consist of gigabit Ethernet over Category 6 cable.
F. The horizontal cabling to the desktop from the wiring closets shall consist of Fast Ethernet 100BASE-TX.
G. All network servers shall be connected to a gigabit switch using 1000BASE-TX
H. The gigabit server switch shall connect to the core using 1000BASE-SX

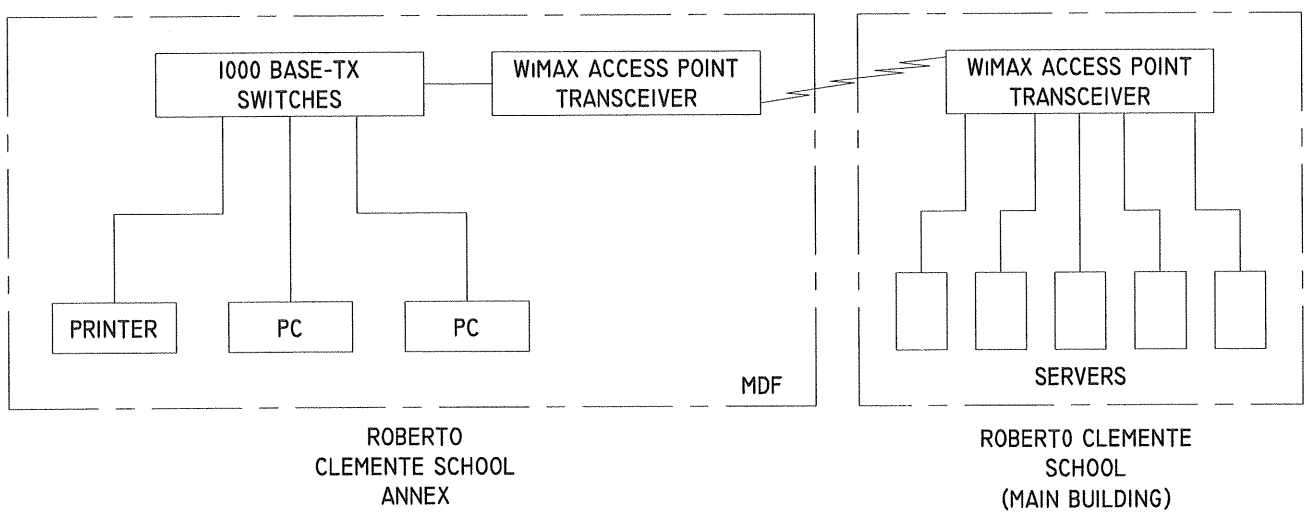

Diagram - A

1.2 SCOPE OF WORK

The CONTRACTOR/VENDOR shall use the following descriptions, to understand the intent of these specifications and how/what systems are to be installed. Equipment locations are provided on the attached drawings.

A. Provide all labor, materials, tools, and equipment required for the complete installation of working Local Area Network for the Paterson Roberto Clemente School Annex including the following:
   1. Installation of specified structured cabling in the School Building (see attached drawings and port location matrix).
   2. Installation of one (1) Mounted equipment Cabinet in MDF room.
   3. Installation of approved cable management and patch panels in sufficient number to provide a working solution.
   4. Installation of one (1) forty-eight (48) port and one (1) twelve (12) port 10/100/1000 switch in the MDF and/or one (1) port for each wire pull.
   5. Installation of one (1) UPS unit in the MDF.
   6. Installation of Category 6 cable within appropriate metallic surface mounted raceway or conduit (as approved by DESIGN CONSULTANT) from MDF to corresponding drops indicated on the attached drawings for PATERSON ROBERTO CLEMENTE SCHOOL ANNEX.
   7. Coordinate with and assist the OWNER's System Administrator in relocation, setting up and configuring the network equipment to meet the OWNER's needs including establishing the LAN.

1.3 SCOPE OF SPECIFICATION

A. This section includes the minimum requirements for equipment, termination hardware and cable for the following:

   1. Floor Mounted Relay Racks
   2. Wall Mounted Cabinets
   3. Floor Mounted Cabinets
   4. Cable Management
   5. Cable Supports/Ladder Rack
   6. Patch Panels - Category 6
   7. WiFi/WiMAX Transceivers
   8. 10/100 Fast Ethernet Switch
   9. UTP Category 6 Cable
   10. Category 6 Patch Cords
   11. Category 6 wall Jacks & plates
   12. Uninterruptible Power Supply (UPS)
   13. Grounding Bars
   14. Power Strip

1.4 QUALITY ASSURANCE

A. All equipment rooms shall be installed in a neat and workmanlike manner.

B. All methods of construction that are not specifically described or indicated in the Contract Documents shall be subject to the control and approval of the OWNER'S representative.

C. Equipment and materials shall be of the quality and manufacturer indicated. Only equipment and materials manufactured by major manufacturing companies are acceptable. No generic equipment or materials shall be allowed, unless otherwise approved in writing by the DESIGN CONSULTANT.

D. The equipment specified is based on the acceptable manufacturers listed.

E. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified, and subject to approval.

F. Separation from sources of EMI shall be as specified in section.

G. Communication grounding/earthing and bonding shall be in accordance with applicable codes and regulations. It is recommended that the requirements of IEC 1000-5-2, ANSI/TIA/EIA-607, or both be observed throughout the entire cabling system.

H. Materials and work specified herein shall comply with the applicable requirements of:

1. EIA/TIA-568-B.1
2. EIA/TIA-569-A
3. EIA/TIA-606
4. EIA/TIA-607
5. Underwriters Laboratory
6. FCC (including CFR 47 and Part 68 - subpart F)
7. National Electric Code
8. Local and State Codes
9. ISO/IEC 11801
10. IEC 1000-5-2
11. CSA C22.2
12. IEC 60603-7

1.5 CONTRACTOR QUALIFICATIONS AND TRAINING

A. The Certified Contractor shall have a full working knowledge of cabling low voltage applications such as, but not limited to data, voice and imaging network systems. The Certified Contractor shall have the following qualifications:

1. Possess those licenses/permits required to perform telecommunications installations in the specified jurisdiction.
2. Have personnel trained in the installation of pathways and support for housing horizontal and backbone cabling.
3. Have personnel knowledgeable in local, state, and national codes and the latest TIA Telecommunications Standards and Manufacturer's recommendations.
4. Have personnel fluent in the use of Computer Aided Design and possess and operate CAD software using .DWG and/or .DXF format.

