GOVERNMENT OF THE DISTRICT OF COLUMBIA
DEPARTMENT OF GENERAL SERVICES

WIRELESS NETWORK UPGRADES (CABLING) AT VARIOUS SCHOOL LOCATIONS

Solicitation #: DCAM-13-CS-0145

Addendum No. 1
Issued: May 2, 2013

This Addendum Number 01 is issued by e-mail on May 2, 2013. Except as modified hereby, the Request for Proposals ("RFP") remains unmodified.

Item #1

Sign-In Sheet: The sign-in sheet from the preproposal conference is attached.

Item #2

Mandatory Site Visits: Mandatory site visits will be held as follows. Please meet the Project Managers (Alan Austin and/or Ryan Columbo) in the lobby of the first school listed on each day. DGS would appreciate if you could confirm your attendance in advance through an email to ryan.columbo@urs.com.

May 9, 2013: 1:00 pm

Kelly Miller MS:	301 49th Street, NW
Smothers ES:	4400 Brooks Street, NE
Savoy ES:	2400 Shannon Place, SE

May 10, 2013: 9:00 am

Hart MS:	601 Mississippi Avenue, SE
Ballou HS:	3401 4th Street, SE
Malcolm X ES:	1351 Alabama Avenue, SE
Garfield ES:	2435 Alabama Avenue, SE
Stanton ES:	2701 Naylor Road, SE

May 13, 2013: 9:00 am

Columbia Heights EC:	3101 16th Street, NW
KC Lewis-Washington Metropolitan HS:	300 Bryant Street, NW
Wheatley EC:	1299 Neal Street, NE
Browne EC:	850 26th Street, NE

Item #3

Clarifications:

1. **OCTO Design Standards**: OCTO standards are attached.
2. **Scaled Drawings**: DGS is attempting to locate scaled drawings for each site, and to the extent they are located, they will be made available by subsequent addendum.
3. **Low Voltage Permits**: Offerors should include an add/alternate price per school to pull a low voltage permit. A revised Offer Letter is attached.

Item #4

The bid date remains unchanged. Proposals are due by **May 21, 2013 at 2:00 pm EDT**. Proposals that are hand-delivered should be delivered to the attention of: Derrick Burke, Contract Specialist, at **Frank D. Reeves Center, 2000 14th Street, NW, 8th floor, Washington, DC 20009**.

- End of Addendum No. 1 -

IF YOU HAVEN'T JOINED OUR CONSTANT CONTACT EMAIL DISTRIBUTION LIST, PLEASE CHECK "NO" BELOW AND WE WILL SEND YOU AN EMAIL INVITATION TO JOIN

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Solicitation #: DCAM-13-CS-0145

Preproposal Conference
May 1, 2013

Sign-in Sheet

1. Name: Gabrielle Alfonso Phone: 202-944-8787
   Company: Dynamic Concepts, Inc.
   Email Address: Galfonso@dcihq.com
   Have you registered for the Constant Contact E-Mailing List? YES ☒ NO ☒

2. Name: Sheldon Willett Phone:
   Company: Jones + Wood
   Email Address: Jonestwood inc@yahoo.com
   Have you registered for the Constant Contact E-Mailing List? YES ☑ NO ☐

3. Name: MARLON CHRISTIE Phone: 202-556-3651
   Company: Grand Ground Enterprise, LLC
   Email Address: marlon.christie@grandgroundenterprise.com
   Have you registered for the Constant Contact E-Mailing List? YES ☐ NO ☑

4. Name: Randy Carroll Phone: 202-997-8499
   Company: Keystone Plus Const. Corp.
   Email Address: rcarroll@keystonedc.com
   Have you registered for the Constant Contact E-Mailing List? YES ☑ NO ☐

5. Name: Aaron Clarke Phone: 202 498-5388
   Company: Accurate Conceptions
   Email Address: AClarke@AccurateConceptions.com
   Have you registered for the Constant Contact E-Mailing List? YES ☒ NO ☐

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Preproposal Conference
May 1, 2013

Sign-in Sheet

1. Name: Dale Dykes Phone: 202-438-7467
   Company: TOUCH Media Systems (TOUCH AV)
   Email Address: dale@touchav.com
   Have you registered for the Constant Contact E-Mailing List? YES ☑ NO ☐

2. Name: Alexandra Paolucci Phone: 202-494-5500
   Company: Mervyn Consulting/Construction
   Email Address: Alex.paolucci@MCI-IT
   Have you registered for the Constant Contact E-Mailing List? YES ☐ NO ☑

3. Name: George Price Phone: 202 544 8787
   Company: Dynamic Concepts Inc
   Email Address: gprice@dcika.com
   Have you registered for the Constant Contact E-Mailing List? YES ☐ NO ☐

4. Name: ADE ADELEKAN Phone: 202-545-0127
   Company: GENGEM SERVICES, INC
   Email Address: ADE@GSIDCWORLD.COM
   Have you registered for the Constant Contact E-Mailing List? YES ☑ NO ☐

5. Name: SHAHROKH GHAHRAMANI Phone: 202 677-7979
   Company: KRAMER
   Email Address: SGHAYRAMANI@KRAMERDC.COM
   Have you registered for the Constant Contact E-Mailing List? YES ☒ NO ☐

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Preproposal Conference
May 1, 2013

Sign-in Sheet

1. Name: OSCAR SMITH Phone: 202-526-0503
   Company: UNITY CONSTRUCTION of DC, INC
   Email Address: OSMITH@UNITYCMS.COM
   Have you registered for the Constant Contact E-Mailing List? YES ☒ NO ☐

2. Name: Jamar Gross Phone: 202-281-5414
   Company: Jones & Wood
   Email Address: Gross-78@Hotmail.com
   Have you registered for the Constant Contact E-Mailing List? YES ☐ NO ☑

3. Name: LISA Harley Phone: 973 202 9143
   Company: Tecknomic
   Email Address: lharley@tecknomic.com
   Have you registered for the Constant Contact E-Mailing List? YES ☐ NO ☒

4. Name: DavidBing Phone: 240-755-2118
   Company: Toni Thomas Associates
   Email Address: IMTONIT@aol.com
   Have you registered for the Constant Contact E-Mailing List? YES ☑ NO ☐

5. Name: PATRICK AZZOLI Phone: 301-868-8400
   Company: MONA ELECTRIC INC.
   Email Address: PATRICK.AZZOLI@GETMONA.COM
   Have you registered for the Constant Contact E-Mailing List? YES ☐ NO ☒

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Preproposal Conference
May 1, 2013

Sign-in Sheet

1. Name: SOURASHE DEBELA Phone: 202-234-9400
   Company: TELECOMMUNICATIONS DEVELOPMENT CORP.
   Email Address: sdebela@telcomdc.com
   Have you registered for the Constant Contact E-Mailing List? YES ☐ ~~NO ☐~~ NO ☑
2. Name: Lloyd Brew Phone: 202-316-6898
   Company: Dupont Comptels
   Email Address: Nshger@dci-online.com
   Have you registered for the Constant Contact E-Mailing List? YES ☐ NO ☐
3. Name: James McCall Phone: (202) 526-2101 ext. 18
   Company: United General Contractors
   Email Address: JMCALL2 united gc.net
   Have you registered for the Constant Contact E-Mailing List? YES ☑ NO ☐
4. Name: Les Monde Phone: 202 434 8726
   Company: Biz Tech Fusion, LLC
   Email Address: lmonde@biztechfusion.com
   Have you registered for the Constant Contact E-Mailing List? YES ☐ NO ☑
5. Name: \ Phone: 202 434 8726
   Company:
   Email Address:
   Have you registered for the Constant Contact E-Mailing List? YES ☐ NO ☐

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Solicitation #: DCAM-13-CS-0145

Preproposal Conference
May 1, 2013

Sign-in Sheet

1. Name: Alex Castillo Phone: 5712451130
   Company: TecKnomic
   Email Address: acastillo@tecknomic.com
   Have you registered for the Constant Contact E-Mailing List? YES ☒ NO ☐

2. Name: Alex Johnson Phone: 202 276 0833
   Company: PNG
   Email Address: ajohnson@pngrp.net
   Have you registered for the Constant Contact E-Mailing List? YES ☐ NO ☒

3. Name: Don Smith Phone: (202) 4860247
   Company: HLCG
   Email Address: don@hlcg.biz
   Have you registered for the Constant Contact E-Mailing List? YES ☐ NO ☒

4. Name: _____ Phone: _____
   Company: _____
   Email Address: _____
   Have you registered for the Constant Contact E-Mailing List? YES ☐ NO ☐

5. Name: _____ Phone: _____
   Company: _____
   Email Address: _____
   Have you registered for the Constant Contact E-Mailing List? YES ☐ NO ☐

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Leslie Monde
Operations Director

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Washington, DC 20005

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lmonde@biztechfusion.com
http://www.biztechfusion.com

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Alexandra 'Alex' Paolucci-Herbert
BUSINESS DEVELOPMENT MANAGER

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Washington, DC 20005

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alex.paolucci@mci-it.com
phone: 202-494-5500
cell: 240-298-2813
fax: 202-318-7670

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PRESIDENT

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Project Manager

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Alex D. Johnson
Account Executive

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Fax (301) 916-4720
ajohnson@pngrp.net

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TELECOMMUNICATIONS DEVELOPMENT CORP.

Sourashe Debela
Business Development Manager

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Washington, DC 20009
Mobile: (703) 786-8891
Office: (202) 234-9400
Fax: (202) 234-0770
sdebela@telcomdc.com www.telcomdc.com

United General Contractors, Inc.
CBE, DBE, HUBZone, LSDB, MBE, MDOT, MWAA, WMATA

James McCall
Sr. Project Manager

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Oscar F. Smith, Jr., PMP
(Sonny)
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Patrick J. Azzole
Operations Manager
Voice/Data/Video

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Website: www.grandgroundenterprise.com

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(202) 545-0202 f
(202) 808-1837 c
ade@gsidcworld.com

GENERAL SERVICES, INC.
Construction Management, General Construction, Facility Mgmt., Design & Build

Kunle Adelekan (Ade)
Project Engineer
3613 Georgia Avenue, NW.,
Washington, D.C. 20010
8(a) * Hubzone * CBE/LSDBE * WOMEN OWNED.

DUPONT COMPUTERS INC.

Ned Elshaer
Vice President

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Washington, DC 20009
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F 202.232.6371
nshaer@dci-online.com
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TECKNOMIC

Lisa M. Harley
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www.dcihq.com

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Fax : 202-944-3983

Attachment C

[Offeror's Letterhead]

[Insert Date]

District of Columbia Department of General Services
2000 14th Street, NW
Washington, DC 20009

Att'n: Mr. Brian J. Hanlon
Director

Reference: Request for Proposals
Wireless Network Upgrades (Cabling) at Various School Locations

Dear Mr. Hanlon:

On behalf of [INSERT NAME OF BIDDER] (the "Offeror"), I am pleased to submit this proposal in response to the Department of General Services' (the "Department" or "DGS") Request for Proposals (the "RFP") to provide Wireless Network Upgrades (Cabling) at Various School Locations. The Offeror has reviewed the RFP and the attachments thereto, any addenda thereto, and the proposed Form of Contract (collectively, the "Bid Documents") and has conducted such due diligence and analysis as the Offeror, in its sole judgment, has deemed necessary in order to submit its Proposal in response to the RFP. The Offeror's proposal, the Lump Sum Contract Price (as defined in paragraph A) and the Add/Alternate Prices (and defined in paragraph B) are based on the Bid Documents as issued and assume no material alteration of the terms of the Bid Documents. (Collectively, the proposal, the Lump Sum Contract Price and the Add/Alternate Prices are referred to as the "Offeror's Bid".)

The Offeror's Bid is as follows:

A. The Lump Sum Contract Price per school is:

Garfield ES:	$_____
Columbia Heights EC:	$_____
Wheatley EC:	$_____
Malcolm X ES:	$_____
Savoy ES:	$_____
Stanton ES:	$_____
Ballou HS:	$_____
Kelly Miller MS:	$_____
Smothers ES:	$_____
KC Lewis-Washington Metropolitan HS:	$_____
Hart MS:	$_____
Browne EC:	$_____

The Offeror acknowledges and understands that the Lump Sum Contract Price is a firm, fixed price to fully complete the work described in the RFP and attachments thereto and that such amount includes funding for work which is not describe in the RFP and attachments thereto but which is reasonably inferable therefrom.

B. Add/Alternate 1: Provide add/alternate unit price for one additional drop.

$_____

Add/Alternate 2: Provide add/alternate price to perform work during off hours, M-F from 3pm to 11pm (per school).

Garfield ES:	$_____
Columbia Heights EC:	$_____
Wheatley EC:	$_____
Malcolm X ES:	$_____
Savoy ES:	$_____
Stanton ES:	$_____
Ballou HS:	$_____
Kelly Miller MS:	$_____
Smothers ES:	$_____
KC Lewis-Washington Metropolitan HS:	$_____
Hart MS:	$_____
Browne EC:	$_____

Add/Alternate 3: Provide add alternate cost to core drill a 4" hole through the floor for potential new cable access.

$_____

Add/Alternate 4: Provide add/alternate price to pull a low voltage permit (per school).

Garfield ES:	$_____
Columbia Heights EC:	$_____
Wheatley EC:	$_____
Malcolm X ES:	$_____
Savoy ES:	$_____
Stanton ES:	$_____
Ballou HS:	$_____
Kelly Miller MS:	$_____
Smothers ES:	$_____
KC Lewis-Washington Metropolitan HS:	$_____
Hart MS:	$_____
Browne EC:	$_____

C. In addition, the Offeror hereby represents that, based on its current rating with its surety, the indicated cost of a payment and performance bond is [INSERT PERCENTAGE].

The Offeror's Bid is based on and subject to the following conditions:

1. The Offeror agrees to hold its proposal open for a period of at least one hundred twenty (120) days after the date of the bid.

2. Assuming the Offeror is selected by the Department and subject only to the changes requested in paragraph 5, the Offeror agrees to enter into a contract with the Department on the terms and conditions described in the Bid Documents within ten (10) days of the notice of the award.

3. Both the Offeror and the undersigned represent and warrant that the undersigned has the full legal authority to submit this bid form and bind the Offeror to the terms of the Offeror's Bid. The Offeror further represents and warrants that no further action or approval must be obtained by the Offeror in order to authorize the terms of the Offeror's Bid.

4. The Offeror and its principal team members hereby represent and warrant that they have not: (i) colluded with any other group or person that is submitting a proposal in response to the RFP in order to fix or set prices; (ii) acted in such a manner so as to discourage any other group or person from submitting a proposal in response to the RFP; or (iii) otherwise engaged in conduct that would violate applicable anti-trust law.

5. The Offeror's proposal is subject to the following requested changes to the Form of Contract: [INSERT REQUESTED CHANGES. OFFERORS ARE ADVISES THAT THE CHANGES SO IDENTIFIED SHOULD BE SPECIFIC SO AS TO PERMIT THE DEPARTMENT TO EVALUATE THE IMPACT OF THE REQUESTED CHANGES IN ITS REVIEW PROCESS. GENERIC STATEMENTS, SUCH AS "A MUTUALLY ACCEPTABLE CONTRACT" ARE NOT ACCEPTABLE. OFFERORS ARE FURTHER ADVISED THAT THE DEPARTMENT WILL CONSIDER THE REQUESTED CHANGES AS PART OF THE EVALUATION PROCESS.]

6. The Offeror hereby certifies that neither it nor any of its team members have entered into any agreement (written or oral) that would prohibit any contractor, subcontractor or subconsultant that is certified by the District of Columbia Office of Department of Small and Local Business Enterprises as a Local, Small, Resident Owned or Disadvantaged Business Enterprise (collectively, "LSDBE Certified Companies") from participating in the work if another company is awarded the contract.

7. This bid form and the Offeror's Bid are being submitted on behalf of [INSERT FULL LEGAL NAME, TYPE OF ORGANIZATION, AND STATE OF FORMATION FOR THE OFFEROR].

Sincerely,

By: _____
Name: _____
Its: _____

OCTO School Technology Standards

VERSION: 1.2

DATE: FEBRUARY 4, 2009

Table of Contents

Revision History

[INTENTIONALLY OMITTED]

1. APPROVAL AND VERIFICATION

[INTENTIONALLY OMITTED]

2. INTRODUCTION

This document contains detailed standards for school modernization projects. The standards can be classified as infrastructure, security, administrational, and instructional or classroom technology. Infrastructure includes Wiring and Cabling, Wired and Wireless Network, Directory Servers, and Audio. Security includes CCTV, Public Address, and Physical Intrusion Detection. Administrational includes PA and Telephones. Classroom Tech includes Digital Whiteboards, Computers and Student Desktop Management, Document Cameras, and Televisions.

3. STANDARDS

3.1 VOICE AND DATA SYSTEMS

Reference: [DIVISION 16 – ELECTRICAL, SECTION 16770 – VOICE / DATA SYSTEMS]

PART 1 – GENERAL REQUIREMENTS

1.1 GENERAL

A. The conditions of the General Provisions (General, Supplementary, and other conditions) and the General Requirements of the Project are hereby made a part of this Specification.

B. All bids shall be based on the voice, power, and data as specified herein and as indicated on the Drawings. A single manufacturer / allied-manufacturer solution to the network design across the entire link shall be provided.

C. Bidders shall provide submittals as required in General Provisions and as specified herein. Bidder shall provide a demonstration of the proposed system, if requested.

D. The Owner reserves the right to determine the final approval of the system at the time of scheduled job completion. Failure to meet the installation schedule or provide the "precise functional equivalent" shall result in the removal of the system at the Contractor's expense.

E. Voice/Data Systems Coordination: The Section 16770 Contractor shall be responsible for coordinating the interfaces, shared devices and installations of the Voice Cabling infrastructure, the Data Cabling infrastructure, the Integrated Telecommunications System infrastructure and the Auditorium Sound System. No additional cost to the Owner shall be permitted for the Contractor's failure to do so.

F. Additional Division/Section responsibility and systems coordination:

1. In addition to the 16770 specification, the 16770 Contractor is responsible for providing, installing and executing the following interfaced contract sections:
2. The Section 16770 Contractor is responsible for providing, installing and executing Section 16780: Integrated Telecommunications System in its entirety. Contractor to provide complete coordination of the hardware and interface(s) between Section 16770 and Section 16780.
3. The Section 16770 Contractor is responsible for providing, installing and executing Section 16925: Local Sound System in its entirety. Contractor to provide complete coordination of the hardware and interface(s) between Section 16770 and Section 16925.
4. The Section 16770 Contractor is responsible complete coordination of the hardware and interface(s) specified between all the Sections listed above. An example: The Intercommunications System (16780) is specified with a priority interlock interface between itself and the Local Sound System (16925).

1.2 SCOPE OF WORK

A. Furnish and install all equipment, accessories, and materials in accordance with these specifications and drawings to provide complete functional Electronic Communication Systems consisting of the following sub-systems:

1. A complete and operable Voice (telephone) Cabling System.
2. A complete and operable Data Communications Cabling System as specified herein.
3. Complete and operable structured cabling systems as specified herein. The structured cabling system for this project includes all communications cabling, wire ways, communications outlets,

terminal blocks, racks, patch cords, cabinets, splitters, surge protectors, and related connectors, mounting hardware, identification devices, accessories, and appurtenances for TIA/EIA Cat 6 data cabling system (Category 6 Augmented as an Alternate), data hardware allowance, and the telephone distributions cabling system where applicable. On new Construction, the rough-in shall provide all conduit paths, outlet boxes, plaster rings, pull strings, backboards, grounding conductors and bus-bars, power receptacles, surface raceway and connectors, and utility columns as indicated on the Construction Documents to accommodate the detailed installation.

B. Contractor shall provide a complete telecommunication system, fully operational, capable of operating at speeds up to 100 Mbps at High Schools, 50 Mbps at Middle Schools, and 25Mbs at Elementary schools, ready for the occupants to use both the voice and data communications outlets. The installation shall include all accessories, devices, and any required extensions/cutovers from the telephone and cable TV utilities points of demarcation to provide complete and functioning systems. Any materials and devices not specifically mentioned in these Specifications or indicated on the Contract Drawings that are required for a finished and operating system installation shall be furnished and installed at no additional cost to the Owner.

C. Contractor shall be responsible for providing a complete, functional system including all necessary components, whether included in this specification or not. Quantities indicated on the Drawings and in these Specifications are for reference purposes only. It is the responsibility of the Contractor to provide appropriate quantities of materials and equipment to provide a complete functional system. In the event any item(s) is(are) not specified, but is (are) needed to complete the work properly, the Contractor shall provide the needed item(s) at no additional charge.

D. If mention has been omitted herein of any items of the work or materials usually furnished for, or necessary to, the completion of the cabling work, or if there are conflicting points in the Specifications, it shall be the Contractor's responsibility to call the Owner's and Engineer's attention to such an item or items in sufficient time for a formal addendum to be issued. Any and all conflicting points in the Specifications and/or drawings which are not questioned by the successful bidder and clarified prior to opening of bids shall be subject to the interpretation of the Owner after award of the contract, and its interpretation shall be binding upon the successful bidder.

E. Contractor shall provide all labor, materials, equipment, software tools, and services necessary for, incidental to, installation and testing of data cable and equipment for a building-wide network. The base data network is to be a ring/loop topology 1000Base-T Ethernet network and sub-networks. The base data network shall have 1000Base-F(X) fiber backbone capacity.

F. Contractor shall provide a complete structured cabling system consisting of the following sub-systems:

1. Equipment Room Subsystem.
2. Horizontal Subsystem.
3. Backbone Subsystem.
4. Media (Video) Subsystem.

G. A reasonable shifting in location of outlets, cabling, and surface metal raceway (up to 20 feet in any direction) shall be expected in order to meet field conditions; and this work shall be provided at no increased cost to the Owner.

1.3 RELATED WORK

A. Refer to bid document alternate(s) for items applicable to the intercommunications, data and video sub-systems.

B. Refer to Bid document Allowance for data hardware.

1.4 SUBMITTALS

A. Original specification sheets or clear copies of same shall be submitted on all items. Manufacturers name, make and model number shall appear on each sheet. Submittals shall be bound in booklet form with cover sheet and index, and presented in a neat and logical order in a binder. Submittals shall contain installation, operation and programming manuals of the system to provide the Owner and Engineer complete information as to system features, functions and capabilities.

B. Submit one-foot sample of each proposed cable type to be used on this project.

C. Submit product data on each product specified in this section, including, but not limited to the cabinets and cabinet components, cabling, and cabling components, rack hardware and accessories, patch cord organizers and cable ring wiring path blocks, fiber optic cable, multipair telephone cable, Category 6 Enhanced UTP cable (Category 6 as an Alternate), cable end connectors, outlets, wireways, cable management, surge protectors, splitters, amps, taps, hubs, switches, electronic hardware, conduit, and other raceways and associated components, jacks, etc., in a bound, jacketed loose-leaf binder. Provide the number of specification copies that are required in the General Provisions of the specifications. Each item proposed shall be tagged with a star, an arrow, etc.

D. Wiring and systems certification shall be provided in text format on hard copy and CD disk copy. Contractor to provide cable routing information on CAD drawings and electronic files. CAD drawings shall show installation locations of equipment, product quantities and types.

E. Submit dimensional outline drawing of systems control cabinet(s) and racks showing relative position and size of all major components and equipment involving dimensions, elevations, and terminations. Each drawing shall indicate all equipment with its manufacturer and model number shown.

F. Submittal shall contain a complete schedule of manufacturer's part numbers and quantity listings of all supplied components.

G. Submit Certifications and lists as required in "Quality Assurance" below.

H. Submit wiring diagrams showing typical connections for all systems and equipment. Include detailed one-line drawings of each system. Each system drawing shall show proposed circuit numbers for all cables and terminal connections. Provide typical wiring termination details for all devices.

I. Submit Shop Drawings of each proposed system (Voice/Data) indicating the proposed system configuration and all specified requirements. Shop Drawing shall indicate proposed cable routing, detail installation locations of equipment, cable quantities, cable types, and terminal block locations. All Shop Drawings shall be Contractor's original drawings. Submission of Engineer's Contract Drawings as Shop Drawings is not permitted. Clear and detailed sets of floor plans for the complete building shall be furnished showing the locations of all equipment and devices and their required interconnections. The interconnections shown shall indicate the number, size, and type of wires as described in this Specification. The layout of all telecommunications system equipment, devices, and conduit routings shall closely follow that shown on the Drawings.

J. A copy of testing procedures including proposed equipment, manufacturer's recommendations, test report forms, and test report format.

K. Cable Certification Test Results: The Contractor is responsible for testing and certification of all components of the voice/data-cabling infrastructure. All relevant test data including documentation of failed tests, the corrective procedures performed, and the results of re-tests, are to be documented and submitted to the Owner in both printed hard copy and machine readable format within five (5) working days of test completion. Unless otherwise noted, all raw test data will be provided to the Owner in a documented ASCII comma delimited format.

L. Submit a certificate of completion of installation and service training from the systems Manufacturers. The supplying Contractor shall have attended the Manufacturer's installation and service schools. Certificates of this training shall be provided within the Contractor's submittal.

M. The Communications Contractor shall submit a list to include at least fifteen (15) of the Contractor's installations of similar or larger size and complexity to the proposed system, which have been in satisfactory operation for a minimum period of five (5) years. The submitted list shall include a minimum of fifteen (15) data cabling system (LAN) references that have been in satisfactory operation for a minimum period of two (2) years. The reference list shall include the project's name, address, date of installation, name of the LEA (Local Education Agency) construction/installation co-coordinator and their telephone number.

N. Submittals not containing complete documentation of specification items shall be automatically rejected before further review.

O. The Contractor shall submit a certificate with the RCDD signature, registration number, and seal verifying the completeness and accuracy of the design and installation. All distribution designs shall be submitted with the RCDD signature, registration number, and seal.

P. Where model number or name of one manufacturer is followed in specifications by one or more other manufacturer's name, design has been based on the first product named, and shall be considered to be the specified product or manufacturer, named alternates may require minor deviations. Contractor shall indicate deviations in submittals/shop drawings.

Q. Manufacturer's model and catalog numbers, which are given for convenience of identifications only, change frequently and may not necessarily include specified or required features and may not insure compatibility with supporting systems or intended application. Contractor shall insure that material and equipment delivered to job site is suitable for the intended application and indicated connections. Review of shop drawings shall not include review and verification of submitted catalog numbers or quantities required.

R. Review of and noted comments on Contractor's submitted shop drawings do not constitute a change order or a waiver of contract requirements. In the event of conflict between submittals or shop drawings and contract documents, the latter shall govern. If waiver of particular requirement is requested by the Contractor, a formal written request shall be made to Owner as per General Conditions.

S. When directed, the Contractor shall provide samples of material or equipment.

T. Equipment shall be shipped or fabricated in sections in suitable size for entering building and the Contractor shall make all necessary arrangements for their installation.

U. Shop Drawings and submittals shall bear the General Contractor's review and approval stamp prior to submission to the Engineer.

V. Manufacturer's Drawings, sketches, and instructions shall supplement, but not supersede, Contract Drawings and Specifications.

W. Submit installation, operation, and maintenance instructions.

X. Any and all conflicting points in the specifications and/or drawings which are not questioned by the successful bidder and clarified prior to opening of bids shall be subject to the interpretation of the Owner after award of the contract, and its interpretation shall be binding upon the successful bidder.

1.5 SUBSTITUTES AND ALTERNATES

A. Under base bid, furnish equipment and material specified or named alternates. Approved equal products by Molex and Hubbell/Mohawk shall also be allowed. Products submitted shall be equal in quality to products of the specified manufacturer and shall include the standard features of the specified product and also optional features or necessary changes specified herein. Submittal of alternates shall include all changes in building systems, piping, wiring, supports or accessories required for satisfactory and intended operation. The Engineer shall be final judge of equivalence.

B. Substitute equipment submitted shall include a price change or advantage to the Owner, if accepted, at the time of submission. Product and performance requirements of substitute items shall be the same as named alternates.

C. Receive approval in writing from the Owner and Engineer for each item of substitution prior to commencing work. Items to be considered for substitution must be clearly indicated as a substitute item at the time of submission. No substitutions shall be allowed without written approval.

1.6 SERVICE, MAINTENANCE AND WARRANTIES

A. A twenty (25) year Extended Product Warranty and System Assurance Warranty for this wiring system shall be provided as follows.

B. Extended Product Warranty: The Extended Product Warranty shall ensure against product and workmanship defects, that all approved cabling components exceed the specifications of TIA/EIA 568A and ISO/IEC IS 11801, exceed the attenuation and NEXT requirements of TIA/EIA TSB 67 and ISO/IEC IS 11801 for cabling links/channels, that the installation will exceed the loss and bandwidth requirements of TIA/EIA TSB 67 and ISO/IEC IS 11801 for fiber links/channels, for a twenty (25) year minimum period. The warranty shall apply to all passive SCS components, including both cable and connecting hardware as a combined system. Any claim covers replacement costs of any defective product, both material and labor.

C. System Assurance: The System Assurance shall cover the failure of the wiring system to support the application which it was designed to support (Category 6 and 1000Base FX), as well as additional application(s) introduced in the future by recognized standards or user forums that use the TIA/EIA 568A or ISO/IEC IS 11801 component and link/channel specifications for cabling, for a twenty (25) year period.

D. Extended Product Warranty: The Extended Product Warranty and the System Assurance shall cover the replacement or repair of defective product(s) and labor for the replacement or repair of such defective product(s).

E. System Certification: Upon successful completion of the installation and subsequent inspection, the customer shall be provided with written guarantee, registering the installation.

F. Warranty shall be a Hubbell MISSION CRITICAL® program giving assurance of system success with a 25-year guarantee on the components, performance, and installation integrity of your structured cabling system.

G. The system manufacturer shall maintain engineering and service departments capable of rendering advice regarding installation and final adjustment of the system.

H. The Contractor shall respond to a trouble call within twenty-four (24) hours or less, after receipt of such a call.

I. The Contractor shall pre-register this project with the Manufacturer for the Warranty Period, in accordance with the Manufacturer's requirements.

J. The Contractor shall be responsible for and pay for damages caused by or resulting from defects in workmanship.

K. The Contract unconditionally guarantees, for a minimum of two (2) years, as set forth in the General Conditions, all materials, workmanship, and installation. During this period, adjust, repair, or replace at no cost to the Owner any item of equipment or workmanship found to be defective.

L. The Contract is for full maintenance (parts and labor), support, or replacement of all network components (excluding the microcomputers and Ethernet cards) for a period of three years from the date of acceptance by the Owner.

1.7 QUALITY ASSURANCE

A. All items of equipment, including wire and cable, shall be designed by the manufacturer to function as a complete system and shall be accompanied by the manufacturer's complete service notes and drawings detailing all connections.

B. The Contractor shall be an established communications and electronics contractor that has had, and currently maintains, a locally run and operated business for at least three (3) years. The contractor shall be a duly authorized distributor of the equipment supplied with full manufacturer's warranty and service privileges. The Contractor shall be a valid District of Columbia licensed and bonded Contractor. The contractor shall maintain a local service center located within fifty (50) mile radius of the project. The system manufacturer shall maintain engineering and service departments capable of rendering advice regarding installation and final adjustment of the system.

C. The Contractor shall show satisfactory evidence, upon request, that he maintains a fully equipped service organization capable of furnishing adequate inspection and service to the system. The contractor shall maintain at his facility the necessary spare parts in the proper proportion as recommended by the manufacturers to maintain and service the equipment being supplied. However, the Contractor shall maintain in house, at a minimum, the spare parts necessary to completely repair three (3) systems.

D. The Contractor shall be a factory-certified, trained, and authorized installer of all equipment to be installed. The contractor shall be certified prior to award of contract. A factory representative or factory authorized school shall train all installers for both copper and fiber optic applications.

E. Standards and Codes: All work performed under this contract shall be done in accordance with the most recent issue and latest revisions of the following codes, standards, and guidelines. All materials and equipment shall be UL listed for the intended application.

1. Americans with Disabilities Act (ADA), and the ADA Accessibility Guidelines (ADAAG).
2. American National Standard Institute (ANSI).
3. ANSI A117.1-1980.
4. ASTM E 814 - American Society for Testing Materials, Fire Tests of Through-Penetration Firestops.
5. BISCI Building Industry Consulting Service International Telecommunications Distribution Methods Manual (TDMM).
6. BISCI LAN Manual.
7. BISCI Cabling Installation Manual.
8. UL 1479 - Fire Tests of Through-Penetration Firestops.
9. UL Fire Resistance Directory, Volumes 1 and 2.
10. EIA-455-171-D Standard Test Procedures for Fiber Optic Cables.
11. Federal Communications Commission (FCC) Regulations for Telephone Data Systems.
12. Federal Communications Commission (FCC) Rules (including FCC 47 CFR 68) The Code of Federal Regulations.
13. ICEA S-80-576, Communications Wire and Cable for Wiring of Premises.

14. ICEA S-90-661. Indoor Wiring Standard.
15. IEEE 802.3 Institute of Electrical and Electronics Engineers LAN Standard for Ethernet. CSMA/CD Access method - Carrier sense multiple access with collision detection access method and physical layer specifications.
16. IEEE 802.7, Recommended Practices for Broadband Local Area Networks.
17. IEEE 802.11, IEEE Standard for Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications.
18. IEEE 1100-1992 Recommended Practice for Powering and Grounding Sensitive Electronic Equipment.
19. Local Codes.
20. National Electrical Contractors Association (NECA) Standards of Workmanship & Installation.
21. National Electrical Manufacturers Association (NEMA) Standard for Low-Loss Premise Telecommunications Cable.
22. National Electrical Safety Code.
23. NFPA National Fire Protection Association, including NFPA 70 (National Electrical Code), NFPA 75 (Protection of Electronic/Data Processing Equipment), NFPA 101 (Life Safety Code), and NFPA 780 (Lightning Protection Code).
24. Requirements of the Fire Marshal.
25. SCTE#1PS-SP-001, Society of Cable Television Engineers Flexible RF Coaxial Drop Cable Specification.
26. TIA/EIA-455-61. *FOTP-61, Measurement of Fiber or Cable Attenuation Using an OTDR.*
27. TIA/EIA-455-A. Standard Test Procedure for Fiber Optic Fibers, Cables, Transducers, Sensors, Connecting, and Terminating Devices, and other Fiber Optic Components.
28. TIA/EIA-492-AAAA. Detail Specification for 62.5 Micrometer Core diameter/125 Micrometer Cladding Diameter Class 1A Multimode, Graded Index Optical Waveguide fibers.
29. TIA/EIA-568-A Electronics Industries Association/Telecommunications Industry Association Commercial Building Telecommunications Cabling Standard.
30. TIA/EIA-569-A Electronic Industries Association/Telecommunications Industry Association Commercial Building Standard for Telecommunications Pathways and Spaces.
31. TIA/EIA -570. Residential and Light Commercial Telecommunications Wiring Standard.
32. TIA/EIA-606. The Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.
33. TIA/EIA-607. Commercial Building Grounding and Bonding Requirements for Telecommunications.
34. TIA/EIA-SP-2840 Commercial Building Telecommunications Cabling Standard - Issue 1.
35. TIA/EIA-4750000-8 Generic Specification for Fiber Optic Connectors.
36. TIA/EIA-TSB-36. "Technical Systems Bulletin Additional Cable Specifications for Unshielded Twisted-Pair Cables".
37. TIA/EIA-TSB-40 "Technical Systems Bulletin: Additional Transmission Specifications for Unshielded Twisted Pair Connecting Hardware".

If local regulations or codes are more stringent, then those stipulations shall govern.

F. The Contractor shall be an experienced firm regularly engaged in the layout and installation of structured cabling systems of similar size and complexity as required for this installation. The Contractor shall have successfully completed the installation, testing, and warranty of systems of similar size at least five (5) years prior to bid. Contractor shall retain at least one (1) BICSI-Certified R.C.D.D. on staff, LAN Specialist designation is preferred. The Contractor shall be factory-certified for all of the products they install.

G. Contractor shall be able to prove to the satisfaction of Owner that it has significant experience in the installation of fiber optics cable systems. Installation must include installation of fiber optics cable, fiber termination, knowledge of interconnect equipment, and a thorough knowledge of testing procedures.

H. The Contractor shall provide references (names/telephone numbers and addresses) that which can confirm they have satisfactorily installed similar networks in other schools.

I. The Contractor shall provide a list of their technical support staff, together with their working experience and certification(s).

J. The Contractor shall submit documentation of their support staff being trained in the manufacturer's factory, on-site training, or other means (college courses, etc.).

K. The Contractor shall state their nearest branch office and dealer's office in relation to the proposed site of the structured building cabling system. If none, the location of the main office shall be stated.

L. The Contractor shall state the nearest location of their principle support center. This center shall have permanently stationed support staff that is capable of providing technical support if required.

M. The Contractor shall provide evidence of being factory-authorized to design, engineer, install, and maintain the proposed network.

N. Enclose letters of commendations from previous customers, if any.

O. The Contractor shall list all sub-contractors and provide information as required in this section for each sub-contractor. Information shall be submitted with bid forms and is due at time of bid opening. The Owner retains the right to request a substitution, if in the Owner's or Engineer's opinion, the sub-contractor is not qualified. If an acceptable sub-contractor cannot be identified, the Owner retains the right for rejection. The Contractor shall submit documentation of Manufacturer's acceptance of subcontractor for all work.

1.8 SINGLE SOURCE RESPONSIBILITY AND ACCEPTABLE MANUFACTURERS

A. Except where specifically noted otherwise, all equipment and products for each subsystem: (Data System, Telecommunications System and Video System), shall be the standard products of a single manufacturer of known reputation and experience in the industry. Integration of various manufacturers' products within each subsection in an attempt to meet the specifications shall be deemed in direct conflict with this specification and shall be automatically rejected.

B. Any potential substitute manufacturer shall be judged against the manufacturer of the highest quality and more stringent specifications for all the manufacturers listed in this specification.

C. Although multiple manufacturers have been listed and cited, along with specific part numbers, this does not indicate pre-approved products. Listing and citations of manufacturer's name and product part numbers is for the purpose of establishing quality and performance criteria.

D. For purposes of determining equality, technical and general information set forth on the respective data sheets by manufacturers named in this section for each specified item shall be considered as part of these Specifications and binding herein. Any proposed equal item offered shall be substantiated fully to prove equality. The Owner reserves the right to require a complete sample of any proposed equal item and may, if necessary, request a sample tested by and a copy of the test results from an independent testing laboratory to prove equality. The decision of the Owner regarding equality of proposed equal items will be final.

E. It is the responsibility of the Contractor to provide appropriate quantities of materials to provide a complete, functional system.

F. All specified items, functions, and quantities are critical to the operation of the School and must be provided exactly as specified. The Engineer and Owner reserve the right to determine if alternate equipment and means of operations meet the requirements of the Project.

G. As this is a performance-based specification, all functions, components and quantities of the system will be reviewed in detail for total compliance. Manufacturers and Contractor shall also fully comply with the provisions specified in this section.

H. The intent is to establish a standard of quality, function, and features. It is the responsibility of the bidder to insure that the proposed product meets or exceeds every standard set forth in these specifications.

I. All equipment shall be new and shall be the latest product of a manufacturer of established reputation and experience of quality electronic equipment.

1.9 SAFETY / COMPLIANCE TESTING

A. All equipment used for normal daily activities/operation by staff and/or students shall be mounted at ADA required heights (for example, Patch Panels).