1.6 SUBMITTALS

A. The CONTRACTOR/VENDOR shall submit product data (manufacturer catalog cut sheets) for all equipment to be used as part of their solution to the DESIGN CONSULTANT and shall not install any equipment until such product data sheets have been approved in writing.

PART 2 - EXECUTION OF WORK

2.1 CABLING METHODS - GENERAL

A. This section of the specifications is for wires, cables, and connectors for signal, control and related systems rated 600 volts and less.

1. All cabling and equipment shall be in compliance with National Electrical Code;

UL 4, 83, 486q 486B, 854; NEMA/ICEA WC5, WC7, WC8; IEEE 82.

B. All exposed wire/cable used for data network; voice, video and/or low-voltage wiring shall be enclosed in cable raceway as specified in this document.

C. Unless otherwise approved by the DESIGN CONSULTANT, all concealed indoor wiring (e.g. wire in ceiling voids) shall be supported by a Cable Tray/Trough, "D" Type rings or "Caddy" Type closed hooks at a minimum of 8' feet above finished floor and supported at no greater than 4' foot intervals.

1. In open ceiling cabling, cable supports shall be provided by means that is structurally independent of the suspended ceiling, its framework, or supports.
2. Cables routed in a suspended or false ceiling environments shall not be draped across the ceiling tiles.

D. All wire/cable shall be plenum rated.

E. Unless otherwise approved by the DESIGN CONSULTANT, all underground wire/cable used for data network, voice, video and/or low-voltage wiring shall be enclosed in rigid, nonmetallic, schedule 40 PVC conduits and schedule 80 PVC under roadways.
1. All fiber optic cable run in such underground conduit shall be within innerduct.

F. Pathways shall be designed and installed to meet applicable local and national building and electrical codes or regulations and shall have no exposed sharp edges that may come into contact with data or telecommunications cables.

G. All wall penetrations shall be installed with sleeves that shall have no exposed sharp edges that may come into contact with data or telecommunications cables.

H. The number of cables placed in a pathway shall not exceed manufacturer specifications, nor, will the geometric shape of a cable be affected.

I. Pathways shall not be located in elevator shafts unless specifically approved by the DESIGN CONSULTANT in writing.

J. Grounding / Earthing and bonding of pathways shall comply with applicable codes and regulations and at a minimum shall include the installation of a grounding halo in the MDF to which equipment shall be grounded.

K. Cable Routing

1. No cable runs of UTP cable shall exceed two hundred and ninety (290) feet.
2. Cables run in underground conduit systems shall not exceed forty percent (40%) of the conduit space.
3. The number of horizontal cables placed in a cable support or pathway shall not exceed a 40% fill.
4. The combined length of jumpers, or patch cords and equipment cables in the MDF and the work area should not exceed 33 feet.
5. Horizontal pathways shall be installed or selected such that the minimum bend radius of horizontal cables is kept within manufacturer specifications both during and after installation.
6. Cable pathways, which run parallel with electric power or lighting that is less than or equal to 480 Vrms, shall be installed with a minimum clearance of 6 in.

7. Cabling shall be installed to maintain a minimum clearance of 10 feet from power cables equal to or in excess of 480 Vrms.
8. No cable cross-connects shall be physically located within 20 feet of electrical distribution panels, step down devices, or transformers, which carry voltages equal to or in excess of 480 Vrms.
9. For voice or data applications, 4-pair UTP.
10. shall be run using a star topology from the telecommunications room/closet serving that floor to every individual information outlet.
11. The CONTRACTOR shall observe the bending radius and pulling strength requirements of the 4-pair UTP/ScTP and fiber optic cable during handling and installation.
12. Each run of UTP/ScTP cable between horizontal portion of the cross-connect in the MDF/IDF(s) and the information outlet shall not contain splices.
13. In the MDF/IDF(s) where cable trays or cable racking are used, the CONTRACTOR shall provide appropriate means of cable management such as reusable color-coded hook and loop cable managers (ties) to create a neat appearance and practical installation.
14. Continuous conduit runs installed by the contractor should not exceed 100 feet or contain more than two (2) 90 degree bends without utilizing appropriately sized pull boxes.
15. All horizontal pathways shall be designed, installed and grounded to meet applicable local and national building and electrical codes.
16. Horizontal distribution cables shall not be exposed in the work area or other locations with public access.

L. Cable Termination

1. All conductors in all UTP cables shall be terminated at both ends.
2. The cable outlet/connector shall be securely mounted at planned locations.
3. All data faceplates shall be configured to house two (2) jack positions.
4. The CONTRACTOR shall provide six (6) foot long, terminated, jumper cables for use between the Patch Panels and the Switches.
   a. Jumper cables shall have the same jacket color as the system they support.
5. The CONTRACTOR shall provide seven (7) and ten (10) foot long connection cables for connection of the OWNER'S PC's to their appropriate jack plates. The number of each provided shall be divided equally between the total number of drops.

M. Pulling Tension

1. The maximum cable pulling tensions shall not exceed manufacturer's specifications.
2. The use of winches to pull cable is NOT permitted.

N. Bend Radius

1. The maximum cable bend radii shall not exceed manufacturer's specifications. At a minimum the bend radius on 4-pair UTP/ScTP cable shall not exceed eight times the outside diameter of the cable and ten times for multi-pair cable. This shall be done unless this violates manufacturer specifications.
2. At cable terminations, the maximum bend radius for 4-pair UTP/ScTP cable shall not exceed four times the outside diameter of the cable and ten times for multi-

pair cable. This shall be done unless this violates manufacturer specifications.

O. Slack

1. In the work area, UTP cables shall installed with a minimum of twelve (12) inches of slack.
2. In the MDF room a minimum of ten (10) feet of slack should be left for all cable types. This slack must be neatly coiled or otherwise managed on trays or other support types.

P. Cable Tie Wraps

1. Tie wraps shall be used at appropriate intervals to secure cable and to provide strain relief at termination points. These wraps shall not be over tightened to the point of deforming or crimping the cable sheath.
2. Hook and loop cable managers should be used in the closet where reconfiguration of cables and terminations may be frequent.

Q. Fire Protection

1. All wall penetrations shall required properly installed firestop systems that shall be installed to prevent or retard the spread of fire, smoke, water, and gases through the building.
a. Sheathing installed for wall penetrations must also be firestopped.
2. Fire stops shall be done to applicable code using approved materials.