B. All data and voice system active components shall be UL listed.

C. All materials and equipment shall be installed and completed in a high quality and workmanlike manner and in accordance with the best modern methods and practice. The Contractor shall be certain that all installation work areas are secure and made safe in accordance with Occupational Safety and Health Administration (OSHA) regulations.

1.10 IN-SERVICE TRAINING

A. The Contractor shall provide at no additional cost a minimum of sixteen (16) hours of in-service on-site training with these systems. The training sessions shall be divided into segments that will facilitate the instruction of individuals in the operation of the systems. Operations Manuals and Users Guides specified in Section IV shall be provided at the time of this training.

1.11 DELIVERY, STORAGE, AND HANDLING

A. All supplies and/or materials shall be held by the Contractor until needed at the site, unless they can be stored in the area in which the work is to be done and that area has been closed to occupant usage.

B. The Contractor shall obtain the permission of the using institution's representative regarding any needed storage of materials and equipment. Such storage shall be done in such a manner as not to interfere with the building schedule. The Contractor shall be responsible for any and all accidents caused by negligence from this source. The Owner does not accept responsibility for losses of material or equipment, regardless of approval to store, in any institution's facilities or grounds.

C. All deliveries shall be scheduled, received and will be the responsibility of the Contractor; and deliveries by "Drop Shipment" from other sources will not be accepted by the Owner.

D. Delivery: The Contractor shall make all arrangements to unload and transport delivered materials and equipment to the job site. Equipment and materials shall be received at the site in new condition and shall be maintained in new condition throughout the installation process.

E. Storage: Designated telecommunication rooms may be used with the project manager's approval for material storage. Materials shall be new. Damaged or deteriorated equipment and material will not be acceptable.

F. Cable reels shall not be rolled or stored without an appropriate underlay.

1.12 PROJECT/SITE CONDITIONS

A. Conditions of the projects will vary with each installation. Sequencing and scheduling shall be the responsibility of the contractor.

B. Refer to Part 3 of this specification section, “Site Survey”, for additional information.

C. The Contractor shall expect that other Contractors from other trades and Contracts may be working in the building at the same time while this contract is in progress. The Contractor shall fully cooperate with all those working in the building. Work shall be done as described in the General Conditions.

D. The Contractor shall meet with the appointed representative of the Owner prior to the start of the project, to coordinate phasing and timing of planned installation. Prior to starting the installation, the assigned supervisor or lead technician, shall participate in a walk-through of the project with the Owner’s representative to review the engineering/installation documentation and verify all installation methods and cable routes.

E. The Contractor shall examine the site and observe the conditions under which the work will be done or other circumstances which will affect the work before submitting his bid. No subsequent allowance will be made for errors or omissions in connection with this examination.

F. The Contractor shall obtain and pay for any and all certificates and permits required for the work to be performed.

G. All materials and equipment shall be installed and completed in a high quality and workmanlike manner and in accordance with the best modern methods and practice. The Contractor shall be certain that all installation work areas are secure and made safe in accordance with Occupational Safety and Health Administration (OSHA) regulations.

H. Materials installed which do not present an orderly and reasonably neat or workmanlike appearance or are not installed in accordance with these specifications or the Contract Drawings shall be removed and replaced at the Contractor’s expense when so directed by the Owner.

I. Drawings shall be considered schematic in nature and shall represent a completed product. Contractor is responsible for installation of equipment and methods of achieving a satisfactory and intended installation. Locations of devices are intended to show a general arrangement and indented function. Coordinate with all Contract Documents and site conditions. Coordinate with other trades.

J. Where a conflict exists between Drawings and Specifications, the Engineer shall be contacted to determine the intent. In all circumstances, the final Contract Document interpretation shall provide compliance with all codes.

K. Wiring devices shall be located uniformly with respect to building structure and other work. Locations shall be coordinated. Should there be any interference between electrical wiring and other trades, Contractor shall notify Engineer so that proper location may be decided upon.

L. If mention has been omitted herein of any items (installation tools) of the work or materials usually furnished for, or necessary to the completion of the cabling work (screws, anchors, clamps, tie wraps, distribution rings, miscellaneous grounding and support hardware) or if there are conflicting points in the Specifications, the Owner’s attention should be called to such an item or items in sufficient time for a formal addendum to be issued. Any and all conflicting points in the Specifications and/or Drawings which are not questioned by the successful bidder and clarified prior to opening of bids shall be subject to the interpretation of the Owner after award of the contract, and its interpretation shall be binding upon the successful bidder.

PART 2 - EQUIPMENT SPECIFICATIONS

2.1 EQUIPMENT RACK/CABLE MANAGEMENT

A. Equipment rack(s) shall be provided for the telecommunication system. The rack shall be upright, floor standing, steel, or extruded aluminum. Equipment racks shall conform to EIA Standard RS-310C for 19" x 84" racks, capable of supporting up to 600 pounds, with Type B universal mounting rail hole pattern, and shall be complete with all mounting hardware. All unused rack space shall be blanked off with matching steel panels.

B. Racks shall be mounted on an isolation pad and utilize non-conductive washers with appropriate sized lag screws to secure the rack to the floor. Provide Chatsworth #10605-019 rack/floor isolation kit. Racks shall be secured to the floor with four screws per rack. Floor-mounted open racks shall be secured from the top rail to the backboard in the room with a length of cable runway to prevent movement. All racks shall be grounded to the isolated ground bar within the Telecommunications Closet (TC) and Main Cross-Connect (MC) using a standard ground lug and #6 AWG jacketed green cable in accordance with 007 portion of TIA/EIA Standards unless otherwise required NEC. Provide ground lug kit for data rack bonding.

C. Provide horizontal and vertical cable management organizers as elsewhere specified in this section. Vertical wire management shall be Hubbell VC76H, and horizontal wire management Hubbell HC219ME3N or approve equals. Each IDF shall be connected to the MDF. Provide a minimum of four (4) rows of 5 count split front "D" ring horizontal cable management panels per rack. Provide power outlet strips in each equipment rack. Power Outlet surge strip shall be Wiremold Part Number JT06B2B or approved equal.

D. Racks shall be Hubbell HPW84RR19, or approved equal.

E. The Contractor shall provide a 12" ladder rack for all vertical and horizontal bulk cable management within telecommunications closets. Acceptable Parts: Cablofil CF105 Series, Hubbell 12" (w) Steel, 9" Ladder Series, or approved equivalent.

1. The Contractor shall install 2 x 6 x 10 wire mesh cable tray in ceiling and telecommunications closets where deemed necessary to facilitate proper cable management. Cable Tray shall be MP Husky's Techtray, Gs Metals Flextray, or approved equal. Contractor shall have the option to provide j-hooks or mesh cable tray for cable supports for distributing cables through the building. The Contractor shall provide only cable tray in each MDF and IDF for cable support.
2. Install cable management system at locations specified. Coordination with other trades will be absolutely necessary in this installation. Any major corrections of the path should be brought to the attention of the Owner and the Engineer.

F. The Contractor shall provide wall-mounted, split-front "D"-type wire management rings above, below, and between each wall-mounted termination panel. Acceptable Parts: Hubbell 110TRA cable management troughs; and cable management rings, or approved equal.

G. The Contractor shall provide 2" (or larger as necessary) J-shaped hooks, with rolled edges; gray baked enamel finish; complete with necessary hardware for attachment to sidewall, ceiling, or joist. J-hooks shall be used to support voice and data cable above suspended ceilings. The Contractor shall supply the quantity necessary. J-hooks shall be spaced a maximum of four feet (4'). Manufacturer shall be Caddy Cat-6 J-hooks, or approved equal.

H. Cable Ties:

1. The Contractor shall provide Velcro-type cable ties. Velcro-type cable ties shall be used exclusively for cable management within the racks in the telecommunications closets. The contractor shall supply quantities as necessary for each system.
2. The Contractor shall provide plastic “zip” tie wraps. “Zip” tie wraps shall be used for general cable management throughout the areas outside the telecommunications closets. The Contractor shall supply the quantity necessary.

I. The Contractor shall provide 3/4” deep fire-retardant-treated plywood backboards, painted white (or other finish color as selected by Owner) with durable enamel paint. Plywood backboards shall conform to Product Standard PS1, Grade B-D, with one finish smooth side (Class A surface). Minimum size shall be 4 feet wide x 8 feet high. All backboards shall be marked with the legend “COMM per EIA/TIA 606 Standards”.

UNINTERRUPTABLE POWER SUPPLY

2.2

A. Provide one (1) UPS unit in each data equipment rack. The UPS System shall be line interactive design with a maximum transfer time of 4 milliseconds. The UPS shall be a single conversion modular UPS System with SNMP Management.

B. The UPS System shall provide a minimum of 2000 VA of output power with 120 Volt input.

C. The UPS System shall provide a minimum battery runtime of 20 minutes at full load.

D. The output waveform of UPS shall be true sine-wave.

E. The UPS System shall be provided with a minimum of six NEMA 5-15R output receptacles.

F. The system shall be covered by a two-year on-site warranty.

G. The front panel display shall indicate load level, battery charge level, and replacement battery indication.

H. The UPS System shall be rack-mounted in the bottom of each 19" equipment rack.

I. The UPS shall be APC Smart UPS XL Series Model SU2200RMXLNET with SU48RMXLBP external battery pack, and SNMP Card AP9619 with environmental monitoring, or approved equal.

J. Provide grounding per EIA/TIA 607 requirements.

SURGE PROTECTION

2.3

A. The Contractor shall provide transient surge protection on the AC power feeds to all equipment, feeds and on all telephone station and central office lines leaving or entering the main building, all classrooms, and portable classrooms (as applicable). This protection shall include equipment with switches, hubs, and similar devices.

B. The Contractor shall note in the submittal drawings, the type and location of these protection devices as well as all wiring information.

C. Provide ventilation panels, louvers, blower fans, etc., as required to provide heat dissipation to conform to the equipment manufacturers’ environmental specifications.

D. Surge protection devices shall be grounded as required by the equipment manufacturers and comply with UL, ANSI, NEC, State and local agencies.

E. Surge protection devices shall have a 5 nanosecond or less response time for clipping excessive voltage. The devices shall consists of solid state circuitry, shall automatically reset after an operation with no degradation in protective capability, and shall have an indicating light to indicate when the unit is now operational. Devices shall be direct plug-in type, plug strip type, or hard-wired connection type as applicable to the respective component of equipment.

F. Provide devices for AC power system surge protection by CITEL, Cylix, or DiTek.

G. Provide devices for data/telephone systems surge protection by CITEL, Cylix, or DiTek.

2.4 VOICE CABLING (CATEGORY/LEVEL 6)

A. Cabling for all telephone jack locations shall be four (4) pair, unshielded, Category 6 type overall plenum-rated jacket from each jack to a Patch Panel in Communications Closet. Horizontal Category 6 cabling and components shall be as specified in ”Data Cabling System” below.

B. The Owner will be utilizing a voice over IP telephone solution and therefore, the standards described for data listed below will apply. .

C. Voice Outlets shall be identical to Category 6 data outlets specified below for data cabling system.

D. Inter-closet and service entrance voice station 110 blocks shall be by Hubbell or approved equal.

E. Provide cabling as recommended by the manufacturer to interconnect the telecommunication system rack in each closet and the main distribution rack. Each IDF shall be connected to the MDF by voice backbone cabling as indicated on contract drawings. All backbone cable pairs shall be end-to-end terminated on Category 6 110 type mass termination blocks.

F. Voice Backbone - Copper Vertical Riser Cables

1. Unshielded 24 AWG multi-pair copper cables shall be used as the vertical riser cables to connect the Telecommunications Closets to the Main Cross-Connect. The cable shall support voice and low speed data.
2. The bending radius and pulling strength requirements of all backbone cables shall be observed during handling and installation. The multi-pair copper cables shall be in non-plenum form and placed in conduit as required.
3. The cable shall consist of solid-copper conductors insulated with expanded polyethylene covered by a Plenum-Rated skin, be conformance tested to meet EIA/TIA 568A for Category 6 cables, be UL7 Listed as CMP. The copper riser cable shall meet or exceed the following electrical specifications listed below:

a. Electrical Specifications:

AVERAGE DC RESISTANCE	26.5Ω/1,000 FT (8.7Ω/100M), MAXIMUM
Average DC Resistance Unbalance	1.7%, maximum
Mutual Capacitance @ 1kHz	16 nF/1000 ft (5.25 nF/100 m), maximum
Capacitance Unbalance (pair	201pF/1,000 ft (65.94 pF/100m)

to ground)	maximum

Attenuation (dB/100 m [328 ft.]:

Frequency	Attenuation (Max.)
1.00 MHz	2.3 dB
5.00 MHz	4.9 dB
10.00 MHz	8.5 dB
16.00 MHz	12 dB

c. Worst Pair Near-End Crosstalk (NEXT) dB/100 m [328 ft]:

Frequency	Pair-to-Pair NEXT (Max.)
1.00 MHz	13.8 dB
4.00 MHz	11.2 dB
10.00 MHz	10.2 dB
16.00 MHz	9.2 dB

d. The cable shall be available in 25 pair counts.
UL7 Listed for Fire Safety
ISO 9001 Certified Manufacturer

e. Voice backbone cables shall be Hitachi 39053-50, Berk-Tek power sum Cable Part Number 530354, Helix/Hi-Temp Super CAT100E Number 803308, or approved equal.

2.5 DATA CABLING SYSTEM COMPONENTS

A. Provide a complete data communications system consisting of the following:

1. Accessories and Appurtenances
2. Cable Management Devices
3. Fiber Optic Cable and Terminators (as indicated on drawings)
4. Copper and Fiber Patch cables
5. Remote Jacks
6. Termination/Patch Panels
7. Twisted Pair Data Cables

2.6 DATA CABLING SYSTEM DESCRIPTION

A. The work includes the provision for a complete and operable Local Area Network Building Data System consisting of both active by Owner and non-active components. The cabling system and all wiring components shall meet and comprise an EIA/TIA Category 6 Wiring System. With master and remote data equipment the completed system shall provide 1000 BASE-F(X) Fiber Optic Fast Ethernet communications backbone support to the edge switches, Ethernet 10/100BASE-T to the workstation data jacks and any Owner-provided wireless service. The system shall provide such services as computer networking, data transmission, graphics and other multi-media offerings.

B. The system will include, but not be limited to, master and remote switches, data jacks, fiber cabling, UTP cable, etc. Equipment shall be compact, modular and IEEE standards compliant.

FIBER OPTIC SYSTEM CABLING

2.7

A. Fiber Optic Cabling:

1. Fiber optic cabling shall be provided between the Telecommunications Closets (IDF) and Main Cross-connect (MDF); and furnished with twelve (12) strands of fiber optic cable as designated on the contract drawings.
2. All fiber in a cable run shall be from the same manufacturer and shall be the same type. A mix of fibers from different manufacturers may not be used without written permission.
3. All Multimode Fiber Optic cabling shall meet the following specifications:
   a. Fibers shall comply with ANSI/EIA/TIA 492A specifications and IS 11801 standards.
   b. Fibers shall have dual wavelength capability; transmitting at 850 and 1300nm ranges.
   c. All fibers shall be color coded to facilitate individual fiber identification.
   d. Fibers shall have D-LUX® coating or approved equivalent to ensure color retention, minimize microbending losses and improve handling. The coating shall be mechanically strippable.
   e. Short Term: 340 lbs. Long Term: 170 lbs.
   f. Fiber optic cables shall comply with NEC for OFNP, CSA and FT4/FT6. Cables shall also comply with Bellcore, FDDI, EIA/TIA-568A & 569, and ICEA standards.

Multi-Mode:

Core:	62 .5 µm +/- 3 µm
Core Non-Circularity:	<6%
Core/Cladding Concentricity Error:	<3.0 µm
Numerical Aperture:	0.275 +/- 0.015
Cladding diameter:	125 µm +/- 1 µm
Cladding Non-Circularity:	<2.0%
Colored Fiber Diameter:	250 µm +/- 15 µm
Buffering Diameter:	890 mm +/- 50 mm
Minimum Tensile Strength:	100,000 psi
Fiber Minimum Bending Radius:	.75 in. (1.91 cm)
Cable Minimum Bending Radius:	
During Installation:	20 times cable diameter
After Installation:	10 times cable diameter
Operating Temp. Range:	32ºF to 122ºF (0ºC to 50ºC)
Storage Temp. Range:	-40ºF to 149ºF (-40ºC to 65ºC)
Maximum Attenuation Fiber Loss:	3.4 dB/km at 850 NM (typical range 2.8 to 3.4 dB/km)
	1.0 dB/km at 1300 NM (typical range 0.5 to 1.0 dB/km)

Minimum Bandwidth:	200 MHZ at 850 NM 500 MHZ at 1300 NM
Attenuation Uniformity:	0.2 dB
Splice Losses shall not exceed:	
Array Splice:	0.15 dB
Fusion Splice:	0.2 dB
Mechanical Splice:	0.2 dB

4. Pre-terminated fiber cabling systems will be allowed as an alternative to field terminated cables.
5. Fiber optic cables shall be Amp/Pirelli 12 LBHNTATJPNN, Berk-Tek #PDR012-CB3510 /15 Plenum, or approved equal by Chromatic Technologies (Plenum).

    a. Furnish and install rack-mounted [wall-mounted] fiber optic cable distribution enclosures at all Telecommunications Closet (TC) and Main Cross-Connect(MC) Room locations indicated on the drawings. Capacity shall be as required to terminate all strands of fiber. Provide strain relief for fiber optic cabling system.

    b. The Fiber Optic Distribution Enclosure (FODE) is a termination and administration point for the fiber in the network. The FODE will protect the connectorized fiber from mechanical stress, strain relief, macro-bending loss at the connection point, tampering with the circuits. The FODE will provide circuit identification.

    c. The Fiber Optic Distribution Enclosure (FODE) shall provide cross-connect, inter-connect, splicing capabilities and include support hardware to properly terminate and ground the cables, routing the fibers and jumpers and mount splices in a wall field. The FODE shall provide a security cover for field terminations and a removable cover for user connections.

    d. The Fiber Optic Distribution Enclosure (FODE) shall have connector panels that snap into the side of the module and accommodate ST connectors. Panels shall be Hubbell FCR rack mount enclosures FCR525SPR, or approved equal.

    e. The Fiber Optic Distribution Enclosure (FODE) shall provide terminating, cross connecting or interconnecting capability of 12 fibers. The units may be stacked to provide additional fiber termination capacity as required.

    f. The Fiber Optic Distribution Enclosure (FODE) shall be made of lightweight polycarbonate or 18 AWG laser cut steel and have a lockable hasp for additional security.

    g. The Fiber Optic Distribution Enclosure (FODE) shall be UL approved.

    h. The Fiber Optic Distribution Enclosure (FODE) shall be Hubbell FCR350SP36R and FCR525SPR rack mount enclosures with Hubbell FSP adapter plates.

    i. Terminate all fiber strands with ST type [SC type] connectors. Cap all terminations with dust covers after termination, labeling and testing. ST type [SC type] connectors shall be as specified below:

j. The Muliti-mode fiber optic connector shall be capable of connecting fiber cable to fiber cable, fiber cable to equipment and equipment to equipment.