R. Labeling

1. Horizontal and backbone cables shall be labeled at each end. The cable or its label shall be marked with its unique identifier.
2. A unique identifier shall be marked on each faceplate to identify it as connecting hardware.
3. Each port in the faceplate shall be labeled with its unique identifier.
4. A unique identifier shall be marked on each piece of connecting hardware (racks, panels, blocks, etc.).
5. Each port on the connecting hardware shall be labeled with its unique identifier.

2.2 HORIZONTAL CABLING - GENERAL

A. The horizontal cabling subsystem is the portion of the cabling system that extends from the work area outlet/connector (wall jack) to the horizontal cross-connect in the Main or Intermediate Distribution Frame Room (MDF or IDF as applicable). It consists of the outlet/connector, the horizontal cables, consolidation point (if required), and that portion of the cross-connect in the MDF/IDF serving the horizontal cable. Unless otherwise indicated, each floor of the building is served by its own horizontal cabling subsystem

B All UTP cables shall conform to ANSI/TIA/EIA-568-B.1 Commercial Building Telecommunications Cabling Standard (latest amendment and including all applicable addenda) and ISO/IEC 11801 (International) Generic Cabling for Customer Premises standard (latest amendment and including all applicable addenda).

C All UTP cables shall:

1. Be manufactured by Mohawk, General Cable, Hitachi, or equal as approved by the DESIGN CONSULTANT,
2. Be 100 Ω 4-pair, Category 6, or higher cable,
3. Have a yellow jacket for data applications and a blue jacket for voice applications,
4. Be appropriately protected for the environment in which it is installed,
5. Have pull string for easy stripping.

2.3 INTRABUILDING CABLING SUBSYSTEM - GENERAL

B. Intrabuilding Cabling Subsystem is defined as the cabling and the associated connecting hardware that links the MDF in the equipment room to the drops.

C. Unless otherwise approved by the DESIGN CONSULTANT, all interbuilding cables shall be run in innerduct.

D. Adequate riser sleeve/slot space shall be available to permit the installation of cabling in the future, such that no drilling of additional sleeves/slots are necessary.

2.4 FLOOR MOUNTED RELAY RACKS

A. All racks shall be anchored to the floor using approved methods.

B. All racks shall include vertical and horizontal cable management.

C. All racks shall be mounted with a minimum of 36" inch clearance behind and in front of rack, unless otherwise approved by DESIGN CONSULTANT.

D. All racks shall be grounded to the equipment ground bar with a #6 stranded copper wire.

2.5 LADDER RACK

A. Where cable shall extend horizontally more than two-feet (2') within any IDF or MDF, the CONTRACTOR/VENDOR shall install approved ladder rack as part of their base bid.

B. All ladder racks shall be securely fastened to walls and/or floor decks and tops of equipment racks.

C. All ladder racks shall be grounded to the equipment ground bar with a #6 stranded copper wire.

2.6 CABLE MANAGEMENT

A. All vertical equipment cabinets and racks shall include approved cable management components.

B. A horizontal crossover cable manager shall be provided for each switch and/or patch panel installed, with a minimum height of 2 rack units each.

C. Provide two rear cable management bars with reusable velcro-type hook and loop straps in each rear vertical channel. Reusable straps shall be of varying sizes (each allowing

50% spare future expansion) and of adequate quantity to secure cable bundles at least every 4 rack units.

D. Secure cable managers, slack managers, support bars, hook and loop straps per manufacturer recommendations.

2.7 CATEGORY 6 PATCH PANELS - DATA

A. Shall be installed in accordance with manufacturer recommendations.

B. Shall be labeled in accordance with this document.

C. Shall be installed with rear cable management bar(s).

E. Shall be installed to identify voice or data functionality.

2.8 CATEGORY 6 PATCH PANELS - VOICE

A. Shall be installed in accordance with manufacturer recommendations.

B. Shall be labeled in accordance with this document.

C. Shall be installed with rear cable management bar(s).

D. Shall be installed to identify voice or data functionality.

2.9 EQUIPMENT/MATERIALS TESTING SPECIFICATIONS

A. Testing of cable channels shall be performed prior to release of system/equipment to OWNER.

B. Copper Cable Testing

1. All Category 6 cable shall be field-tested with an approved level 3 UTP field test device. All installed channels shall perform equal to or better than the minimum requirements as specified by Table 1.

TABLE 1 - Category 6 Permanent Link Limits

Specified and Tested to 350MHz	
Frequency Range	1-550 MHz
Attenuation	37.0 dB
NEXT Loss	36.1 dB
Power Sum NEXT Loss	43.0 dB
ELFEXT	16.9 dB
Power Sum ELFEXT	13.9 dB
Return Loss	10.0 dB
Propagation Delay	534 ns
Delay Skew	37 ns
ACR*	10 dB*
Power Sum ACR	3.1 dB

*Note: minimum ACR rating must show 10 db at 250MHz

2. All UTP/ScTP field testers shall be factory calibrated each calendar year by the field test equipment manufacturer as stipulated by the manuals provided with the field test unit. The calibration certificate shall be provided for review prior to the start of testing.

3. Autotest settings provided in the field tester for testing the installed cabling shall be set to the default parameters.

4. Test settings selected from options provided in the field testers shall be compatible with the installed cable under test.

5. UTP horizontal and backbone cables shall be 100 percent tested according to ANSI/TIA/EIA-TSB-67 and ANSI/TIA/EIA-568-A-5. Test parameters include wire map plus shield continuity (when present), length, NEXT loss (pair-to-pair), NEXT loss (power sum), ELFEXT loss (pair-to-pair), ELFEXT loss (power sum), return Loss, attenuation, propagation delay, and delay skew.

2.10 GROUNDING

A. The technology equipment room shall be provided with a grounding halo consisting of a #2 stranded copper cable securely connected to the building ground or to grounded structural steel using approved clamps. A #6 stranded copper cable shall provide connection to the grounding bar assembly as specified below. The #6 grounding wire shall be bonded to the #2 grounding halo.
   1. In the MDF Room the halo ground shall be connected at each corner of the room to a 20' x ¾" grounding rod via a #2 stranded copper cable that is cad welded or appropriately bonded as approved by the ENGINEER.

B. The Contractor shall provide grounding bar assemblies, which shall be mounted to the wall in the MDF Room.
   1. This grounding bar shall be distinct from any provided for the LAN or Security systems.

C. The grounding bar shall be ground to the building ground or to grounded structural steel using a minimum #6 stranded copper grounding cable.