B. Fiber Optic Connectors:

1. Connector basic design shall be an SC or ST-style connector body with a zirconium ceramic ferrule, having a rear inner bore designed specifically to accept a precision fiber crimp insert. The crimp insert, fitted with an elastic tube inside, is crimped onto the optical fiber with a precision crimp tool specifically designed for the purpose. The crimp insert is then secured within the connector body with a second crimp, using a second die cavity within same crimp tool. Cleaving and polishing the connector tip is then performed to complete the termination.
2. Each basic connector unit delivered shall consist of: (1) connector body, (1) crimp insert, (1) strain relief boot, and (1) plastic dust cap. SC connectors have an additional plastic outer body included.
3. ST and SC multimode connectors shall be suitable for both 50 micron and 62.5 micron multimode fiber core diameters, including laser optimized versions of either size.
4. Multimode and single mode connector materials shall be as follows:
   a. Ferrule: zirconium ceramic
   b. Body: nickel plated brass
   c. ST Nut: nickel plated zinc
   d. Crimp insert: nickel plated annealed brass
   e. Elastic tube: thermoplastic/elastic extrusion
   f. SC inner body and outer housing: molded thermoplastic
   g. Dust Cap: nylon or PVC
   h. Strain relief boot: UL94-V0 molded PVC
5. ST and SC connectors, either multimode or single mode shall require no adhesives.
6. Performance Requirements
   a. All transmission performance parameters shall be independently verified by a UL or ETL third party testing organization.
   b. Properly installed ST and SC connectors shall exceed the 10 Gb/s Ethernet performance requirements of IEEE802.3.
   c. All mechanical and environmental performance parameters shall be independently verified to ANSI/TIA/EIA-568-B.3, Annex 'A', by a UL or ETL third party testing organization.
   d. Mating durability shall be rated for 500 cycles.
7. Fiber optic connectors shall be Hubbell 2Quick SC/ST, or approved equal.

Description	Catalog Number
SC Multimode, Pack of 12	FCSCMQ12R
SC Multimode, Pack of 100	FCSCMQ100R
ST Multimode, Pack of 12	FCSTMQ12R
ST Multimode, Pack of 100	FCSTMQ100R
SC Singlemode, Pack of 12	FCSCSQ12R
SC Singlemode, Pack of 100	FCSCSQ100R
ST Singlemode, Pack of 12	FCSTSQ12R
ST Singlemode, Pack of 100	FCSTSQ100R

C. Fiber Optic Patch Cords

1. Optical fiber patch cords shall be constructed with aramid-reinforced PVC loose-jacket duplex or simplex cable, with optical fiber(s) having a 900-micron PVC buffer coating diameter.

2. Connector terminations on each end of the fiber patch cord shall be heat-cured epoxy type with a machine polish, inspected 100% for polish quality and mated-pair insertion loss.

3. Epoxy volume within each connector shall be sufficient to properly surround and strain relieve the buffer layer at the buffer/fiber transition inside the connector body.
4. Additional strain relief of the buffered fiber shall result from crimping the rear of the connector during termination.
5. Factory mounted connectors on each end of the patch cords shall comply with the applicable ANSI/TIA/EIA-604 Intermateability standard.
6. Simplex cable jacket diameter for ST, SC patch cords shall be 2.5mm-3.0mm.
7. Duplex fiber patch cords shall be a zip-cord cable construction with jacket cross-section dimensions of 3.0 mm X 6.0 mm for ST and SC style. .
8. Duplex fiber patch cords shall have reverse-pair polarity according to ANSI/TIA/EIA-568-B.3 and TIA/EIA-TSB-125.
9. Multimode 62.5 micron core optical fiber within the patch cord cable shall be graded index type in accordance with ANSI/TIA/EIA-492AAAA, with the following specifications:
    a. Core diameter: 62.5 +/-3.0 microns
    b. Cladding diameter: 125 +/- 2.0 microns
    c. Core/cladding concentricity: less than 3.0 microns
    d. Core non-circularity: 6% maximum
    e. Proof test: 100 kpsi
    f. Coating diameter: 245 +/-15 microns
    g. Buffer diameter: 900 microns nominal

10. Singlemode optical fiber within the patch cord cable shall be dispersion un-shifted, Class IVa, in accordance with ANSI/TIA/EIA-492CAAA, with the following specifications:
    a. Mode Field Diameter: 9.10 +/- 0.6 microns @ 1310 nm, and 10.3 +/- 1.1 microns @ 1550 nm
    b. Cladding diameter: 125 +/- 1.0 microns
    c. Proof Test: 100 kpsi minimum
    d. Coating Diameter: 245 +/- 10 microns
    e. Buffer Diameter: 900 microns nominal
    f. Max Attenuation @ 1310 nm: 0.50 dB/km
    g. Max Attenuation @ 1550 nm: 0.50 dB/km
    h. Gbit Ethernet Distance: 5000 meters

11. Performance Requirements
    a. Multimode patch cords shall have a maximum mated-pair insertion loss of 0.60 dB per end, with a minimum return loss of –20 dB.
    b. Singlemode patch cords shall have a maximum mated-pair insertion loss of 0.60 dB per end, with a minimum return loss of –26 dB.
    c. Multimode and singlemode fiber patch cords shall exceed the Gigabit Ethernet performance requirements of IEEE 802.3 standard.
    d. Multimode and singlemode fiber patch cords shall exceed the mechanical reliability requirements for tensile, flex, twist and impact as specified in ANSI/TIA/EIA-568-B.3, Annex ‘A’.
    e. Multimode and singlemode fiber patch cords shall exceed the environmental reliability requirements for high/low temperature and humidity as specified in ANSI/TIA/EIA-568-B.3, Annex ‘A’.

12. Fiber patch cords shall be Hubbell OptiChannel SC type paired cords patch cords or approved equal.

Optical Fiber Patch Cords Fiber Type	Hubbell Catalog No. SC to SC Duplex
62.5/125 MM	DFPCSCSCCXMM
50/125 MM	DFPCSCSCDXMM
Singlemode	DFPCSCSCSXSM

13. In addition to the multi-mode fiber described above, the bidder will run a six strand single-mode fiber bundle from the MDF to the Demarcation Point.

VOICE AND DATA SYSTEM CABLING

2.8

A. Data (and Voice) Cable (Category 6, 350 Mhz, Plenum-Rated):

B. Data (and Voice) cables shall be extended between the data outlet location and its associated TC and consist of Category 6, 4 pair, 24 gauge, UTP, and shall be terminated on the 8 pin modular jacks provided at each outlet. Cable jacket shall comply with Articles 800 and 725 NEC for use as a plenum cable as required. The 4 pair UTP cable shall be UL® and c(UL®) Listed Type CMP (plenum). Interior individual conductors shall have all four pairs 100% F.E.P. (Teflon) insulated. Cable shall meet the requirements of UL910 and NFPA 262-1985.

C. Color of the data-cabling jacket shall be blue and the voice-cabling jacket shall be gray, for uniformity of facility.

D. All Category 6 cables shall conform to TIA/EIA 568A Commercial Building Telecommunications Cabling Standard, Horizontal Cable Section, and be part of the UL7 LAN Certification and Follow-up Program. Applications standards supported should include, but be not limited to, IEEE 802.3, 100BASE-T; IEEE 802.5, 4 Mbps, 16Mbps (328 ft [100m], 104 Workstations) and TP-PMD. In addition, these cables shall be capable of supporting applications such as 10/100 Base-T, and shall meet or exceed the electrical and mechanical specifications listed below:

E. Design requirements

1. Cable construction shall be four twisted pairs of 23 AWG insulated solid conductors, with a ripcord, surrounded by a tight outer jacket.
2. Cable shall be manufactured with an “X”-shaped pair-divider along the center to maintain separation of individual pairs.
3. Conductor diameters shall be 0.0224” (.0003” solid copper.
4. Conductor insulation diameter shall be 0.039” (.0005” high performance fluoro-copolymer.
5. Twist lay of each pair shall vary in a manner to optimize noise immunity and minimize crosstalk.
6. Outer jacket diameter shall be 0.220” (.008” low smoke PVC, with a nominal wall thickness of 0.015”.
7. UL, ETL, or CSA agency certification or verification markings shall be marked on the cable jacket according to the certifying agency’s requirements.
8. Color coding of the pairs shall be as follows:
   a Pair 1: White/Blue; Blue
   b. Pair 2: White/Orange; Orange
   c. Pair 3: White/Green; Green
   d. Pair 4: White/Brown; Brown
9. Cable shall be supplied in 1000 ft spools or 1000 ft Reelex boxes.

F. Performance Requirements:

1. All transmission performance parameters shall be independently verified by a UL or ETL third party testing organization.
2. Cable shall exceed Category 6 transmission requirements specified in ANSI/TIA/EIA-568-B.2-1, and shall be tested to 500 MHz.
3. Worst-case cable performance shall be +1.0 dB headroom over current TIA/EIA and ISO standards limits for NEXT loss and PSNEXT loss.
4. Worst-case cable performance shall be +3.0 dB over current TIA/EIA and ISO standards limits for ELFEXT and PSELFEXT loss.
5. Worst case electrical performance characteristics shall be as follows:
   a. Characteristic Impedance: 100 + 15 W(1.0-100 MHz) 100 + 20 W(101-250 MHz)
   b. Maximum Conductor Resistance: 9.38 W/100 Meters @ 20°C
   c. Maximum Resistance Unbalance: 3%
   d. Maximum Mutual Capacitance: 5.6 nF/100 Meters @ 1 kHz
   e. Maximum Capacitance Unbalance: 330 pF/100 Meters
   f. Maximum Delay Skew: 45 ns/100 Meters
6. The manufacturer shall provide Category 6 component compliance certificates from third party testing organization upon request.
7. Cable shall be UL and c(UL) listed.
8. Cable shall exceed IEEE 802.3 DTE Power specification to 4 times the rated current limits with no degradation of performance or materials.
9. Cable shall be third party verified, error free Gigabit Ethernet performance to IEEE 802.3 standard.
10. Cable shall exceed the requirements of TIA/TSB-155: 10 Gb/s Ethernet Operation over 55 Meters Channel Length.
11. Cable shall meet or exceed the 4-connector channel performance requirements of Category 6, per the ANSI/TIA/EIA-568-B.2-1 standard.
12. The 4-connector channel test configuration shall utilize Category 6 jacks and patch panels, with Category 6 patch cords, from the same manufacturer, with qualified Category 6 cable.
13. The 4-connector channel performance margins in the table below shall be guaranteed, provided the configuration satisfies requirement No. 12 above.

Electrical Parameter (1 – 250 MHz)	**Guaranteed Margins to Category 6 / Class E Channel Specifications**
Insertion Loss	3%
NEXT	4 dB
PSNEXT	5 dB
ELFEXT	4 dB
PSELFEXT	5 dB
Return Loss	2 dB

14. Data cable shall be Hubbell NextSpeed C6 Cable or approved equal

Category 6 – Balanced UTP Cable Plenum, 500 MHz	Hubbell Catalog No. (1000 ft. lengths)
NextSpeed C6 Cable, Plenum, Blue, Reelex	C6RPB
NextSpeed C6 Cable, Plenum, White, Reelex	C6RPW
NextSpeed C6 Cable, Plenum, Yellow, Reelex	C6RPY
NextSpeed C6 Cable, Plenum, Gray, Reelex	C6RPGY
NextSpeed C6 Cable, Plenum, Green, Reelex	C6RPGN
NextSpeed C6 Cable, Plenum, Blue, Spool	C6SPB
NextSpeed C6 Cable, Plenum, White, Spool	C6SPW

NextSpeed C6 Cable, Plenum, Yellow, Spool	C6SPY
NextSpeed C6 Cable, Plenum, Gray, Spool	C6SPGY
NextSpeed C6 Cable, Plenum, Green, Spool	C6SPGN

15. Provide one home run cable from each data jack to appropriate wiring closet
16. Cable length shall not exceed 90 meters.

2.9 VOICE and DATA PATCH PANELS

A. Panels shall contain the number of TIA/EIA 568A verified Category 6 termination ports necessary to connect all data and voice jacks shown on the drawings plus 25 % spare capacity. Panels shall comply with TIA/EIA 568A and 606 and be UL verified.

B. The patch panel shall support the appropriate Category 6 applications, including 1000 Mbps TP-PMD and 155 Mbps ATM, and facilitate cross connection and inter connection using modular patch cords.

C. All Modular jack panels shall be wired to EIA/TIA 568B and meet the following specifications:

D. Design requirements

1. Category 6 patch panels shall be standard 8-position, RJ-45 style, un-keyed, FCC-compliant receptacle, in 24-, 48-, and 96-port configurations.
2. Panel frames shall be black powder coated 14-gage steel with rolled edges top and bottom for proper stiffness.
3. Panel design shall incorporate plastic push-fasteners to permit hands-free positioning onto standard EIA-310-D 19” mounting rails.
4. Panels shall accommodate a minimum of 24 ports for each rack mount unit (1 RMU = 1.75 in.).
5. Panels shall be designed for 4-pair, 100 ohm balanced unshielded twisted pair (UTP) cable.
6. Panels shall terminate 26-22 AWG solid conductors, with maximum insulation diameter of 0.050 in.
7. Panels shall have attached wiring instruction labels to permit either T568A or T568B wiring configurations.
8. Panels shall have individual port identification numbers on the front and rear of the panel.
9. Panels shall have a temperature rating of -10 (C (14(F) to 70(C (158 (F).
10. Printed circuit boards shall be fully enclosed front and rear for physical protection.
11. Panel contacts shall withstand a minimum of 2000 mating cycles with an FCC 8-position RJ-45 plug, without degradation of electrical or mechanical performance.
12. Panel contacts shall maintain a minimum deflection force of 100 grams while mated with an FCC-standard RJ-45 plug.
13. Panel contacts shall be formed flat for increased surface contact with mated plugs.
14. Panel contacts shall be constructed of Beryllium copper for maximum spring force and durability.
15. Contact plating shall be a minimum of 50 micro-inches of hard gold in the contact area over 50 micro-inch of nickel.
16. Panel termination method shall follow the industry standard 110 IDC punch-down, using a standard 110 impact termination tool.
17. Panels shall be compatible with a 4-pair multi-punch impact termination tool designed specifically for the purpose. Bending or other damage to the panel using a multi-pair punch tool shall not occur.
18. IDC contact termination towers shall have tapered pair-splitting features to aid wire insertion and minimize pair un-twist.
19. IDC contacts shall be Phosphor Bronze with 100 micro-inch tin lead 60/40 plating over nickel.
20. P6E series panel adapter ports shall accept optional hinged dust covers.
21. P6E series panel adapter ports shall accept snap-on icons for specific identification.

22. Space above the adapter ports shall be available for additional labeling per ANSI/TIA/EIA-606-A.
23. Category 6 panels shall be backward compatible with existing Category 3, 5, and 5e cabling systems for fit, form, and function.
24. Panels shall accept a clip-on rear cable management support bar to provide cable strain relief.
25. Panels shall include self-adhesive, clear label holders for each row of 24 ports.

E. Performance Requirements:

1. All transmission performance parameters shall be independently verified by a UL or ETL third party testing organization.
2. Category 6 panels shall meet or exceed Category 6 transmission requirements for connecting hardware, as specified in ANSI/TIA/EIA-568-B.2-1, Transmission Performance Specifications for 4-Pair 100 ohm Category 6 Cabling.
3. The manufacturer shall provide Category 6 component compliance certificates from third party testing organizations upon request.
4. Panels shall be UL LISTED 1863 and CSA certified.
5. Panels shall exceed IEEE 802.3 DTE Power specification to 4 times the rated current limits with no degradation of performance or materials.
6. Panel contacts shall withstand a minimum of 2000 mating cycles with an FCC 8-position RJ-45 plug, without degradation of electrical or mechanical performance.
7. Panels shall be third party verified, error free Gigabit Ethernet performance to IEEE 802.3 standard.
8. Category 6 panels shall exceed 4 Gb/s data transmission capacity within the bandwidth of 1 – 250 MHz when configured in a 4-connector channel.
9. Category 6 panels shall meet or exceed the 4-connector channel performance requirements of Category 6, per the ANSI/TIA/EIA-568-B.2-1 standard.
10. The 4-connector channel test configuration shall utilize Category 6 patch panels, Category 6 jack, and Category 6 patch cords, from the same manufacturer, with qualified Category 6 cable.
11. The 4-connector channel performance margins in the table below shall be guaranteed. Conditions of requirement No. 10 above apply.
12. Category 6 panels shall meet the current draft 10 Gb/s performance requirements of IEEE 802.3an and TSB-155, for a maximum 55-meter channel length. Conditions of requirement No. 10 above apply.

Electrical Parameter (1- 250 MHz)	Guaranteed Margins to Category 6 / Class E Channel Specifications
Insertion Loss	3%
NEXT	4 dB
PSNEXT	5 dB
ELFEXT	4 dB
PSELFEXT	5 dB
Return Loss	2 dB

13. Modular patch panels shall be Hubbell NEXTSPEED 6 System, or approved equal.

Category 6 Patch Panels No. of Ports	Rack Units	Hubbell Catalog No.
24	1U	P6E24U
48	2U	P6E48U
96	4U	P6E96U

14. Provide horizontal and vertical patch cord organizers for each patch panel for proper management of patching system and cable strain relief. Vertical wire management shall be Hubbell VC76H, and horizontal wire management Hubbell HC219ME3N or approve equals.

2.10 PATCH CORDS

A. Provide Category 6 Modular Patch Cords for each assigned port on the patch panel. All cords shall conform to the requirements of EIA/TIA 568A Commercial Building Telecommunications Cabling Standard, Horizontal Cabling Section, and be part of the UL7 LAN Certification and Follow-up Program. Cords shall be equipped with a 8 pin modular connector (RJ45 Style) on each end and shall conform to the length(s) specified on the detailed drawing or as directed. Field-fabricated (hand pressed) plugs shall not be allowed.

B. Design requirements

1. Category 6 patch cords shall be constructed with a smoke-colored polycarbonate plug having vertically staggered, trifurcated contacts, each having 50 micro-inches of gold plating.
2. Plug dimensions and function shall comply with FCC 47, Part 68.5.
3. Patch cords shall have a snag-less feature, integral to the strain relief boot on each end. Strain relief boot shall be molded PVC, and color matched to the cable jacket.
4. Patch cords shall be constructed with category 6 patch cable, with 24 AWG 7/32 tinned copper stranded conductors, each insulated with polyethylene, and overall jacket with UL flame-retardant PVC.
5. Patch cords shall be manufactured using a T568B wiring format, and shall function suitably for either T568A or T568B wiring schemes.
6. Patch cords shall be available in the following colors: black, blue, gray, yellow, orange, red, green, white, and purple. Custom lengths and colors shall be available with a delivery lead-time quotation.
7. Standard patch cord lengths shall range from 3 ft. to 20 ft.
8. Category 6 patch cords shall be backward compatible with existing Category 3, 5, and 5e cabling systems for fit, form, and function.

C. Performance Requirements:

1. All transmission performance parameters shall be independently verified by a UL or ETL third party testing organization.
2. Category 6 patch cords shall be channel performance balanced with Hubbell category 6 jacks, patch panels, and punch-down blocks.
3. Category 6 patch cords shall meet or exceed Category 6 component transmission requirements for connecting hardware, as specified in ANSI/TIA/EIA-568-B.2-1 standard.
4. The manufacturer shall provide Category 6 component compliance certificates from third party testing organization upon request.
5. Patch cords shall be cUL and UL LISTED 1863.
6. Patch cords shall exceed IEEE 802.3 DTE Power specification to 4 times the rated current limits with no degradation of performance or materials.
7. Patch cords shall be third party verified, error-free Gigabit Ethernet performance to IEEE 802.3 standard.
8. Jacks shall exceed 4 Gb/s data transmission capacity within the bandwidth of 1 – 250 MHz when configured in a 4-connector channel.
9. Category 6 patch cords shall meet or exceed the 4-connector channel transmission performance requirements of Category 6, per ANSI/TIA/EIA-568-B.2-1 standard.
10. The 4-connector channel test configuration shall utilize Category 6 patch panels, blocks, and jacks, with Category 6 patch cords, all from the same manufacturer, with qualified Category 6 cable.

11. The 4-connector channel performance margins in the table below shall be guaranteed, provided the configuration satisfies requirement No. 9 above.

12. Category 6 patch cords shall meet the current draft 10 Gb/s transmission performance requirements of TSB-155, provided the configuration satisfies requirement No. 9 above.

Electrical Parameter (1-250 MHz)	Guaranteed Margins to Category 6 / Class E Channel Specifications
Insertion Loss	3%
NEXT	4 dB
PSNEXT	5 dB
ELFEXT	4 dB
PSELFEXT	5 dB
Return Loss	2 dB

D. Provide patch cords in 4-pair versions with lengths of 2 through 9 feet as required for the installation.

E. Category 6 patch cords shall be Hubbell NEXTSPEED 6 System, or approved equal.

Category 6 Patch Cords Length (ft)	Hubbell Catalog No. Blue	Hubbell Catalog No. Black	Hubbell Catalog No. Gray	Hubbell Catalog No. Yellow
3	PCX6B03	PCX6BK03	PCX6GY03	PCX6Y03
6	PCX6B06	PCX6BK06	PCX6GY06	PCX6Y06
8	PCX6B08	PCX6BK08	PCX6GY08	PCX6Y08
10	PCX6B10	PCX6BK010	PCX6GY10	PCX6Y10
12	PCX6B12	PCX6BK12	PCX6GY12	PCX6Y12
16	PCX6B16	PCX6BK16	PCX6GY16	PCX6Y16
20	PCX6B20	PCX6BK20	PCX6GY20	PCX6Y20
Note: For other colors, replace color designation with one of the following: *OR = Orange* *R = Red* *GN = Green* *P = Purple* *W = White*				

F. The successful bidder shall supply factory assembled enhanced Category 6 patch cables (350 MHz) to connect the computer workstations to the network outlets and to patch the network switches to the patch panel. All patch cables shall have built-in strain relief and be blue in color. Total patch cords supplied to be equal to twice the number of network outlets. One-fourth to be ten (10) feet long, one-fourth to be seven (7) feet long, one-fourth to be five (5) long and one-fourth to be three (3) feet long. In addition, the successful bidder shall provide forty (40) white patch cords; twenty to be five (5) feet long and twenty to be three (3) feet long.

G. The successful bidder will supply factory assembled enhanced Category 6 patch cables (350 MHz) to connect telephones to network outlets. These shall be ten (10) feet long and white in color. The quantity should be equal to the number of installed telephone outlets plus 20%. In addition, the successful bidder will provide an equal number of red factory assembled enhanced Category 6 patch cables (350 MHz) to patch telephone connections in wiring closets. Half of the red cables to be five (5) feet long and half to be seven (7) feet long.

VOICE AND DATA OUTLETS

Room	Drop Count	Drop Type	Location
General Classroom	8	Dual Ethernet RJ-45	Spread around room, one at teacher's station.
General Classroom	1	Voice	Fax/Landline
Media Room	n	Dual Ethernet RJ-45	Depends on layout
Administration	3	Dual Ethernet RJ-45	Principal, Asst Prin., Secretary
General Classroom	1	Coaxial	Near TV/Digital Whiteboard

Table 1. Drops By Room Type

2.11

A. For each voice and data jack location designation, provide a non-keyed RJ45, 8 pin, 8 conductor, Category 6 modular jack with compatible faceplate. All data jacks shall be T568B wiring pin-pair configuration – no other configuration is acceptable. Jack shall be compatible for use with Unshielded Twisted Pair (UTP) cable. Provide cover caps to complete the termination and provide for a reliable connection for the UTP cable. All data jacks shall be bright orange color with matching icon for uniformity in facility or as required to match the applicable School District's standardized color coding requirements. All data jacks shall be as follows:

B. Category 6 Outlets: All Category 6 outlets shall conform to TIA/EIA 568A Commercial Building Telecommunications Cabling Standard, Horizontal Cable Section, and be part of the UL® LAN Certification and Follow-up Program, and shall meet or exceed the following electrical and mechanical specifications:

C. Design requirements

1. Jacks shall be standard 8-position, RJ-45 style, un-keyed, FCC compliant.
2. Jacks shall be designed for 4-pair, 100 ohm balanced unshielded twisted pair (UTP) cable.
3. Each jack shall be single unit construction, with snap – fit to industry standard keystone opening (.760" x .580").
4. Jack housings shall be high impact UL 94 V-0 rated thermoplastic.
5. Jacks shall have a temperature rating of -10 (C (14(F) to 70(C (158 (F).
6. Jack housings shall fully encase and protect printed circuit boards and IDC fields.
7. Modular jack contacts shall accept a minimum of 2000 mating cycles without degradation of electrical or mechanical performance.
8. Jack contacts shall maintain a minimum deflection force of 100 grams while mated with an FCC-standard RJ-45 plug.
9. Jack contacts shall be constructed of Beryllium copper for maximum spring force and durability.

10. Contact plating shall be a minimum of 50 micro-inches of hard gold in the contact area over 50 micro-inch of nickel.
11. Jack termination method shall follow the industry standard 110 IDC punch-down.
12. IDC contact termination towers shall have tapered pair-splitting features to aid wire insertion and minimize pair un-twist.
13. IDC contacts shall be Phosphor Bronze with 100 micro-inch tin lead 60/40 plating over nickel.
14. Jacks shall terminate 26-22 AWG solid or stranded conductors.
15. Jacks shall terminate insulated conductors with outside diameters up to .050".
16. Jacks shall not require special cords, specialty tools or special installation requirements.
17. Jacks shall be compatible with single conductor standard 110 impact termination tools.
18. Jacks shall be compatible with a 4-pair single punch impact tool designed specifically for the purpose.
19. Jacks shall include a translucent stuffer cap for wire retention and to permit visual inspection.
20. Jacks shall accept FCC compliant 6 position plugs.
21. Jacks shall accept optional hinged dust covers.
22. Jacks shall be compatible with ANSI/TIA/EIA-606-A color code labeling.
23. Jacks shall accept snap-on icons for specific identification.
24. Jacks shall be available in various colors to meet specific customer applications.
25. Jacks shall have attached wiring instruction labels to permit either T568A or T568B wiring configurations.
26. Category 6 jacks shall be backward compatible with existing Category 3, 5, and 5e cabling systems for fit, form, and function.

D. Performance Requirements

1. All transmission performance parameters shall be independently verified by a UL or ETL third party testing organization.
2. Category 6 jacks shall exceed Category 6 transmission requirements for connecting hardware, as specified in ANSI/TIA/EIA-568-B.2-1, Transmission Performance Specifications for 4-Pair 100 ohm Category 6 Cabling.
3. Category 6 jacks shall exceed 10 Gb/s transmission requirements for connecting hardware, under the constraints of ANSI/TIA-TSB-155 (current draft).
4. The manufacturer shall provide Category 6 component compliance certificates from third party testing organization upon request.
5. Jacks shall be UL LISTED 1863 and CSA certified.
6. Jacks shall exceed IEEE 802.3 DTE Power specification to 4 times the rated current limits with no degradation of performance or materials.
7. Jacks shall be third party verified, error free Gigabit Ethernet performance to IEEE 802.3 standard.
8. Jacks shall exceed 4 Gb/s data transmission capacity within the bandwidth of 1 – 250 MHz when configured in a 4-connector channel.
9. Jacks shall exceed the 4-connector channel performance requirements of Category 6, per the ANSI/TIA/EIA-568-B.2-1 standard.
10. Jacks shall exceed the 4-connector Category channel performance requirements for 10 Gb/s transmission over Category 6, according to TIA/TSB-155 (current draft).
11. The 4-connector channel test configuration shall utilize Category 6 patch panels and Category 6 patch cords, from the same manufacturer, with qualified Category 6 cable.
12. The 4-connector Category 6 channel performance margins in the table below shall be guaranteed, provided the configuration satisfies requirement No. 11 above.

ELECTRICAL PARAMETER (1-250 MHz)	Guaranteed Margins to Category 6 / Class E Channel Specifications
Insertion Loss	3%
NEXT	4 dB

PSNEXT	5 dB
ELFEXT	4 dB
PSELFEXT	5 dB
Return Loss	2 dB

E. Category 6 outlets shall be Hubbell IFP14OW faceplate, and Hubbell HXJ6OR NEXTSPEED 6 System modular jacks, or approved equal.

F. Office White color phenolic/plastic face plates shall be provided. A molded or engraved label, with color coded, user-friendly symbols or icons, shall be provided with each faceplate to identify it as a data jack. Except for surface raceway applications, all face-plates shall be provided with four (4) ports. All unused ports and icon slots shall be filled with office white color blanks. Where stainless steel faceplates are specified, provide a receptacle color matching duplex mounting strap w/flush data jacks. All jacks shall be installed flush with mounting plates. Gravity feed style faceplates shall be provided.

G. Faceplates shall be Hubbell Office White IFP Series rear loading, or approved equal.

G. Icons shall be Hubbell Computer Icons IOR100C, or approved equal.

H. Blank modules shall be Hubbell SFB10, or approved equal.

I. Each jack and its associated termination at the Main Distribution Room (MDR/MDF) or Communication Closet (IDF) shall be machine labeled according to TIA/EIA 606 and the following scheme:

1. Refer to contract drawings for detail of jack labeling scheme.

J. Termination/Patch panels shall be identically numbered by the connection to respective jack and shall be arranged in sequential ascending order from left to right and top to bottom.

K. Labeling scheme by Contractor shall be submitted for review.

L. Refer to drawings for outlet type details and quantities, and additional labeling requirements.

2.12 DATA HARDWARE

A. The Owner shall provide and install the following data infrastructure hardware solution: Data hardware to be supplied by District of Columbia Public Schools.

2.13 DATA AND VOICE SYSTEMS TESTING

A. Testing of all copper wiring (including spares) shall be performed prior to system cutover. One hundred percent of the horizontal and riser wiring pairs shall be tested for opens, shorts, crosses, polarity reversals, transposition, grounded pairs, and presence of AC voltage. Voice and data horizontal wiring pairs shall be tested from the information outlet to the TC. The Category 6 cable runs shall be tested for conformance to the specifications of EIA/TIA 568A Category 6, TIA SP-4195 Additional Transmission Performance Specifications for 4-Pair 100 Ohm Enhanced Category 6 Cabling, and Technical Service Bulletin 67 (TSB-67) Transmission Specifications for Field Testing of Unshielded Twisted Pair Systems. Testing shall be done with a TIA/EIA TSB-67 UL Certified Level 2 test set. Test shall include length, mutual capacitance, wire map, characteristic impedance, attenuation, and near-end and far end crosstalk, PowerSum near and PowerSum crosstalk, remote PowerSum near and remote PowerSum crosstalk, Ambient Noise, and Attenuation to Crosstalk Ratio (ACR) in both directions. Any pairs not meeting the requirements of the standard shall be brought into compliance by the Contractor, at no charge to the Owner. Complete, end to end test results with detailed printouts of cable tests in the test equipment Operations &

Maintenance Manuals must be submitted to the Owner. Test results indicating defective pairs comply with the following:

1. Pairs that do not meet the Manufacturer's Specifications will be considered defective.
2. Pairs that do not meet the EIA/TIA TSB-67 Specifications will be considered defective.
3. No defective pairs will be allowed in lateral or high pair count cables of 100 pairs or less.
4. Maximum allowable defective pairs in high pair count cables larger than 100 pairs will be limited to 1% of the pairs. All defective pairs will be clearly identified on the cable designation strips and the "as-built" drawings with the notation "defective" by the Contractor.

B. Voice Outlets: All voice jackets shall be tested for end-to-end continuity on each wire in the cable. This test shall be performed using a testing device that will also indicate to the tester of any crosses, opens, grounds and shorts within the cable. These tests shall be between the voice jack located in a room and associated 110 block in the wire closet.

C. All fiber optic cabling and terminations shall be tested for continuity, insertion loss, bandwidth, and overall attenuation. Testing set up and performance shall be conducted in accordance with the ANSI/EIA/TIA-526-14 Standard. All fiber testing shall be performed on all fibers in the completed end-to-end system. There shall be no splices. Testing shall consist of a bidirectional end to end Optical Time Domain Reflectometer (OTDR) trace performed per EIA/TIA 455-61 or a bidirectional end to end power meter test performed per EIA/TIA 455-53A. The system loss measurements shall be provided at 850 and 1310 nanometers for multimode fibers. Test evaluation shall be based on the valves indicated in EIA/TIA-568A, Annex H: Optical Fiber Link Performance Testing.

D. All optical fiber links shall be 100% tested for length and loss with an OTDR.

E. All optical fiber shall be tested for continuity and bandwidth.

F. All optical fiber terminations shall be visually inspected with a minimum 100% microscope to ensure no surface imperfections exist after polishing.

G. The Contractor shall test all light guide cable prior to the installation of the cable. The Contractor shall assume all liability for the replacement of the cable should it be found defective at a later date.

H. Loss Budget:

1. Fiber links shall have a maximum loss of:
   (Allowable cable loss per km)(km of fiber in link) + (.4dB)(number of connectors) = maximum allowable loss.
   a. A mated connector-to-connector interface is defined as a single connector for the purpose of this Specification.
   b. Loss numbers for the installed link shall be calculated by taking the sum of the bidirectional measurements and dividing that sum by two.
   c. Any fiber with loss significantly higher than EIA/TIA 586B specification of 3.75 dB/kM at 850 nm and 1.5 dB/kM at 1300 nm shall be considered defective. No defective fibers shall be allowed.
2. Any link not meeting the requirements of the standard shall be brought into compliance by the contractor, at no charge to the Owner. Correct deficiencies indicated by tests and completely retest work affected by such deficiencies. Retest total system to verify compliance.

I. Documentation shall be provided in both hard copy and CD disk in ASCII/MSWord format to the point of contact. Test Reports and Logs to be submitted in booklet form shall include outlet identifiers, test dates, initials of the test technician with witness signatures verifying execution of tests, test results, and interpretations of results.

J. Test equipment for fiber and twisted pair cabling shall be manufactured by Microtest, PentaScanner, WaveTek, or Datacom Technologies (LANCATVX).

K. All test reports shall be submitted in a signed, hard copy format and on a floppy disk for approval.

L. Provide a minimum of four inspections and tests of all components and all systems. The Contractor at no additional cost shall provide corrections and retesting of all unacceptable test results to the Owner. Corrections and retesting shall be provided until 100% functionality and complete acceptance of the system by the Owner is approved.

PART 3 - EXECUTION

3.1 GENERAL

A. The conditions of the General Provisions (General, Supplementary, and other Conditions) and the General Requirements are hereby made a part of this Section.

B. Install and connect all appliances and equipment as specified and shown on the contract drawings in accordance with the manufacturer's instructions and recommendations.

C. Machine label switches, connectors, jacks, receptacles, conduits, outlets, cables, and cable terminations, clearly, logically, and permanently. Program system per instructions of the Owner.

D. Execute, without claim for payment, moderate moves or changes necessary to accommodate other equipment or cabinetry to assure symmetry and pleasing appearance.

E. The system must be matched. All major electronic equipment must be furnished, assembled, installed and tested by the Communication Contractor.

F. Final appearance and finishes are subject to the Owner' s approval.

G. Cabling types shall be installed per manufacturer's recommendations as required and as indicated on the drawings and in the specifications.

H. Cabling shall be terminated neatly and logically. All connectors shall be as recommended by the manufacturer or as indicated in the specifications or drawings.

I. Co-ordinate and submit to the Owner a proposed work schedule chart indicating starting time from notice to proceed, job progression and completion/closeout schedule. Notify the contract administrator immediately for if changes to the schedule are required.

J. Facility occupation and availability: the Owner will make all reasonable attempts to provide access to the facility. At the end of each workday the Contractor shall leave the occupied areas of the facility in a safe and ready condition for faculty and student use.

3.2 CABLE ROUTING

A. Wiring for the voice/data/video system shall be plenum-rated and supported by J hooks, installed four (4') apart. Exposed wiring run below ceiling tiles shall be installed in surface metal raceway as indicated on the Drawings. Exposed wiring run in the gymnasium, mechanical rooms, and other rooms where there is no drop ceiling shall be installed in EMT conduit above 10'-0" AFF and in surface metal raceway below 10-0" AFF. EMT conduit in mechanical rooms may be installed in EMT conduit below 10'-0" AFF. Refer to Specification Section 16770, Paragraphs 3.2C, 3.2Q, 3.2T, 3.2U, 3.2V, 3.2Z, 3.2 FF and 3.2 JJ. Refer to Specification Section 16770, Paragraph 3.2

for all voice/data/video system-cabling requirements. All voice and data horizontal cables shall not exceed 90 m (295 ft) from the telecommunications outlet in the work area to the horizontal cross connect. The combined length of jumpers, or patch cords and equipment cables in the telecommunications closet and the work area should not exceed 10m (33 feet) total, including 3 m (10 feet) at the station and 6 m (20 feet) at the closet. Every effort will be made to route cables so as not to exceed 90 meters in length. Contractor will identify any cable runs exceeding 90 meters from proposed BDF/IDF location and shall provide solution to meet the 90-meter requirement.

B. 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. Cable bends shall be no less than four (4) times the cable outer diameter or 1.00".

C. In open ceiling cabling, cable supports shall be provided by means that are structurally independent of the suspended ceiling, its framework, or supports. These supports shall be spaced no more than 1.2 m (4 feet) apart.

D. Telecommunications pathways, spaces and metallic cables which run parallel with electric power cables or lighting cables shall be installed with a minimum clearance of 300 mm (12 inches). Communication cables shall not be run parallel with electric power cables for more than 10 m (33 feet) if their separation is less than 300 m (12 inches). Maintain minimum distances of voice and data cables from the following items:

ITEM	MINIMUM SEPARATION
Parallel with electric power and lighting cables	300 mm (12 inches)
Fluorescent Light Fixtures	300 mm (12 inches)
Heat-Generating Devices Ductwork Radiators Heaters	300 mm (12 inches)
Transformers Motors	1.2 mm (48 inches)
Video/Broadband Distribution System Cabling	600 mm (24 inches)
Minimum Distance Above Ceilings	75 mm (3 inches)
Exterior Wall	1.2 mm (48 inches)

E. For voice or data applications, UTP cables shall be run using a star topology from the telecommunications closet on each floor to every individual information outlet. The Engineer, prior to installation of the cabling shall approve all cable routes.

F. The Contractor shall observe the bending radius and pulling strength requirements of the UTP and fiber optic cable during handling and installation.

G. Each run of UTP cable between horizontal portion of the cross-connect in the telecommunication closet and the information outlet shall not contain splices.

H. In the telecommunications closet where 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 appearing and practical installation.

I. In a false ceiling environment, a minimum of 3 inches (75 mm) shall be observed between the cable supports and the false ceiling.

J. Continuous conduit runs installed by the contractor should not exceed 30.5 m (100 ft) or contain more than two (2) 90 degree bends without utilizing appropriately sized pull boxes.

K. Cable pathways shall be designed and installed to meet applicable local and national building and electrical codes or regulations.

L. Grounding/earthing and bonding of cable pathways shall comply with applicable codes and regulations.

M. Cable pathways shall not have exposed sharp edges that may come into contact with telecommunications cables.

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

O. Pathways shall not be located in elevator shafts.

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

Q. Cables routed in a suspended ceiling shall not be draped across the ceiling tiles. Cable supports shall be mounted a minimum of 75 mm (3 in) above the ceiling grid supporting the tiles.

R. Minimum separation of 300 mm (12 in) shall be provided in areas where power or electric light circuits which are equal to or less than 480 Vrms and telecommunications cabling coexist.

S. No exposed wiring will be accepted unless approved in writing by the construction manager. Cabling shall be in the wall, above the ceiling, or where exposed, enclosed within raceway.

T. Exposed wiring will only be accepted in cases where other installation methods are not possible; e.g., a saw-toothed wooden ceiling or a tectum decked roof. Where aesthetics are a concern (i.e., visible to the occupants) and ceiling accessibility is not possible, surface-mounted raceway may be considered for an installation. A difficult installation will not be sufficient to avoid the requirement for non-exposed wiring. Exposed wiring will be acceptable in crawl spaces.

U. Exception: Adequately supported, exposed wiring may be used horizontally (not vertically) in exposed truss spaces in shop areas and shop corridors. Entry into the room must be sleeved and fire/smoke stopped. Vertical installations must be in raceway.