D. The grounding bar shall be either attached to the equipment room wall with stand off insulators.

E. Label grounding and bonding hardware and connections per EIA/TIA 606.

F. Ground Bar Assembly to be constructed with following materials (See drawing details for additional information):
   1. Copper Ground Bar (1/4"x4"x10") with 9/32" holes spaced 1 1/8" apart
   2. Insulators
   3. 5/8" Lockwashers
   4. Wall Mounting Brackets
   5. 5/8-11"x1" HHCS bolts

G. The CONTRACTOR shall ground cable shields, rain conductors, and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

H. Primary protection (BET) shall be installed on all copper cable that transect building exterior walls.

1.02 SUBMITTALS

A. The CONTRACTOR shall submit product data (manufacturer catalog cut sheets) for all equipment to be used as part of their solution to the engineer and shall not install any equipment until such product data sheets have been approved in writing.

B. Refer to Administrative Requirements of the project.

PART 3 - PRODUCTS

The following products may not be required for **ALL** locations for this bid:

3.1 FLOOR MOUNTED RELAY RACKS

A Racks shall meet the following physical specifications:

1. 19" rack mounting space.
2. 7 foot high (nominal)
3. Lightweight, high strength aluminum construction.
4. Black powder coat finish.
5. 15" deep base with four (4) ¾" bolt down holes.
6. EIA Channel width of 3.0", with #12-24 screw holes
7. Rack shall have double sided 12/24 tapped holes and EIA universal rack 5/8" to 5/8"- ½" standard hole pattern (compatible with 11/4"" – ½" hole patterns)
8. Acceptable Manufacturers, unless otherwise approved by DESIGN CONSULTANT:

    a. Chatsworth
    b. Hubbell
    c. Datatel
    d. Or Approved Equal

3.2 WALL MOUNTED CABINETS

A Wall mounted cabinets shall meet the following specifications:

1. 19" equipment mounting space.
2. 48" high with 26 rack mount spaces.
3. Universal mounting rails with 10/32 and 12/24 tapped holes.
4. 5/8", 5/8", ½" EIA standard hole pattern.
5. Black powder coat finish.
6. Racks shall have a two hinge design for front and rear access, louvered sides for ventilation, knockouts in top and bottom for cable access both front and rear access shall be lockable.

7. Acceptable Manufacturers, unless otherwise approved by DESIGN CONSULTANT:

   a. Chatsworth
   b. Hubbell
   c. Datatel
   d. Or Approved Equal

3.4 FLOOR MOUNTED CABINETS

A Floor mounted cabinets shall meet the following specifications:

1. 16 gauge steel construction
2. Nominal 77" x 21" x 36"
3. Lockable Plexiglass® hinged door on front and steel hinged door in rear.
4. Vented roof
5. Removable side panels.
6. Leveling feet
7. Acceptable Manufacturers, unless otherwise approved by DESIGN CONSULTANT:

   a. Chatsworth
   b. Hubbell
   c. Datatel
   d. Or Approved Equal

3.5 CABLE MANAGEMENT

A Cable management systems shall comply s the following specifications:

1. Cable management shall be black metal with integral wire retaining fingers.
2. Vertical cable management panels shall have front and rear channels.
3. Vertical cable management panels shall have removable front and back covers, made of black metal.
4. A horizontal crossover cable manager shall be provided at the top of each relay rack, with a minimum height of 2 rack units each.
5. A horizontal crossover cable manager shall be provided near the center and at the bottom of each relay rack, with a minimum height of 4 rack units.
6. Acceptable Manufacturers, unless otherwise approved by DESIGN CONSULTANT:

   a) Siemon
   b) Hubbell
   c) Superior Modular
   d. Or Approved Equal

3.6 CABLE SUPPORTS/LADDER RACK

A Cable supports and ladder rack shall comply with the following specification:

1. Constructed of 16 gauge tubular steel.

2. Capable of mounting to floors, walls, ceilings, equipment racks and cabinets.
3. Modular construction to allow for future expansion.
4. Capable of vertical or horizontal installation.
5. Durable powder coat finish.

6. Capable of supporting 45 lbs/ft weight.
7. Acceptable Manufacturers, unless otherwise approved by DESIGN CONSULTANT:

   a. Datatel
   b. Hubbell
   c. Wiremold
   d. Or Approved Equal

3.7 PATCH PANELS - CATEGORY 6

A Patch Panels for Data and Voice are covered in Division 17 Section 17110.

3.8 WIRELESS BRIDGE

A The Wireless Bridge shall comply with the following specification:

1. Radio

a.	Radio Frequency	-	4.940 – 4.990 GHz
b.	Data Rate	-	Up to 48 Mbps
c.	Channel Bandwidth	-	20 MHz
d.	Duplex Technique	-	TDD
e.	Transmit Power	-	4.9 GHz: 10 dBm (max)
f.	RF Dynamic Range	-	More than 50 dB

2. LAN Interface

a.	Number of Ports/Type	-	1, 10/100Base T, autonegotiation
b.	Framing/Coding	-	IEEE 802.3/U
c.	Bridging	-	Self-learning, up to 2000 MAC addresses
d.	Traffic Handling	-	MAC layer bridging, self-learning
e.	Latency	-	8 msec, 3 msec (typical)
f.	Line Impedance	-	100 Ohms
g.	VLAN Support	-	Transparent
h.	Connector	-	RJ-45

3. Management

a.	Protocol	-	SNMP-based
b.	Network Management	-	SNMPc-based
c.	Management Interface	-	10/100Base T
d.	Connector	-	RJ-45
e.	Up-grade Capabilities	-	Local and over-the-air software download

4. Antenna Characteristics

a.	Type	-	External flat panel
b.	Gain	-	21
c.	Max Range (km/miles)	-	24/15

d.	Connector	-	N-type
e.	Lightening Protection	-	Yes

5. General

a.	Diagnostics	-	Local and remote loopbacks
b.	ODU-to-POE injector connection	-	Outdoor Cat. 5 cable, 100m (328 ft.) max. length
c.	Power	-	Power-over-Ethernet (PoE)
d.	Power Consumption	-	10 W
e.	Environment	-	Outdoor unit and external antenna
f.	Enclosure	-	All-weather case
g.	Temperature	-	-35-60°C/-31-140°F

3.9 10/100 FAST ETHERNET SWITCH

A 10/100 Fast Ethernet Switches shall comply with the following specification:

1. 12 / 24 Port 10/100 autosensing Fast Ethernet switches with management.
2. Autosensing on Each 10/100 Port
3. Autonegotiating on Each 10/100 Port
4. 802.1p Traffic Prioritization
5. 802.1x Dynamic User Authentication and Policy Enforcement
6. VLAN support (IEEE 802.1q)
7. 10BaseT ports: RJ-45 connectors Category 5 unshielded twisted-pair (UTP) cabling
8. 100BaseTX ports: RJ-45 connectors Category 5 UTP cabling
9. 1000Base-SX Gigabit Ethernet Uplink
10. Management console port: RJ-45 connector
11. Must have provisions for cascading
12. Simple Network Management Protocol (SNMP) and Telnet interface support
13. 19-inch rack-mountable
14. IEEE 802.1p Technology
15 IEEE 802.3 (Power over Ethernet)
16. Shall include network management software
17. Acceptable Manufacturers, unless otherwise approved by DESIGN CONSULTANT:

    a. 3Com
    b. Cisco
    c. Nortel
    d. Or Approved Equal

3.10 UTP CATEGORY 6 CABLE

A UTP Category 6 cable shall comply with the following specification:

1.	Pairs	4
2.	Insulation	Teflon or approved equal
3.	Color	Data – Yellow Voice – Blue
4.	Type	24 AWG Twisted
5.	Impedance	100 ohms ± 15% across the band
6.	Attenuation/100m	5.6 db @ 10 MHz

		7.9 db @ 20 MHZ 18.4 db @ 100 MHz 27.0 db @ 200 MHz 37.0 db @ 350 MHz
7.	Capacitance	4.4 nF/100m @ 100 MHz
8.	DC Resistance	8.9 Ohms/100m @ 100 MHz
9.	PS-NEXT	47.0 db @ 10 MHz 43.0 db @ 20 MHz 32.0 db @ 100 MHz 28.0 db @ 200 MHz 25.0 db @ 350MHz
10.	SRL	20.0 db @ 350MHz(Typical) 23 db @ 100MHz (Minimum)

11. ACR, PS-NEXT, Attenuation, SRL have to be specified and tested to 350MHz.at the manufacturer location.
12. Minimum ACR rating must show 10 dB at 250MHz.
13. Minimum SRL rating must show 20 dB at 350MHz.
14. Must be PS-NEXT performance ETL verified to TIA/EIA 568-A and ISO/IEC 11801
15. Acceptable Manufacturers, unless otherwise approved by DESIGN CONSULTANT:

    a. Mohawk
    b. General Cable
    c. Hitachi
    d. Or Approved Equal

3.11 CATEGORY 6 PATCH CORDS – MATCH COLOR OF VOICE AND DATA CABLING

A Category 6 patch cords shall comply with the following specification:

1. Shall be round, and consist of eight insulated 24 AWG, stranded copper conductors, arranged in four color-coded twisted-pairs within a flame-retardant jacket.
2. Be equipped with modular 8-position plugs on both ends, wired straight through with standards compliant wiring.
3. Use modular plugs, which exceed FCC CFR 47 part 68 subpart F and IEC 60603-7 specifications, and have 50 microinches minimum of gold plating over nickel contacts.
4. Be resistant to corrosion from humidity, extreme temperatures, and airborne contaminants.
5. Utilize cable that exhibits power sum NEXT performance.
6. Be available in several colors with or without color strain relief boots providing snagless design.
7. Meet the flex test requirements of 1000 cycles with boots and 100 cycles without boots.
8. Be available in any custom length and standard lengths of meters (3, 5, 7, 10, 15, 20, and 25 feet).
9. Input impedance without averaging 100 $\Omega \pm$ 15% from 1 to 100 MHz.
10. Acceptable Manufacturers, unless otherwise approved by DESIGN CONSULTANT:

    a) Mohawk

b) General Cable
c) Hitachi
d. Or Approved Equal

3.12 UNINTERUPPTABLE POWER SUPPLY (UPS)

A. Input and Output connections of the UPS units shall be configured in accordance with the devices the unit is intended to power.

B. Individual UPS units shall be sized to provide one (1) hours of operation for the equipment it powers.

C. UPS units shall comply with the following specification:
1. Waveform Type shall be sine wave.
2. Battery Type Sealed Lead-Acid battery
3. Interface Port DB9, RS232
4. Mgmt. Software Windows based with Server Shut down
5. Floor placement with manufacturer supplied support legs.
6. Acceptable Manufacturers, unless otherwise approved by DESIGN CONSULTANT:

a. APC
b. Tripp Lite
c. Best Power
d. Or Approved Equal

3.13 GROUNDING BARS

A Grounding bars (busbars) shall comply with the following specification:
1. Provide grounding busbar and a minimum #6 grounding wire from ground bar to suitable electrical building ground.
2. Label grounding and bonding hardware and connections per EIA/TIA 606.
3. Grounding wire shall be appropriately bonded to the grounding bar and electrical building ground.
4. Ground Bar Assembly to be constructed with following materials:
a) Copper Ground Bar (1.4"x4"x10") with 9/32" holes spaced 1 1/8" apart
b) Insulators
c) 5/8" Lockwashers
d) Wall Mounting Brackets
e) 5/8- 11"x1" HHCS bolts

3.14 POWER STRIP

A Power Strips shall comply with the following specification:
1. Shall be 20 amp, 115V.
2. Shall be rack mounted.
3. Shall be non-switched.
4. Shall provide a minimum of one power strip per rack that contains active electronics, or as detailed on the drawings.
5. Shall be surge suppressed.
6. Shall have a minimum of 6 outlets, but shall be sized with an appropriate number of power outlets to power all equipment with two (2) spares.
7. Must have 20 Amp twist lock plug.

8. Shall have a 10' cord minimum.
9. Shall be UL listed and must meet UL 1363 and 1449 requirements.

3.15 SYSTEM CONFIGUATION

A ROUTING: Fully brief Owner on available routing and protocol options. Record Owner's decisions and set up initial system program. Prepare a written record of decisions, implementation methodology, and final results.

3.16 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Schedule tests with at least seven days' advance notice of test performance.

2. Retesting: Correct deficiencies and retest. Prepare a written record of tests.

3. Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified. Prepare a list of final tap settings of paging speaker-line matching transformers.

4. Prepare written test reports.

a. Include a record of final cable performance test results certified by Installer.