V. CONTRACTOR SHALL PROVIDE PLENUM-RATED CABLING THROUGHOUT THE PROJECT.

W. Exposed EMT conduit will be accepted as an installation method in gymnasiums, mechanical equipment rooms, and shop areas ten feet above finished floor. These areas will still be treated like classrooms for the final installation and termination.

X. In unheated crawl spaces, the Contractor is to install the cable at least four (4) feet from the exterior wall mounted securely to the slab or structure. Any cable support installation must attach securely to the deck.

Y. System wiring and equipment installation shall be in accordance with good engineering practices as established by ANSI, EIA and NEC. Wiring shall meet all state and local electrical codes. All wiring shall test free from all grounds and shorts. All voice and data cabling shall be installed to ANSI EIA/TIA 568A and 569 Standards, and ISO/IEC 11801 (International) Generic Cabling for Customer Premise Standard.

Z. All cabling furnished under this specification shall be installed in a neat and workmanlike manner and to the satisfaction of the Owner. All cabling must be installed with extreme care. Cables must not be cinched, subjected to sharp bends in excess of the manufacturer's recommended bending radius or anything else that would change the specified characteristics of the cables. Comply with ANSI/EIA/TIA 568-A.

AA Cables run exposed above accessible ceilings shall be run in bundles of a size for installation. Bundle by use of cable ties, taking care not to cinch cables. Cable shall be supported from roof structures, joists and other appropriate structural members by means of J hooks. J hooks shall not exceed spacing of four (4) feet. In no case shall any cable be supported from below by contact with the ceiling system. The data, telecommunication and video cabling systems shall be separated into bundles and separated by a minimum of 12". Provide cable ties to secure cables to each "J" hook. Avoid cinching cables.

1. All voice and data telecommunications cable installed above suspended ceilings shall be supported by 2" "J" hooks spaced at a maximum of 48". For support of high density (>50 cables) bulk cable where 48" spacing results in the bowing of cable, the Contractor shall divide bulk cable into smaller parallel streams or decrease the spacing of the "J" hooks sufficiently to adequately support the cable.

2. Where voice and data telecommunication wiring is supported by "J" hooks, wire shall be run neatly bundled with tie wraps. Tie wraps shall be spaced randomly between 6" and 10" apart, 8" on the average. Tie wraps shall be snug, but capable of being easily rotated about the cable bundle so as to secure the cable without binding, deforming or damaging it. Cable deflection shall be less than 5" between "J" hooks.

3. Fiber optic and Category 6 UTP backbone cable shall be run separately from the horizontal distribution cable. This shall be accomplished by running said cable parallel to horizontal distribution cabling supported on the back-side of the "J" hooks used for the horizontal cabling or by supporting the backbone cable separately from the horizontal. In either case, the backbone cabling shall not be tie wrapped together with the horizontal distribution cable.

4. "J" hooks shall be supported directly by the building structure. "J" hooks shall be supported on minimum 3/8" threaded rod anchored to the side hallway walk, or to the slab above. "J" hooks shall not be attached to or supported by ceiling supports, piping or piping supports, or duct work or duct work supports.

5. Install cabling below or to the side of the duct work, just above the suspended ceiling. Extend "J" hooks down to support the cabling at that level.

BB. Cables passing through fire/smoke containment walls shall be sleeved. Where these wall penetrations are required, said sleeves shall be fireproofed to maintain the integrity of the wall rating.

CC. Cables shall be installed in metal conduit raceways on walls, below ceilings, where exposed and wherever it may be accessible or may be subject to physical damage.

DD. The cable and conduit routes used should avoid water pipes, fluorescent lighting and other utilities that may adversely affect the system's performance or result in damage to the cable. If cable must be placed close to such utilities, keep it separate and protect with approved barriers and/or insulation.

EE. Do not run cable or conductor in hangers used for pipes, electric conduits or ceiling hangers, nor support it in any way by attachments to pipes, conduits, HVAC ducts or ceiling grid hangers.

FF. All cables shall be continuous runs with no splicing permitted.

GG. Cabling types shall be plenum construction as required by applicable electrical codes and as specified. Contractor shall provide plenum-rated cabling throughout the project.

HH. Refer to project descriptions and/or drawings all cabling systems.

II. The Contractor shall place distribution cabling following the same basic route of the wiring, except where shorter route is required to meet distance limitations of cabling..

JJ. In suspended ceiling areas where cable trays or conduit are not available, the Contractor shall bundle station wiring with plastic cable ties at appropriate distances. The cable bundling shall be supported via the contractor provided J-hook system.

KK. The Contractor shall conceal horizontal distribution wiring internally above ceiling and in wiremold on walls.

LL. The Contractor shall be responsible for removing all ceiling tiles required for the installation of the wiring. Contractor shall provide new ceiling tiles for any ceiling tiles damaged.

MM. Run cables above hung ceilings suspended from surfaces above with approved devices, or in cable trays, using convenient run sizes secured with properly tensioned plastic cable ties. Comply with NFPA requirements for exposed cable. Route cable runs to clear electrical devices above ceilings by not less than 12 inches.

NN. Where wire and cable penetrate walls or other structural elements or pass above inaccessible areas of the building, install EMT sleeves sized to accept sizes of run, as follows (in no case shall sleeves exceed 40% fill ratio):

IPS/TRADE SIZE	NUMBER OF CABLES
0.75-inch	2
1.00-inch	4
1.25-inch	8
1.50-inch	11
2.00-inch	18
2.50-inch	27
3.00-inch	41
3.50-inch	55
4.00-inch	71

OO. Where cables penetrating exceed specified capacity of a single sleeve, install multiple sleeves. Where sleeves penetrate fire-rated Construction, install with fire-stopping.

PP. Size sleeves to accept number of conductors or cables in run, plus ten percent for future expansion.

QQ. Cable lubricants: Lubricants specifically designed for installing communications cable may be used to reduce pulling tension as necessary when pulling cable into conduit. After installation, exposed cable and other surfaces must be cleaned free of lubricant residue. Twisted pair cable lubricant shall be Dyna-Blue, American Polywater, or approved equal. Optical fiber cable lubricant shall be Optic-Lube, Ideal, or approved equal.

3.3 BACKBONE CABLING

A. The bending radius and pulling strength requirements of all backbone cables shall be observed during handling and installation.

B. The backbone subsystem shall include cable installed in a vertical manner between floor telecommunications closets (TC) and the main or intermediate cross-connect in a multi-story building and cable installed horizontally between telecommunications closets and the main or intermediate cross-connect in a long single story building like a school.

C. All fiber cables will be run in inner-duct. Fibers will be terminated in the TC's using paired SC connectors in wall-mounted Interconnect Centers or rack-mounted panels equipped with sufficient ports, slack storage space, and splice trays, if required to terminate and secure all fibers.

D. Adequate riser sleeve/slot space shall be available with the ability to ingress the area at a later date, in all TC's such that no drilling of additional sleeves/slots is necessary.

E. The backbone cables shall be installed in a star topology, emanating from the main cross-connect to each telecommunications closet. An intermediate cross-connect may be present between the main cross-connect and the horizontal cross-connect. This is known as a hierarchical star topology, per ANSI/EIA/TIA 568-A. No more than two levels of cross-connects shall be allowed between the main cross-connect and the station.

F. Optical fiber shall be run for all backbone segments. All backbones shall comply to distance limitations required by ANSI/EIA/TIA 568-A.

G. Backbone pathways shall be installed or selected such that the minimum bend radius of backbone cables is kept within manufacturer Specifications both during and after installation.

3.4 EQUIPMENT ROOMS/CLOSETS

A. The Equipment Subsystem consists of shared (common) electronic communications equipment in the equipment room or telecommunications closet and the transmission media required to terminate this equipment on distribution hardware.

B. 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. Provide 12" ground bus bars and #6 solid copper ground wires from the ground bus bars to the building ground. Provide #6 ground from the ladder cable rack to the ground bus bars.

C. A minimum of two dedicated duplex or two dedicated simplex electrical outlets each on a separate circuit, shall be provided for equipment power. Additional convenience duplex outlets should be placed at 1.8 m (6 ft) intervals around the perimeter walls. Provide "Lock Dog" Breaker Locks, on panelboard circuit breakers serving outlets, to prevent inadvertent shut-down of power.

D. Provide a minimum of one 4' w x 8' h x 3/4" fire-retardant-treated plywood backboard, painted white, two feet off the floor to top. Secure backboard with a minimum of eight (8) screws. Plywood backboard shall conform to Product Standard PS1, Grade B-D, with exterior glue and one side finished.

E. Cable installation in the Equipment Room and Communications Closet must conform to the Project Drawings. All cabling shall be routed so as to avoid interference with any other service or system, operation, or maintenance purposes such as access boxes, ventilation mixing boxes, network equipment-mounting access hatches to air filters, switches or electrical outlets, electrical panels, and lighting fixtures. Avoid crossing areas horizontally just above or below any riser conduit. Lay and dress cables to allow other cables to enter the conduit/riser without difficulty at a later time by maintaining a working distance from these openings. Use a minimum of 36 inches for a service loop to the patch panel.

F. Cable shall be routed as close as possible to the ceiling, floor, or other corners to ensure that adequate wall or backboard space is available to current and future equipment and for cable terminations. Cables shall not be tie-wrapped to electrical conduit or other equipment. The minimum bend radius shall be observed.

G. Lay cables via the shortest route directly to the nearest edge of the backboard from the mounted equipment or block. Lace or tie-clamp all similarly routed cables together and attach by means of clamps screwed

to the outside edge(s) of the backboard vertically and/or horizontally, then route via square corners over a path that will offer minimum obstruction to future installations of equipment, backboards, or other cables.

H. Provide rack and jack panel hardware as required for all data station wiring. Provide the following for each equipment rack:

I. Racks shall be installed in accordance with the Manufacturer's pre-printed instructions. Racks shall be anchored to the building structure at the base and top of each rack.

J. Racks shall be installed perpendicular to the wall on which the data jack panels are installed. Racks shall be spaced at least 6" from the wall (at the side) and have a minimum of 36" clearance in front and behind.

K. Subsequent to rack installation, provide wire management hardware, power strips, and grounding on racks as noted herein.

L. Install cable management channel the entire height of the rack, on both sides.

M. Install split front D-ring panels below patch panels for cable management.

N. Install an uninterruptible power supply into each rack at the bottom of the rack and plug-in the power cord where directed by the Owner to fully charge the batteries.

O. Provide a 12" wide ladder rack from the backboard wall to each equipment rack, 7'2" AFF. All cables shall be routed across the ladder rack. Provide angle iron and attach securely to the wall and to the rack.

3.5 SITE SURVEY

A. Provide examination of site.

B. Prior to placing any cable pathways or cable, the Contractor shall survey the site to determine job conditions will not impose any obstructions that would interfere with the safe and satisfactory placement of the cables, and to arrange the removal of any obstructions with the Project Manager accordingly.

C. The Drawings provided are diagrammatic and generally representative of the site conditions, but not necessarily accurate in all aspects; therefore, verification of these drawings is solely the responsibility of the Contractor. The Contractor shall verify all field conditions and make field measurements as required.

D. Visit the site before submitting bid and check location of existing and proposed utilities, check conditions, verify dimensions and locations shown on the plans, and verify over-all costs and work herein described or shown.

E. Take measurements necessary for this work and be responsible for their accuracy. Necessary pullboxes and junction boxes as required to accomplish distribution shall be provided.

3.6 BEND RADIUS

C. The maximum cable bend radii shall not exceed manufacturer's specifications.

B. In spaces with UTP cable terminations, the maximum bend radius for 4-pair 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.

C. During the actual installation, bend radius on 4-pair 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.

3.7 SLACK

A. In the work area, a minimum of 300 mm (12 in) should be left at outlets, while 1 m (3 ft) be left at the backboard or rack, and 6 m (20 feet) in the closet area.

B. In telecommunications closets a minimum of 6 m (20 ft) of slack should be left for all cable types. This slack must be neatly managed on trays or other support types. "All cable types" includes all voice/data/video backbone cables and fiber optic backbone cables.

C. All unused cables shall be properly terminated, as specified, with 10 m (33 feet) extra cable neatly coiled and tie-wrapped at the workstation end of cable in the ceiling space.

D. Where Tele-Power Poles are installed, provide a minimum of 3 m (10 feet) of cable coiled, tie-wrapped, and supported in the ceiling space.

3.8 CABLE TIE WRAPS

A. Tie wraps shall be used a 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. Tie wraps shall be attached with screws to walls, backboards, and other structures. Tie wraps shall be spaced between 6" and 10" apart, 8" on the average.

B. Hook cable managers should be used in the closet where reconfiguration of cables and terminations may be frequent. Cable Managers shall be Polygon Softcinch Series, or approved equal.

C. No "stick-on" cable wraps, raceways, or terminal devices are acceptable.

3.9 FIRE STOP

A. Provide properly installed firestop systems to prevent or retard the spread of fire, smoke, water, and gases through the building. This requirement applies to openings designed for telecommunications use that may or may not be penetrated by cables, wires, or raceways. Contractor shall seal all floor, ceiling, and wall penetrations.

B. Provide fire and smoke stopping in accordance with all applicable codes.

C. Provide fire-rated seals for all penetrations through fire-rated floors and walls. Provide UL listed fire sealant, Dow Corning Silicon foam, or approved equal. Provide UL listed expanding fire barrier and expanding type grout.

3.10 WORKMANSHIP

A. All work shall be done in a workman like fashion of the highest standards in the telecommunications industry. All equipment and materials are to be installed in a neat and secure manner, while cables are to be properly dressed. Workers must clean any debris and trash at the close of each workday.

B. The installation shall be in strict accordance with all applicable codes and standards, the respective manufacturer's written instructions, contract drawings, and these Specifications. All materials, equipment, and devices shall be new and unused, of current manufacture of the highest grade, free from defects. Workmanship shall be of the highest grade in accordance with modern practice. The installed system shall be neat, clean, and well

organized in appearance. Contractor shall provide working clearances for normal system operation, reconfiguration, and repair.

C. The Owner reserves the right to reject all or a portion of the work performed, either on technical or aesthetic grounds.

D. The Contractor shall replace any damaged ceiling tiles that are broken during cable installation.

E. The Contractor shall replace or rework cables showing evidence of improper handling and storage, including stretches, deformations, compression, temperature related installation/storage damage, cuts, kinks, short radius bends, over-tightened bindings, loosely twisted and over-twisted pairs at terminals, and cable sheath removed too far (over 1-1/2 inches), at no additional cost to the Owner.

3.11 LABELING

A. Horizontal and backbone cables shall be labeled at each end, 1" from end of the sheath. The cable or its label shall be marked with its identifier.

B. A unique identifier shall be marked on each faceplate to identify it as connecting hardware.

C. Each port in the faceplate shall be labeled with its identifier.

D. A unique identifier shall be marked on each piece of connecting hardware to identify it as connecting hardware.

E. Each port on the connecting hardware shall be labeled with its identifier.

F. Each RF trunk cable shall be numbered and each RF jack served by a particular trunk shall be sequentially numbered, beginning at the closest jack to the MATV head-end, using the trunk number as a prefix (i.e., 2-34).

G. Each patch panel in the building shall be given a letter designation. Each data jack served by a particular patch panel shall be numbered with the patch panel jack number feeding the work station jack to the closet in which the patch panel is located, using the patch panel designation as a prefix (i.e., C-21).

H. Each 25/50 pair 110 type mass termination wiring block in the building shall be given a two-letter designation with the first letter being “V”.

I. Tag all cables, terminal blocks, outlets, and other components for which tests have been satisfactorily completed.

J. Each Hi/Lo audio and video jack shall be labeled as such respectively (i.e., Audio).

K. Each video jack shall be labeled as such (i.e., Video).

L. Where applicable, identify telephone system backboards and cabinets with the legend “Telephone”.

M. Identify terminals at terminal strips, telecommunications outlets, and pull-and junction boxes with approved designations.

N. All trunk cables linking the wire closets together shall be logically designated to industry standards.

O. Labeling requirement: Generally, all wiring shall be labeled consistent with ANSI/TIA/EIA-606, and include the following:

P. Adhesive labels shall meet the legibility, defacement, and adhesion requirements specified in UL 969 for indoor use. Cable labels shall have a durable substrate, such as vinyl, suitable for wrapping. Labeling practices shall be consistent across the installation.

Q. Data and communications voice cable/outlet labeling.

1. All wiring closets shall be numbered starting with one (1) for the MDF. This number should be clearly identified in the closet as well as on all as-built drawings. All equipment racks shall be numbered from left to right starting with one (1). All data patch panels should be identified with a letter starting with "A" on the top most patch panel.

2. The cable labels to include the following and be on each end of the cable itself:
   a. Wire Closet # (1, 2, 3, etc)
   b. Rack # within the closet (1, 2, 3, etc)
   c. Patch Panel Letter Designation (A, B, C, etc (starting from the top and working down)
   d. Port # on the patch panel
   e. Room #
   f. Plate designation within the room starting on the left inside the door and working clockwise (A, B, C, etc).
   g. Port # in plate (1, 2, 3, etc) beginning at the top/upper left and working down/clockwise.

   For example, 2-1-B-35-B216-C-2

3. Each Network Outlet in classroom, labs, offices, etc., will be labeled with a permanent marking scheme with an identification number as per the following scheme:
   a. Wire Closet #
   b. Rack # within the closet
   c. Patch Panel Letter Designation
   e. Port # on the Patch Panel

   For example, 2-1-C-31. Closet 2, Rack 1, Patch Panel C, Patch Panel Port 31

4. Each RJ -45 termination on modular patch panels to be labeled with the appropriate NO connector location information. Patch panel labels should include:
   a. Room #
   b. Plate designation within the room starting on the left inside the door and working clockwise (A, B, C, etc).
   c. Port # in plate (1, 2, 3, etc) beginning at the top/upper left and working down/clockwise.

      For example: B213-C-2

5. The outlet faceplate shall be provided with a permanently affixed machine labels. The cable run shall be machine labeled with Mylar wrap wire markers within 1" of termination. Final termination at the distribution frame is also to be appropriately tagged. All cabling and fiber optics are to be tagged in a consistent manner.

R. All rack fields, devices, components, etc., shall be provided with plates, labeled with appropriate designations on the front and rear of the equipment. All devices are to be installed and labeled in a sequential, logical order. (For example: A, D, C, B will be retagged and reterminated to A, B, C, D).

S. Distribution Frame Connecting Hardware: All connecting hardware shall be adequately tagged with a similar nomenclature to the above.

T. Cross-connecting Cable: All cross-connecting cable shall be adequately tagged with a similar nomenclature to the above with tags of “to” and “from”.

U. Equipment ports shall be adequately tagged with a similar nomenclature to the above.

V. Patch Cords shall be color-coded per specifications above. All patch cords shall be by the same Manufacturer.

W. No handwritten labels shall be accepted.

X. All labels shall be machine-printed on clear or opaque tape, stenciled onto adhesive labels, or typewritten onto adhesive labels. The font shall be at least one-quarter inch (1/4") in height, block characters, and legible. The text shall be of a color contrasting with the label such that it may be easily read. If labeling tape is utilized, the font color shall contrast with the background

1. Brady Labeling Systems, Panduit Pan-Mark Labeling Systems, or approved equal shall be used.

Y. Each fiber optics cable segment shall be labeled at each end with its respective IDF identifier. Each fiber interconnect device shall be labeled with its respective IDF identifier. Each telecommunications outlet shall be labeled with its respective workstation number (machine labels only). Each workstation cable shall be neatly labeled, at each end with its respective workstation number. Each copper backbone cable shall be machine labeled at each end with its respective IDF number. Each binder group shall be tied off with its respective identifying ribbon at each break-out point.

Z. Warning Tags: At each location where the fiber cable is exposed to human intrusion, it shall be marked with warning tags. These tags shall be yellow or orange in color, and shall contain the warning: “CAUTION FIBER OPTIC CABLE”. The text shall be permanent, black, block characters, and at least 3/16" high. A warning tag shall be permanently affixed to each exposed cable or bundle of cables, at intervals of not less than five (5) feet. Any section of exposed cable which is less than five (5) feet in length shall have at least one warning tag affixed to it.

3.12 DOCUMENTATION:

A. The conditions of the General Provisions (General, Supplementary, and other Conditions) and the General Requirements are hereby made a part of this Section.

B. A comprehensive installation, operation, programming and instruction manual shall be supplied as part of the system. The manual shall provide complete service information, including schematics, layout drawings, and interconnecting diagrams showing the location of all the outlets, cable taps, cable routes, and other installed components. Include final revised one-line system drawings. Include for this particular project parts lists to permit quick and efficient maintenance and repair of the equipment by qualified technicians. Manuals shall include 8 2" x 11" device location/cabling route drawings provided in CADD format Autodesk -AutoCadd Release 13 or later (.dwg/.dxf) on CD disk. Manuals shall include a copy of the operations manuals listed in 4.003 below. Manuals shall be indexed and placed in a hard-cover three ring binder. Three (3) copies of this manual shall be provided to the Owner upon project completion. Contractor shall retain a minimum of one (1) copy for their permanent records. Provide one copy of Manual and disk(s) in the Main Equipment Rack. Refer to “General Provisions” in the contract for additional or prevailing documentation requirements.

3.13 DRAWINGS

A. As-built drawing shall be provided by the Contractor, in compliance with EIA ANSI/TIA/EIA-606, showing the locations of and identifiers for all:

B. Horizontal cable routing and terminations.

C. Telecommunications outlets/connectors, Telco System interfaces.

D. Backbone cable routing and terminations and outlets.

E. Video cable routing and terminations and outlets.

F. Data cable routing and terminations and outlets.

G. Electrical power cable routing and terminations, power outlet locations.

H. Network cabling plans identifying type, number, and location of equipment and outlet.

I. Cable penetration details, schematic riser diagrams, and equipment closet layouts.

J. Provide as-built drawings to include cabling routing, details of station and hardware locations, etc. The Contractor shall provide as-built drawings on CD disk in AutoCAD (.dwg/.dxf) file format. Contractor will have access to drawings provided with this specification where they are in electronic form.

K. Provide a set of "As-Built" Drawings encased in a plastic sheet protector at backboard, in each wiring closet.

L. At the completion of the project, the Contractor shall bring the system wiring diagrams fully up to date with the actual field installation, showing all field-made changes for deviations from the approved shop drawings. Accurately record location of service entrance conduit, termination backboards and cabinets, outlet boxes, messenger cable raceways and cable trays, pull boxes and equipment. Room names and numbers shall be updated to indicate actual field-assigned room numbers. They may not necessarily be the room names and numbers shown on the Contract Drawings.

3.14 RECORDS

A. All records shall be created by the installation contractor and turned over at the completion of work. The format shall be computer based and both soft copies and hard copies shall be part of the As-built package. The minimum requirements include:

B. Cable records shall contain a complete listing of the identifier, cable type, length, pair status, pair assignment, termination positions at both ends, manufacturer, and part number.

C. Connecting hardware records shall contain the identifier, type of hardware and the amount of positions.

D. Connecting hardware positions records shall contain the identifier, type of position, and the cable identifier attached to it.

E. Test documentation on all cable types shall be included as part of the As-built package. Only signed copies of test reports shall be acceptable.

F. Outlet Records: Provide a database of outlet designations capable of being exported to a cable management software system.

G. Provide a complete Owner's Manual including full documentation of system paths and components to allow for plug and play operating cable management, cable maintenance, and cable modifications. Commercial off-the-shelf manuals shall be furnished for operation, installation, configuration, and maintenance for all products provided as a part of this section.

H. The Contractor shall provide a complete database indicating the location of each outlet and corresponding port on wire closet equipment.

3.15 REPORTS

A. All reports shall be generated from the computer-based program used to create the records above. These reports should include but not limited to:

B. Cable Reports

1. Cross-connect Reports
2. Connecting Hardware Reports

C. Reports shall include cable schedules fully documenting length, path, and conductivity test results for each cable.

D. Provide standard “D” or “E” size floor plans identifying all room outlet numbers, cabling routing, closets and device locations.

3.16 TRAINING:

A. The Contractor shall include sixteen (16) hours in four (4) four-hour on-site training sessions, or as required, of startup and training assistance during cutover and Owner installation of equipment to ensure a fully functional system. This training may also be used for system configuration during initial system startup or other services as required at the Owner’s request.

B. Training shall include a “walk-through” of the system for location and labeling orientation, a discussion of overall system concepts and configuration, specific instruction in system reconfiguration using patch cords in the wiring closets, a review of the as-built drawings, a review of the system testing and acceptance documentation, and guidelines for basic trouble-shooting of the structured cabling system. The contractor shall supply personnel who are thoroughly familiar with the installation to present the instruction in an organized and professional manner. CCPS shall supply personnel to physically inspect the installation to assure that all equipment and cable is installed in a neat and workmanlike manner as called for by the plans and specifications. Contractor to schedule the inspection and walk-through with Supervisor of Network Infrastructure and Classroom Support Services at a mutually agreeable time.

C. The Contractor shall provide key personnel at each training session, as required by the Owner, at no additional cost to the Owner. Key personnel include Contractor’s site-foreman, project manager and service manager.

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3.2 INTEGRATED TELECOMMUNICATIONS SYSTEM

Reference: [DCPS DIVISION 16 – ELECTRICAL, SECTION 16780 - INTEGRATED TELECOMMUNICATIONS SYSTEM]

PART 1 GENERAL

1.1 GENERAL PROVISIONS

A. All bids shall be based on the equipment as specified herein. The catalog numbers and model designations are that of the RAULAND-BORG CORPORATION. The specifying authority must approve any alternate system.

B. Bidders wishing to submit alternate equipment shall submit to the specifying authority, at least 10 days prior to bid opening, the equipment proposed to provide a precise functional equivalent system to meet specifications. Bidder shall provide adequate information prior to bid date such as specification sheets, working drawings, shop drawings, and a demonstration of the system. Alternate supplier-contractor must also provide a list to include six installations of the identical system proposed which have been in operation for a period of two years.

C. Final approval of the alternate system shall be determined at the time of job completion. Failure to provide the "precise functional equivalent" shall result in the removal of the alternate system at the contractor's expense.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section

B. Drawings and Specifications are intended to be complimentary. All work exhibited in the Specifications and not shown on the Drawings, and vice versa, is to be executed as if mentioned within both.

1.3 SUMMARY

A. This section includes Integrated Intercom/PA/Master Clock Systems. It includes requirements for Integrated Electronic Communications Network systems components including:

1. Administrative Telephones
2. Ceiling and Wall Mounted Speakers
3. Normal and Emergency Intercom Call Buttons
4. Public Address and Intercom Systems
5. Digital Administrative Readout Displays
6. Power Supplies
7. Wiring
8. Paging Horns
9. Master Clock
10. Program Sources

B. This Section also includes the Areas of Refuge system. Product requirements for a complete system include:

1. Main Terminal
2. Call Switches
3. Back-up Power Supply

1.4 SUBMITTALS

A. Submit the following in accordance with Conditions of Contract and Division 1 Specifications Sections:

1. Submit equipment prints, panel diagrams, full electronic wiring diagrams and specifications sheets for items included herein. Provide a tabulation of the specification clearly comparing the submitted items with the items specified. Specifications shall be submitted for all items.

2. Shop drawings detailing integrated electronic communications network systems including the built-in station arrangement and equipment cabinet arrangement.

3. Wiring diagrams detailing power, signal and control.

4. Typical connections for all types of equipment.

5. A riser diagram for the system showing all connections, interconnections and all provisions available for future expandability. The riser diagram must include calculations, charts and test data for the system demonstrating full functionality.

6. A certificate of completion of installation and service training.

1.5 QUALITY ASSURANCE

A. All items of equipment including wiring and cable shall be designed by the manufacturer to function as a complete system and shall be accompanied by the manufacturer's complete service notes and drawings detailing all interconnections.

B. The contractor shall be an established communications and electronics contractor that has had and currently maintains a locally run and operated business for a minimum of five years. The contractor shall utilize an authorized distributor of the equipment supplied for this project location with full manufacturer's warranty privileges.

C. The contractor shall show satisfactory evidence that the supplier maintains a fully equipped service organization capable of furnishing adequate inspection and service to the system. The supplier shall maintain at his facility the necessary spare parts to properly service the equipment.

D. Electrical Component Standard: Provide work complying with the applicable requirements of NFPA 70 "NEC" including, but not limited to:

1. Article 250, Grounding
2. Article 300, Wiring Method
3. Article 310, Conductors for general wiring
4. Article 725, Remote Control, Signaling Circuits
5. Article 800, Communications Systems

E. EIA Compliance: Comply with the following Electronics Industries Association Standards:

1. Sound Systems, EIA-160
2. Loudspeakers, Dynamic Magnetic Structures and Impedance, EIA-299-A
3. Racks, Panels, and associated Equipment, EIA-310-A.
4. Amplifiers for Sound Equipment, SE 101-A
5. Speakers for Sound Equipment, SE103.

F. Installation and start up of all systems shall be under the direct supervision of a local agency regularly engaged in installation, repair, and maintenance of such systems. The supplier shall be accredited by the proposed equipment manufacturers and be prepared to offer a service contract for system maintenance on completion of the guarantee period and provide the names, locations, and size of ten (10) recent successful installations in the area.

G. The agency providing equipment shall be responsible for providing all specified equipment and mentioned services for all equipment as specified herein. The agency must be a local authorized distributor of all specified equipment for single source of responsibility and shall provide documents proving such. The agency must provide written proof that the agency is adequately staffed with factory-trained technicians for all of the specified equipment. The agency must have established business for and currently be providing all services for the equipment to be provided for a minimum of 20 years.

H. The contractor shall guarantee availability of local service by factory-trained personnel of all specified equipment from an authorized distributor of all equipment specified under this section. On-the-premise maintenance shall be provided at no cost to the purchaser for a period of one (1) year (parts and labor) from date of acceptance unless damage or failure is caused by misuse, abuse, neglect, or accident. Additionally, all Rauland-Borg manufactured products are covered by a five (5) year (parts only) limited warranty from the date of acceptance. The warranty period shall begin on the date of acceptance by the owner/engineer.

I. The contractor shall, at the owner's request, make available a service contract offering continuing factory authorized service of the system after the initial warranty period.

J. The supplier shall visit the sites and familiarize himself with the site conditions and field requirements prior to submitting a proposal.

1.6 DELIVERY STORAGE AND HANDLING

A. Deliver products in factory containers. Store in clean, dry space in original containers. Protect products from fumes and construction traffic. Handle carefully to avoid damage.

1.7 WARRANTY

A. All Rauland-Borg manufactured products are covered by a five (5) year (parts only) limited warranty from the date of acceptance. The warranty period shall begin on the date of acceptance by the owner/engineer.

1.8 TRAINING

A. Train Owner's maintenance personnel in the procedures and schedules involved in operating, troubleshooting, servicing, and preventative maintenance of the system. Provide a minimum of 16 hours training. Operators Manuals and Users Guides shall be provided at the time of this training.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide the following system:
1. Rauland-Borg Telecenter

B. Catalog and product numbers are those of the Rauland-Borg Corporation, and constitute the type, level of quality and operational characteristics of the equipment to be furnished

2.2 INTERCOMMUNICATIONS SYSTEMS

A. All centrally located equipment will be mounted in a vertical rack, providing 77" of vertical panel space with locking rear door and installed as indicated on the drawings.

B. Provide distribution capability of announcements from the central rack to individual rooms, selected groups, and selected rooms or to all speakers.

C. Provide capability to broadcast AM/FM radio broadcasts, cassettes, compact discs to any selected area or all locations equipped with speakers.

D. Provide two-way intercommunication between the central rack and any individual classroom or other selected speaker locations.

E. Provide visual and audio monitoring of all program material

F. Provide volume controls for all materials mounted in the equipment rack

2.3 RACK EQUIPMENT

A. A centrally located, floor-mounted equipment rack shall house all of the amplification and intercommunication equipment. The rack shall be the Rauland-Borg RP1100B rack that provides 77" of vertical panel space and is finished in textured black enamel. The rack shall be equipped with a rear-locking door and cable entry to the rack shall enter through grommeted holes. The rack shall be 81.5" high, 22 ¾" wide and 18 ½" deep. Any space not filled with intercommunications equipment shall be filled with Rauland-Borg charcoal gray panels. The manufacturer shall supply five operating/maintenance manuals and a number will be assigned to each rack with a record of the system kept by the manufacturer. Each rack can be referenced by the manufacturer to provide information on upgrades, service and maintenance.

B. The AM/FM/Cassette player shall provide digital readout of station selected, provide automatic station search, preset station buttons, continuous manual tuning, digital clock, auto reverse tape functions and a built-in monitor speaker with rack mount panel 3.5" high. The AM/FM Cassette shall be the Rauland-Borg MCX300.

C. A rack mounted compact disc player shall be supplied. The compact disc player shall have a minimum 20 bit digital filter with 8x over sampling and noise shaper, 18 bit super linear converter, in addition to standard audio output, digital coax output, 20 track programmable memory, pitch control and have 3.5" from face that is rack mountable. Shelf mounted compact disc players are not acceptable.

D. A rack mounted telephonic switch that is expandable up to 500 stations complete with power supply, 12 watt intercom channel, modular construction, non-volatile user programmable memory, built-in diagnostics, and be expandable to add media retrieval. The telephonic switch shall be the Rauland-BorgTC4002 with a Rauland-Borg TC4156 adapter for 48-volt operation.

E. A Line Link Module that provides multiple system connections shall be provided. The unit shall provide access for 32 system links and be modular in nature. The unit shall be the Rauland-BorgTC4155. The Line Link Module shall be accommodated in the rack unit by means of an approved expander chassis. The unit shall be the Rauland-Borg TC4145 Expander Chassis.

F. The unit shall be able to accept multiple intercom amplifiers. The units shall be rack mountable and be modular in nature. The unit shall be the Rauland-Borg TC4165 Expander Chassis for intercom amplifiers.

G. A flush-mounted, five gang, wall display shall be located in the office that will indicate any classroom placing a call the office. In addition to the room identification, a tone will sound calling attention to the call-in. The unit shall be the Rauland-Borg TC4222 Flush Wall-Mount Vacuum Fluorescent Digital Display. The wall display shall be located in the main office of the facility.

H. Two Rauland-Borg TC4221 sidecar displays shall be installed with two of the owner's designated administrative phones. The designated office person may speak directly to the classroom with an administrative telephone.

I. The intercom and program control center shall be rack mounted. It shall contain a 15-watt intercom amplifier, monitor speaker, volume control, an emergency call switch, intercom panel microphone, a press to send tone switch, and an all call switch. The unit shall be the Rauland-Borg MCZ300 that is 3.5" high and 19" wide.

J. A "B" channel program amplifier that provides four color-coded input selector switches, a monitor speaker, tone send push button, volume control and LED output level indicators. The unit shall be the MCB300.

K. A room selector panel shall be provided that includes program distribution and intercom to selected room and or corridors. The selector Intra-Building Communications Systems panel shall have 25 four-position switches. Each switch has four positions, which are "C" Orange intercom, "A" Green program channel, and a "B" Blue program channel. The unit shall be the Rauland-Borg SWT425 with a Rauland-Borg TC110 speaker control assembly. This assembly shall provide the interface for the room selection, class change tones, and zone call.

L. A blank panel shall be installed below the room selector panels that are 2.625" inches high. The unit shall be the Rauland-Borg BP15.

M. Two 120-power amplifiers shall be mounted in the rack. The amplifiers shall provide output for 25 and 70-volt speaker lines and be capable of operating with a 24 volt DC battery backup. The amplifier shall meet the UL 1711 standard for use in fire protective backup. The amplifier shall occupy 5 ¼" of rack space and be the Rauland-Borg FAX120.

N. A power supply shall be supplied in the bottom of the rack and be the Rauland-Borg PSX300 that occupies 3.5" of rack space.

O. Engraved or silkscreen lettering, neatly and permanently identify all console controls, sound receptacles and remote controls. Stick-on tape punch letters are not acceptable.

P. Provide two 2" conduits from a 24" x 24" x 4" junction box located behind the sound rack to the ceiling above from home run classroom cable. The junction box shall be mounted with its center 16" above the fixed floor.

Q. Two administrative phones shall be provided in the welcome center. These phones will be used to receive classroom calls as well as produce general paging and intercommunications conversations. The telephones for the intercommunications and paging system shall be the Rauland-Borg TC6402.

2.4 ANTENNA

A. AM/FM antenna. AM antenna shall be vertical stainless steel whip type, ward 11-w. FM antenna shall be Blonder-Tongue FMT-2s turnstile omni-directional 72-ohm impedance. Antenna shall be mounted approximately 5' above roof. AM/FM antenna must be grounded to approved NEC ground with associated connectors. Minimum mast diameter shall be at least 2".

B. Run separate RG6/U lead-in cable from each antenna down inside mast. Cable shall enter mast through weatherproof tubes with watertight caps.

MICROPHONE

2.5

A. The program system microphone shall be dynamic moving coil type of omni-directional pattern. The unit shall provide frequency response from 60 to 10000 Hz, output sensitivity of –52 dB, be one piece zinc alloy, die cast construction, include a press to talk bar switch with lock on feature in the base, have a satin chrome finish and associated 7 foot cable. The unit shall be the Rauland-Borg 1295.

LOUDSPEAKERS

2.6

A. Recessed ceiling mounted speaker units shall consist of an 8" diameter cone type speaker with a wizzer cone, 25/70-volt transformer and baked white epoxy circular baffle. The speaker shall have a sensitivity of 93 db at four feet with 8 watt continuous power rating, ¾" diameter voice coil operating in magnetic flux of 9,500 gauss. The

frequency response shall be 65 to 17000 Hz. The speaker unit shall be the Rauland-Borg ACC1400 with associated Rauland-Borg ACC1000 baffle.

B. Speaker back boxes shall be cylindrical, welded steel construction, undercoated to prevent metallic resonance, have and external finish of zinc chromate and be 4 1/16" high and 9 ¾" wide with a 12 5/16" flange. The unit shall be the Rauland-Borg ACC1101.

C. A support bridge shall be used for all ceiling mounted speakers. The unit shall be the Rauland-Borg ACC1104.

D. Interior paging horns shall be surface mounted wide-angle horns consisting of a driver, horn, transformer and mounting bracket. The unit shall be constructed of non-resonant heavy duty ABS resin. The unit shall contain a built-in, weatherproof 25/70-volt transformer and shall contain a screwdriver adjustable impedance wattage switch. Power taps shall be 1.8, 3.7, 7.5, 15, and 30 volts in the 70-volt line. Power taps shall be 1.8, 3.7, 7.5, and 15 watts in the 25-volt line. Switch selectable impedance shall be 2500, 1300, 670, 330, 170, 90, and 45 ohms. The loudspeaker driver assembly shall have a heavy-duty replaceable diaphragm. Power handling capacity shall be 30 watts a full range and produce 107 db a 1 meter on axis with one-watt input. Frequency response shall be 225 t0 1,000 Hz. Dispersion shall be no less than 120° horizontal and no greater than 60° vertical. The unit shall be the Rauland-Borg 3603 wide-angle horn.

E. Exterior paging horns shall be the double re-entrant type with a power rating of 15 watts. The frequency range shall be 480 to 14,000 Hz, have a dispersion angle of 180°, have a sound pressure level of 106 db at one watt at one meter, have a 25/70 volt transformer and be mounted in the associated Rauland-Borg ACC1117 back box. The unit shall be the Rauland-Borg 3607 with the Rauland-Borg ACC1014 vandal-proof baffle.

2.7 CONNECTORS

A. Use color coding of conductors and apply wire and cable marking tape to designate wires and cables so all media are identified in coordination with wiring diagrams.