3.17 STARTUP SERVICE

A. Verify that electrical wiring installation complies with manufacturer's submittal and installation requirements.

B. Complete installation and startup checks according to manufacturer's written instructions.

3.18 ADJUSTING

A. On-Site Assistance: The Vendor shall provide on-site assistance in adjusting sound levels, resetting transformer taps, and adjusting controls to meet occupancy conditions.

B. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to site outside normal occupancy hours for this purpose, without additional cost.

3.19 DEMONSTRATION

A. The VENDOR shall train Owner's maintenance personnel to adjust, operate, and maintain intercommunication equipment.

1. Train Owner's maintenance personnel on programming equipment for starting up and shutting down, troubleshooting, servicing, and maintaining equipment.

B. Contractor to coordinate with General Contractor (GC) single prime.

3.20 SUPPORT AND WARRANTY

A. Refer to Division 17090 for Support and Warranty details.

3.21 CUTOVER AND TRAINING

A. Refer to Division 17060 for Cutover and Training details.

END OF SECTION 17200

SECTION 17270
TESTING, IDENTIFICATION AND ADMINISTRATION

PART 1 – GENERAL

1.0 RELATED DOCUMENTS

A. Drawings, General Conditions, and Special Conditions related to this project are found in this Division, as well as the other Divisions included in the Contract Documents.

1. It is the obligation and responsibility of the CONTRACTOR to carefully read all Sections and Divisions in order to ensure compliance with this specification.

1.1 SCOPE OF WORK

A. Refer to Section 17200 for details.

1.2 SCOPE OF SPECIFICATION

A. This section includes the minimum requirements for the following:

1. System Testing

2. Equipment and Materials Identification

3. System Administration

1.3 SUBMITTALS

A. The CONTRACTOR shall submit product data (manufacturer catalog cut sheets) for all equipment to be used as part of their solution to the ENGINEER and shall not install any equipment until such product data sheets have been approved in writing.

B. See Section17030 for additional requirements.

1.4 FUNCTIONAL SYSTEM DESCRIPTION

A. Refer to Section 17000 and 17200 for details.

PART 2 – PRODUCTS

(NOT INCLUDED IN THIS SECTION)

PART 3 – EXECUTION

3.1 EQUIPMENT/MATERIALS TESTING

A. Network Switches

1. All network switches provided as part of this contract shall be powered up on site by the CONTRACTOR for a minimum of one (1) week prior to attaching other network equipment.

2. All network switches shall be tested out and documented to perform at manufacturers advertised specifications for data throughput.

B. Uninterruptible Power Supplies (UPS)

1. All UPS units provided as part of this contract shall be powered up and the batteries charged on site by the CONTRACTOR in accordance with the manufacturers specifications.

3.2 EQUIPMENT/MATERIALS LABELING

A. In addition to requirements in this Article, the CONTRACTOR shall comply with applicable requirements in TIA/EIA-606 for labeling.

B. The CONTRACTOR shall label horizontal and backbone cables with its unique identifier at each end within four (4) inches (100 mm) of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated. The cable or its label shall be marked with its unique identifier.

C. The CONTRACTOR shall label each faceplate with a unique identifier to identify it as connecting hardware.

D. The CONTRACTOR shall label each port in the faceplate with its unique identifier.

E. A unique identifier shall be marked on each piece of connecting hardware (racks, patch panels, punch down blocks, etc.).

F. Each piece of connecting hardware (racks, patch panels, punch down blocks) shall be labeled with its unique identifier.

3.3 EQUIPMENT/MATERIALS ADMINISTRATION

A. The administration of the network equipment shall be managed by the OWNER; however the CONTRACTOR shall be responsible for assisting the OWNER in configuring the network to meet their needs.

END OF SECTION 17270

SECTION 17300
VOICE OVERVIEW

PART 1 - GENERAL

1.0 RELATED DOCUMENTS

A. Drawings, General Conditions, and Special Conditions related to this project are found in this Division, as well as the other Divisions included in the Contract Documents.

a. It is the obligation and responsibility of the Contractor to carefully read all Sections and Divisions in order to ensure compliance with this specification.

1.1 SCOPE OF WORK

A. The Contractor shall use the following descriptions to understand the intent of these specifications and how/what systems are to be installed. This description contains information regarding equipment and materials reviewed in other divisions. Equipment locations are provided on the attached drawings.

B. The Contractor shall provide a complete and fully operational Telephone System as specified herein.

1. Any ancillary products required to provide a working solution that is/are not included in this document shall be assumed required and shall be provided as part of a working solution by the Contractor in the base bid and listed in the unit price schedule and schedule of values.

2. The project will include the installation of new devices, master equipment, and all appurtenances as necessary to provide a complete and working solution.

C. This project requires the Telephone System, Paging/Intercom System and Master Clock System to be integrated. However it is at the final approval of the Paterson BOE if an integrated system will be installed. If not a separate telephone system will be required to service offices and the classrooms will be wired for future addition of instruments. A separate Paging/Intercom System will be installed if the Paterson BOE does not select an integrated system. As such, it is the responsibility of the Contractor to include the cost of providing and installing speakers in the all hallway/corridors and specified rooms.

D. The Contractor shall install their equipment in the MDF Room as indicated on the specification drawings.

1. Should the Contractor require additional space for their equipment installation, the matter shall be brought to the attention of the Engineer immediately. No equipment shall be installed by the Contractor in any area other than that specified on the specification drawings.

F. The basic system shall be installed and provided with sufficient cards and facilities to meet the initial system configuration. The system shall be expandable by at least 20 percent above its initial configuration without the addition of any hardware other than line and trunk cards.

1. The Contractor shall provide all main cabinet and station equipment and cards needed to service the system as initially configured. This will include the necessary PRI (T-1), CBWT, CTX and other line cards as required in this document to provide a fully operation solution.

G. The system shall be provided equipped and wired with extensions, lines and trunks as indicated herein.

H. A PC Workstation, which is to be provided by the Contractor and as specified herein, shall provide Control of the system's features, functions and facilities.

I. All incoming trunks will terminate in the Auto Attendant, which will be a separate trunk group from the outbound trunk group. Some of the incoming trunks may be utilized for outbound service as well based upon peak busy conditions.

J. Class Of Service, where extensions are restricted to certain calling areas, shall be designated by the Owner during the implementation phase.

K. The system shall be configured to route outgoing calls to the trunk(s) that will carry the call at the lowest rate. If the designated trunk group is busy, depending on the subscriber's/station's class marking, the call will either be busied out or will be offered to the next designated trunk group. The route selection system shall be capable of automatically changing the ranking of the trunk groups with the time of day to adjust to rate changes and calling patterns. The Owner shall be able to update the system manually to account for rate changes. A rate of four manual updates per year shall be included at no additional cost as part of the Service and Maintenance Contract.

L. The system shall provide a Malicious Call Trace function, which will send to the system printer the ANI, time and date information of an incoming call upon activation by a station.

M. The Contractor shall provide, as part of their bid, a Schedule of Values that shall include unit prices (installed and uninstalled), number of units and extended prices for all equipment and items required to provide a working solution.

1. These prices are for additions and deletions in the final system or in the final system or the additions during the five years of operation. However, there is no guaranteed quantity that will be purchased by the Owner.

2. The Contractor shall include in the Schedule of Values a list of optional equipment for the working solution. This optional equipment list will also provide unit prices (installed and uninstalled) for each unit.

3. Should any equipment or materials to be supplied by the Contractor be subject to a discount, this shall be clearly indicated for each item in a separate column on the Schedule of Values.

1.2 SCOPE OF SPECIFICATION

A. The Owner's facility will be provided with a state-of-the-art telephone system to allow outbound and inbound calls from the Owner's chosen telephone service provider and that

shall be integrated with the building internal communications (intercom) and master clock systems.

B. This document shall specify the products and methods for the installation of a new Telephone System at the facility.

1.3 SUBMITTALS

A. Refer to Division 17030 for requirements.

1.4 FUNCTIONAL SYSTEM DESCRIPTION

A. The facility will have one (1) main number. Individuals and Departments shall be provided with unique telephone numbers (DID).

B. The solution provided by the Contractor shall direct all incoming calls to an Auto-Attendant System to be included in the base bid. The Auto-Attendant will greet incoming calls with the following message:

"You have reached the Paterson BOE and Roberto Clemente School Annex, if you know your party's 4-digit extension; you may dial it at anytime. For the Administration offices, press 1; for the Guidance Office, press 2; for the Nurse's Office, press 3; for all other calls, please stay on the line or press 0 for the Operator now. …".

C. Callers will be able to leave messages for individuals and specific departments.

1. A specific person for each department will be assigned the responsibility of checking the department's mailbox and directing the call to the appropriate person.

2. When a message is left in an individual's voice mail system, an indicator light on the deskset will remain lit.

D. All personnel will receive a unique four-digit extension number and/or voice mailbox.

1. To access their messages stored in the voicemail system from inside the building, the individual will press a message light on their deskset. This will prompt the individual to enter their extension number and their four-digit personal identification number (PIN). In this way, individuals will be able to retrieve messages throughout the day from any internal extension.

2. To access their messages stored in the voicemail system from outside the building, an individual will dial the main number and enter their four-digit extension. They will be able to enter their four-digit PIN to hear their messages.

E. Administrative control of the Voice Processing System shall be performed at a personal computer attached to the Telephone System. The Owner's System Administrator shall be able to create mailboxes for users, assign the appropriate class marks and privileges to each user, and provide backup and restoration functions to the system.

PART 2 - PRODUCTS

(NOT INCLUDED IN THIS SECTION)

PART 3 – EXECUTION

3.1 GROUNDING

A. The Contractor shall provide grounding bar assemblies (as specified herein), which shall be mounted to the wall in the MDF Room.

1. This grounding bar shall be distinct from any provided for the LAN or Security systems.

B. The grounding bar shall be ground to the building ground or to grounded structural steel using a minimum #6 stranded copper grounding cable.

C. Label grounding and bonding hardware and connections per EIA/TIA 606.

D. Ground Bar Assembly to be constructed with following materials (See drawing details for additional information):

1. Copper Ground Bar (1/4"x4"x10") with 9/32" holes spaced 1 1/8" apart
2. Insulators
3. 5/8" Lockwashers
4. Wall Mounting Brackets
5. 5/8-11"x1" HHCS bolts

3.2 SUPPORT AND WARRANTY

A. Refer to Division 17090 for Support and Warranty details.

END OF SECTION 17300

SECTION 17320
TELEPHONE SETS

PART 1 – GENERAL

A. See Overview Section 17300

B. Contractor to coordinate with General Contractor (GC) single prime.

1.1 SUMMARY

A. This project requires the use of Digital or IP Telephones that are compatible with the PBX specified in Section 17000.

B. Analog sets will be located in none administrative and educational program areas, such as maintenance areas and the MDF.

C. Digital phones will be located in administration and educational areas.

D. All digital phones will have speakerphone and intercom capabilities for integration into the building paging system.

E. Phones will allow for dial intercom capabilities serving all areas of the building.

F. Paging shall be accessible through the telephone system by zone and code.

G. All telephones must be ADA Compliant.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Available Manufacturer's/Vendor's

1. Nortel
2. Avaya
3. Tadiran
4. Or Approved Equal

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B. The following types of station equipment will be supported by the PBX specified in Section 17000.

1. Single line instruments with fixed "Hold" and "Release" keys and a "Message Waiting" lamp as a minimum.

2. Single line instruments will have a "momentary panic button" installed to allow for emergency calling. The button will be wired to one of the pairs of the RJ11 or RJ45 cable.

3. Single line instruments with feature buttons, LCD, with speakerphone, hands free intercom and display. (Typically in classrooms)

4. Multi-Button instruments with 8 –12 feature buttons, LCD, 12 or more feature buttons, with speakerphone, hands free intercom and display. (Typically in Administration/Business offices)

5. A telephone instrument suitable for a centralized answering position, LCD, with 12 or more Buttons keys and an add-on of 20 plus line keys, to function as a DSS and an attendant console with hands free intercom.

6. Wireless Telephone Sets with transponders.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The vendor will coordinate the placement and features of telephones with the district technology staff and consultant by:

   1. Meeting with both parties and filling out station programming worksheets.

   2. Identifying type and quantity of telephones for each location.

   3. Identifying what line appearances will be required on each telephone.

   4. Establishing the station numbering plan.

B. In addition to the above the vendor will:

   1. Phones will be installed and connected to wiring according to EIA/TIA-568-B.1

   2. Phones will be labeled with proper telephone and extension number

   3. Phone number, room location, jack identification number and port number will be entered into an inventory database.

3.3 TELEPHONE PROGRAMMING

A. Programming: Fully brief Owner on available programming options. Record Owner's decisions and set up initial system program. Prepare a written record of decisions, implementation methodology, and final results.

3.4 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Schedule tests with at least seven days' advance notice of test performance.

2. After installing telephone instruments test for compliance with requirements.

3. Operational Test: Test originating station-to-station, all-call, and page messages at each telephone station. Verify proper routing and volume levels and that system is free of noise and distortion. Test each available message path from each station on system.

4. Frequency Response Test: Determine frequency response of two transmission paths, including all-call and paging, by transmitting and recording audio tones. Minimum acceptable performance is within 3 dB from 150 to 2500 Hz.

5. Signal-to-Noise Ratio Test: Measure signal-to-noise ratio of complete system at normal gain settings, as follows:

   a. Disconnect speaker microphone and replace it in the circuit with a signal generator using a 1000-Hz signal. Measure signal-to-noise ratio at paging speakers.
   b. Repeat test for four speaker microphones and for each separately controlled zone of paging loudspeakers.
   c. Minimum acceptable ratio is 35 dB.

2. Distortion Test: Measure distortion at normal gain settings and rated power. Feed signals at frequencies of 150, 200, 400, 1000, and 2500 Hz into each paging and all-call amplifier, and a minimum of 2 selected intercommunication amplifiers. For each frequency, measure distortion in the paging and all-call amplifier outputs. Maximum acceptable distortion at any frequency is 5 percent total harmonics.

3. Acoustic Coverage Test: Feed pink noise into system using octaves centered at 500 and 4000 Hz. Use sound-level meter with octave-band filters to measure level at three locations in each paging zone. Maximum permissible variation in level is plus or minus 3 dB; in levels between adjacent zones, plus or minus 5 dB

B. Retesting: Correct deficiencies and retest. Prepare a written record of tests.

C. Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified. Prepare a list of final tap settings of paging speaker-line matching transformers.

3.5 STARTUP SERVICE

A. Verify that electrical wiring installation complies with manufacturer's submittal and installation requirements.

B. Complete installation and startup checks according to manufacturer's written instructions.

3.6 ADJUSTING

A. On-Site Assistance: The Vendor shall provide on-site assistance in adjusting sound levels, resetting transformer taps, and adjusting controls to meet occupancy conditions.

B. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to site outside normal occupancy hours for this purpose, without additional cost.

3.7 TRAINING

A. The VENDOR shall train Owner's maintenance personnel to adjust, operate, and maintain telephone instruments.

B. Train Owner's maintenance personnel on programming equipment for starting up and shutting down, troubleshooting, servicing, and maintaining equipment.

C. For the first year, after the initial Owner's training the Vendor will provide up to three (3) training sessions for maintenance personnel upon the request of the Owner.

D. The Vendor will provide at a minimum three (3) user-training sessions. These sessions shall be coordinated with the District Technology Manager and School Principal's office.

END OF SECTION 17320

SECTION PLYGRD – PLAYGROUND EQUIPMENT/PLAYGROUND SAFETY SURFACING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Playground Equipment.
2. Playground Safety Surfacing.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show locations, components, materials, dimensions, sizes, and finishes of components. Include plans, elevations, sections, details of anchorage, attachment, and other required installation and operational clearances.

C. Samples:

1. Materials for Playground Equipment.
2. Material for poured in place Playground Safety Surfacing.

D. Maintenance Data: For all products.

E. Qualification Data: For Installer.

F. Warranty: Special warranty specified in this Section.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Source Limitations: Obtain each type of gymnasium equipment through one source from a single manufacturer.

1.4 PROJECT CONDITIONS

A. Environmental Limitations: Do not install equipment until spaces are properly prepared and conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Verify position and elevation and layout for all surfacing and equipment.

1.5 COORDINATION

A. Coordinate installation of playground equipment and safety surfacing with other site or construction work.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of equipment that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure of paint, materials or structural integrity.
b. Faulty operation of equipment.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PLAYGROUND EQUIPMENT

A. General: Playground Equipment to be installed in the area as detailed on Drawings. Comply with US Consumer Product Safety Commission Voluntary Safety Standards and ASTM F1487 Standard Consumer Safety Performance Specification for Playground Equipment for Public Use.

1. Playground Equipment: Play Mart Playgrounds “Trinket”; Play Mart Playgrounds “Freestanding Chain Link Climber” or approved equal.

a. Mesh Size: 2-1/8 inches.
b. Aluminum Coating: ASTM A 491, Type I.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following or approved equal:

1. BigToys, Inc.
2. Grounds for Play, Inc.
3. Play Mart, Inc.
4. U.S. Toy Co. Inc.

2.2 PLAYGROUND SAFETY SURFACING

A. General: Playground Safety Surfacing, poured-in-place, to be installed in the area as detailed on Drawings. Comply with US Consumer Product Safety Commission Voluntary Safety Standards and ASTM F1487 Standard Consumer Safety Performance Specification for Playground Equipment for Public Use.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following or approved equal:

1. Surface America, PlayBound™
2. No Fault Sports Group
3. American Safety Surface, LLC
4. Grounds for Play, Inc.
5. Play Mart, Inc.
6. U.S. Toy Co. Inc.

2.3 MATERIALS

A. Playground Equipment: Aluminum, plastic, recycled plastic. rubber, recycled rubber, EPDM, recycled tires.

B. Playground Safety Surfacing: Poured-in-place, rubber, recycled rubber, EPDM, recycled tires.

C. Anchors, Fasteners, Fittings and Hardware: Manufacturer's standard corrosion-resistant or noncorrodible units; concealed; tamperproof, vandal- and theft-resistant design.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for playground safety surfacing, alignment of mounting substrates, installation tolerances, operational clearances and other conditions affecting safety and installation.

1. Verify critical dimensions.
2. Examine supporting subgrades, and any necessary footings below finished grade.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. General: Comply with manufacturer's written installation instructions. Complete equipment field assembly, where required.

B. Unless otherwise indicated, install playground equipment after other finishing operations, have been completed.

C. Permanently Placed Playground Equipment and Components: Rigid, level, plumb, square, and true; anchored securely; positioned at locations and elevations indicated on Shop Drawings; in proper relation to any adjacent construction.

1. Playground Equipment: Verify safety clearances per manufacturers recommendations and US Consumer Product Safety Commission Voluntary Safety Standards and ASTM F1487 Standard Consumer Safety Performance Specification for Playground Equipment for Public Use.

3.3 CLEANING

A. After completing installation, inspect components. Remove spots, dirt, and debris and touch up damaged shop-applied finishes according to manufacturer's written instructions.

B. Replace product, equipment and finishes that cannot be cleaned and repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION PLYGRD