2.8 CABLE

A. Classroom speakers with call-in circuits shall have a homerun from each loudspeaker/call-in station that is a four conductor with shield (two shielded and two unshielded). The cable shall be 20 gauge stranded cable and shall be the West Penn non-plenum or 25359B plenum cable.

B. Corridor and speaker locations with no associated call-in switch shall be shielded and 18 gauge stranded. The cable shall be the West Penn 293 non-plenum or 25293B plenum cable.

2.9 CALL-IN SWITCHES

A. Flush wall mounted call stations shall be provided where indicated. The units shall be rocker type with spring-action return, include push to call stamped or silk screened on the faceplate, have satin finished stainless steel, mount in a standard single gang box and be 4 ½" high x 2 ¾ inches wide x 1-13/16" deep. The units shall be the Rauland-Borg 2305CS.

2.10 CONDUIT

A. Conduits shall be provided with fills that do not exceed 40% of the internal area of the conduit. Pull boxes shall be provided every 200' and every 270° of bend. All electronics shall be labeled at device ends and rack locations.

CLOCK EQUIPMENT

2.11

A. A master clock control unit to correct all secondary clocks and activate the intercom chime tone shall be provided. The unit shall be the Rauland-Borg 2524

B. Clocks shall be provided in all corridors, cafeteria, auditoriums and gymnasiums that are considered secondary type clocks. Clocks in the cafeteria and gymnasium shall be equipped with a protective wire cage. The units shall be Rauland-Borg 2460 and 2464 type analog clocks.

C. Clocks shall be provided in the classrooms that are correctable from a master clock. The units shall be Rauland-Borg 2460 surface mounted units at 120 V.

D. Double face clocks shall be provided in corridors where wall mounting is indicated.

E. Clock wiring shall be minimum size #14 AWG installed in approved metal raceway per the manufacturer's instructions..

2.12 AREAS OF REFUGE EQUIPMENT

A. Master Call Switch that will accommodate the necessary number of call boxes. The unit shall be the Alpha Communications 4200 Rescue Assistant.

B. The necessary call boxes, that will work with the before mentioned Master Call Switch.

C. Battery Back-up Power Supply, for the system to work in emergency situations.

D. Annunciator Unit A-4010TG

E. 22 AWG 3 Conductor Cable

TELEPHONES

2.13

Please use Cisco VOIP models:
Model 7921's for admin area's not specific to a person (teacher's lounge, cafeteria, etc) $350
Model 7945's for the administrative personnel $379
Model 7965's for the teachers $457
You can purchase these from OFRM via RTS (Request for Telecom Service)

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine conditions, with the Installer present, for compliance with requirements and other conditions affecting the performance of the Integrated Electronic Communications Network system.

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

3.2 INSTALLATION

A. Install system in accordance with NFPA 70 and other applicable codes. Install equipment in accordance with manufacturer's written instructions.

B. Install wiring in raceway except within consoles, desks, and counters, and except in accessible ceiling spaces, and in gypsum board partitions, where cable wiring method may be used. Use UL listed plenum cable in environmental air spaces including plenum ceilings. Conceal wiring except in unfinished spaces

C. Carefully match input and output impedance's and signal levels at signal interfaces. Provide matching networks where required.

D. Install control circuits in accordance with NFPA 70 and as indicated. Provide number of conductors as recommended by system manufacturer to provide control functions indicated or specified.

E. The contractor shall mount a main distribution frame behind the Integrated Electronic Communications Network console. All wires shall be laid down on terminal punch blocks and identified by the actual room location it serves. All the communications points shall be wired into this main distribution frame, laid down in sequence, and identified by which line it is on and the point position it serves. All housings are to be located as specified and shown on drawings. Make installation in strict accordance with approved manufacturer's drawings and instructions.

F. The contractor shall provide necessary transient protection on the AC power feed, all station lines leaving or entering the building, and all central office trunks. All protection shall be as recommended by the equipment supplier and referenced to earth ground.

G. Provide adequate length of conductors. Bundle, lace, and train the conductors to terminal points with no excess. Provide and use lacing bars.

H. Provide physical isolation from each other for speaker-microphone, line-level, speaker-level, and power wiring. Run in separate raceways, or where exposed or in same enclosure, provide 12 inch minimum separation between conductors to speaker-microphones and adjacent parallel power and telephone wiring. Provide physical separation as recommended by equipment manufacturer for other Integrated Electronic Communications Network system conductors.

I. Make splices, taps and terminations on numbered terminal punch blocks in junction, pull, and outlet boxes, terminal cabinets and equipment enclosures.

J. Use color coding of conductors and apply wire and cable marking tape to designate wires and cables so all media are identified in coordination with system wiring diagrams.

K. Provide weatherproof enclosures for items to be mounted outdoors or exposed to weather.

L. Wherever walls, ceilings, floors, or other building finishes are cut for installation, repair, restore, and refinish to original appearance.

M. Grounding

1. Provide equipment grounding connections for Integrated Electronic Communications Network systems as indicated. Tighten connections to comply with tightening torque specified in UL Standard 486A to assure permanent and effective grounds.

2. Ground equipment, conductor, and cable shields to eliminate shock hazard and to minimize to the greatest extent possible, ground loops, common mode returns, noise pickup, cross talk, and other impairments. Provide 5-ohm ground at main equipment location. Measure, record, and report ground resistance.

3. The contractor shall provide all necessary transient protection on the AC power feed and on all station lines leaving or entering the building.

4. The contractor shall note in his system drawings, the type and location of these protection devices as well as all wiring information.

5. The contractor shall furnish and install a dedicated, isolated earth ground from the central equipment rack and bond to the incoming electrical service ground bus bar.

6. Contractor shall ground the AM and FM antennas using #2 AWG and a 5/8" x 10 foot ground rod.

N. Provide interface relays, provide interconnect wiring and raceway, and interface central sound system wit h the telephone system. Provide necessary transformers and relays.

O. Areas of Refuge

1. A Master Call Switch must be installed in an office area accessible to emergency personnel. The Switch must have an adequate number of connections to accommodate the number of call boxes (Rescue Assistance).

2. All Call Boxes must be home run back to Master Call Switch.

Intra-Building Communications Systems

3. All Call Boxes will be home run back to Master Call Switch with designated cable type. 22 AWG 3 conductor cable will be run to NEC Security Cabling Codes.

4. Master Call Switch is to be connected to a battery back-up system, specified by Master Call Switch Manufacturer, incase of power outage during a crisis.

3.3 QUALITY CONTROL

A. Provide services of a duly factory authorized service representative for this project location to supervise the field assembly and connection of components and the pre-testing, testing, and adjustment of the system.

B. Make observations to verify that units and controls are properly labeled and interconnecting wires and terminals are identified. Provide a list of final tap settings of paging speaker line matching transformers.

C. Rectify deficiencies indicated by tests and completely re-test work affected by such deficiencies at Contractor's expense. Verify by the system test that the total system meets the Specifications and complies with applicable standards.

3.4 OCCUPANCY ADJUSTMENT

A. When requested by the Architect within one year of date of Substantial Completion, provide on-site assistance in adjusting sound levels, resetting matching transformer taps, and adjusting controls to suit actual occupied conditions. Provide up to three visits to the site for this purpose

3.5 CLEANING AND PROTECTION

A. Prior to final acceptance, clean system components and protect from damage and deterioration

3.3 ANALOG LINES

Analog Lines should be requested from OFRM via a Request for Telecom Service (RTS). The current city contract is with Verizon, who pulls the lines to the demarcation point.

3.4 SECURITY SYSTEMS

[Reference: DCPS DIVISION 16 – ELECTRICAL, SECTION 16800 - SECURITY SYSTEMS]

PART 1 - GENERAL

1.1 GENERAL:

A. The conditions of the General Contract (General, Supplementary, and other conditions) and the General Requirements are hereby made a part of this Section.

B. All bids shall be based on the performance of the system as specified herein. All systems must be approved by the specifying authority.

1.2 SCOPE OF WORK:

A. Furnish and install all equipment, accessories, and materials in accordance with these Specifications and drawings to provide a complete and operating integrated Security System consisting of security control panel, command center, power supplies, alarm sirens, contacts, sensors, point of protection devices, wiring and other products as required for a complete system.

B. Provide a complete and ready intrusion detection security system. The system shall safeguard the perimeter and interior of the building against theft and vandalism. Equipment used shall be UL listed and the product of a manufacturer with established reputation and experience, who shall have produced similar equipment for a period of at least ten years.

C. All equipment such as control units, sensors, key pads, etc., shall be furnished in the quantities called for, and located where indicated on the plans and drawings. The Intrusion Detection System, as herein specified and as located on the Drawings, had been designed around the control panel, as manufactured by ADT / DMP. Alternate equipment of other manufacturers may not be substituted on a piece-for-piece basis as the motion detection coverage will be less.

D. Should alternate equipment be proposed for use on this project, a complete set of Specifications, drawings, and catalog cuts describing the proposed equipment along with a drawing showing the quantity and location of all equipment must be submitted to the Architect for consideration at least ten working days before the bid date. It will be the responsibility of the parties proposing the alternate equipment to provide that the system and equipment they are proposing is equal to or better than the system and equipment as specified.

E. Scope of work includes providing security check point equipment including, walk-through metal detectors, hand-held metal detectors, and X-ray baggage inspection equipment.

F. Scope of work also includes providing a complete video intercom and door entry system.

1.3 QUALITY ASSURANCE:

A. The alarm installer shall have been regularly engaged in the alarm business for the past five years, shall be a manufacturer authorized dealer, and shall provide proof of installing at least three systems of equal size in the past two years, to the Owner; no exceptions. No subcontracting of wire installation shall be allowed to any Electrician by the Contractor.

B. All equipment components of the security alarm system shall be the standard manufactured product of a company engaged in the manufacture of security alarm systems for at least five (5) years.

C. Unless otherwise indicated, the system and its components specified, and their installation and operation shall conform to the latest applicable requirements of the following:

1. National Fire Protection Association (NFPA):

   NFPA 70 National Electrical Code

2. Underwriters Laboratories (UL):

   Electrical Construction Materials Directory

3. Factory Mutual Approval Guide

4. Building Officials and Code Administration (BOCA) National Building Code

5. Americans with Disabilities Act (ADA)

6. Occupational Safety and Health Act

D. All system components must be UL Listed individually and for use as a complete system where required by State and/or Local Codes. Devices and or systems must be approved for use in the planned locale, where such approval is required by the Authority having jurisdiction.

E. Acceptable evidence of compliance of components is a UL or FM label or listing or an independent Certification, satisfactory to the Engineer, that the components meet the applicable standards.

F. Comply with UL Household Burglary and Fire Standard.

G. Comply with NFPA 74, NFPA 72, NFPA 71, and Factory Mutual.

H. All work shall adhere to standard engineering practices, and shall comply with appropriate national, state, and local building codes.

1.4 MANUFACTURERS:

A. The following control equipment shall be used in this project as it is the same as used in other DC Schools and conforms to other system designs for ease of service and maintenance ability. No substitutions shall be allowed. All field devices shall be as listed for the same reasons.

B. Security System : ADT, local contact: Tom Mahoney, 571-338-4480, tjmahoney@adt.com

C. X-Ray Equipment : Rapid Scan Systems, local contact: Marc Gregorio, 301-922-4271

D. Metal Detection Equipment: Garrett, local contact: Rich Brown, 757-496-8431

1.5 SYSTEM FUNCTION AND OPERATION:

A. Alarm Reporting: All signals shall report to the authorized central station service provider under Contract to the Owner. This programming shall be coordinated with the Owner provider.

B. Zoning: There shall be no less than seventy (70) zones using point of protection devices and on-board points. All zones shall be customized on the Command Center.

1. Each motion detector shall be addressed as a single zone.

2. Groups of four (4) glass break sensors (maximum) shall be on a single zone.

C. The system shall provide perimeter and internal protection by the use of motion sensors.

D. The system shall be installed so that additional area protection may be added, whenever required, without obsolescence to existing equipment.

E. The system shall have the capability to be able to arm or disarm system from any On/Off premise touch-tone telephone.

F. A magnetic door contact shall be provided at each door with a keypad. The door contact at the main entry shall sound a pre-alarm signal on time delay to allow for disarming the system.

G. Each door and motion detector shall be on a separate point (zone). Each device shall have its own built-in or dedicated RPM for point identification by zone (remote-point-module). Looping multiple devices onto a single zone is not acceptable. The control panel shall be capable of monitoring a minimum of 70 separate points.

H. The system shall detect unauthorized entry at various locations using a combination of magnetic door contacts and interior motion detectors. All circuit runs shall be supervised by addressable devices or end of line resistors. All devices shall be UL approved.

I. Each detections device shall report to the arming station as a separate independent zone. All zones shall report in alpha/numeric English language for ease of identification of trouble and zone alarms. Main controls shall be housed in a common enclosure.

J. The control/communicator shall be a single UL-approved microprocessor unit with the ability to monitor and report up to 8 individual partitions, up to 64 zones, with multiple devices per zone.

K. Remote arming stations shall include a touchpad station with LCD status message display in a common enclosure. Remote arming station/annunciator panels shall display all alarms, trouble messages, etc., in alpha/numeric English language. Arming station/annunciator shall be UL approved.

L. Upon detection of unauthorized entry, the system shall report alarm information at the main control panel, display alarm information at the remote annunciator panels, and send all digital reports to the Owner's central station alarm monitoring company.

M. Security alarm system shall be partitioned (zoned) to allow after-hours use of defined areas while the remainder of the building is armed. Partitioning shall allow use of zones individually or simultaneously. Partitions shall be as defined below. Coordinate zones with the Owner and actual device mounting locations prior to programming.

1. Gymnasium/Parks & Recreation Zone shall bypass selected areas within the building system to permit entry and after hours use of the gymnasium, cafetorium, stage, kitchen and associated areas. Coordinate exact boundaries of after-hours use with Owner prior to installation and programming.

2. Provide subcontrol keypads to allow use of designated areas for recreational purposes and allow full security of remaining school areas. A special subzone code will be sent whenever the subzone

is disarmed or armed by any authorized user or group of users. An entry/exit delay loop and instant loop will be a part of this subzone control.

1.6 SUBMITTALS

A. Submit shop drawings, product data, itemized equipment list, wiring diagrams, and manufacturer's literature and 1/16 scale plan indicating components and cabling requirements.

B. Indicate system components, size of components, location and provide full schematic or wiring system showing building and operation details.

C. Submit manufacturer's installation instructions.

D. Submit manufacturer's descriptive literature, operating instructions, and maintenance and repair data.

E. Equipment submittals shall include the following:

1. Manufacturer's literature and illustrations.

2. A description of the system operation which includes the method of operation and supervision of each type of circuit operation of manual controls, and sequence of operation.

3. Wiring diagrams which show the method of wiring for each type of circuit for each function performed. These shall include the following:

a. Each type of alarm initiation circuit.

b. Each type of alarm signaling circuit.

c. Annunciation methods.

d. Control methods (separate diagrams shall be provided for each type of device controlled).

4. Each wiring diagram shall indicate:

a. Method of fusing and location of fuses on the circuit.

b. Recommended wiring type and size and methods of ground or shielding (if used).

c. Terminal identification at control panels and remote devices.

F. Submission of shop drawings without the 1/16" scale floor plan, wiring, and connection diagrams shall be cause for rejection of the submission.

1.7 COORDINATION

A. Coordinate protection zones with the Owner, after-hours use areas, or other structural elements, and Specifications for proper function. Specifically, coordinate the deactivation of any subzones from remote entry points while remainder of building is protected.

B. All related work specified in other sections shall be properly coordinated with the security alarm equipment.

C. Prior to the installation, the alarm system contractor must meet with the Owner to confirm the installation procedures, zoning device locations, and to resolve any concerns regarding equipment installations.

D. The alarm system contractor shall coordinate the installation of all equipment and systems to prevent interference from other building equipment or systems.

E. Alternate device locations must be approved by the Owner's representative and the Project Engineer.

F. The alarm system installation contractor is required to constantly, or as otherwise directed by the Owner, maintain a fully operating system in all or any part of a building which is occupied or which houses equipment and/or supplies.

G. Coordinate with the Owner for the Central Station Service Account Number for digital communicator and specific programming directions.

PART 2 - PRODUCTS

2.1 WIRING

A. System wiring and equipment installation shall be in accordance with good engineering practices as established by the EIA and the NEC. Wiring shall meet all State and local electrical codes. All wiring shall test free from all grounds and shorts.

B. Detection system shall be wired in accordance with manufacturer's instructions and shall meet applicable provisions of national and local codes. All system field wiring shall be supervised; unsupervised point wires shall not be permitted. Final connections between field wiring system and control and annunciator equipment shall be made under the direct supervision of a fully qualified technical representative of the equipment manufacturer.

C. Connections shall be made with 4 conductors of #18 gauge twist/shielded wire, type THHN, color-coded and kept entirely independent of all other wiring. Exposed wiring in public areas will not be accepted. All wiring shall be plenum-rated. All wiring shall be installed in conduit.

D. Wiring quantities, if shown on plans, are for general information only. Actual wiring quantities point-to-point shall be per detection system manufacturers' wiring diagrams.

E. Wiring to keypads shall be a dedicated loop of four #18 AWG shielded cable. All wiring shall be installed in conduit.

F. Trunk wiring to power the devices and provide data circuits for the devices shall be a dedicated loop of two conductor #16 AWG and two conductor #19 solid trunk cable. All wiring shall be plenum-rated.

G. Branch wiring to serve for devices (tied to the trunk wiring) shall be a dedicated loop of two pair #22AWG stranded – each pair shielded cable. All wiring shall be plenum-rated.

H. Wiring to all devices shall be as recommended by the Manufacturer.

I. Furnish and install all wiring, equipment, and associated appurtenances in accordance with all Drawings, Specifications, and the manufacturer's installation instructions.

J. All wiring is to be marked with numbered wire markers at each end throughout the project. The wire marking information will be turned over to the Owner.

K. Complete raceway system of conduits and outlets shall be provided, including the following:

1. Between interface junction cabinet and area junction boxes.

2. For plenum wiring when cables are not approved for plenum use.

3. To span above plastered ceiling or any other area that has limited access to cables.

4. From each motion detector, door contact, and keypad to area above drop ceiling.

5. For twelve (12) conductor 22 gauge, jacketed stranded, copper, wire installed between interface junction cabinet in Mechanical Room for future monitoring of energy management sensors.

6. For cable between Fire Alarm control and main security interface junction used to monitor Fire Alarm.

L. Interface Junction Cabinet:

1. The Contractor shall furnish and install a finished, smooth-edged junction cabinet with a side hinge lockable cover 18" x 24" x 6".

2. The junction cabinet shall be mounted on a 4' x 4' x 3/4" piece of plywood. Only equipment related to the security system is to be mounted on this plywood. Cabinet shall be located in the area with telephone incoming service.

3. Provide two parallel 1" conduits between the junction cabinet and security control box.

4. Provide and install barrier terminal strips in junction cabinet to accommodate each individual motion conductor's power and circuit.

5. Provide and install numbered wire markers to identify each cable.

6. Barrier type terminal strips shall have double screws 6-32 x 1/4 binder head nickel-plated brass screws.

2.2 CONTROL

A. DMP XR500EA-G Control/Communicator: Provide module for 246 points of protection, eight programmable areas, 500 event log, auto reset, 12 VDC 2 amp. Power with battery, 7-Hour standby, and all required accessories.

1. Batteries: Rechargeable, valve-regulated, recombinant, sealed lead-acid type with nominal 10-year life expectancy. Capacity adequate to operate portion of system served, including audible trouble signal devices for up to seven (7) hours and audible and visual alarm devices under alarm conditions for an additional ten 1(10) minutes.

2. Battery Charger: Solid-state, fully automatic, variable-charging-rate type. Charger recharges fully discharged battery within 24 hours.

B. Provide heavy-duty cabinet with lockable cover.

2.3 REMOTE CONTROL KEYPAD

A. DMP 690 Remote Control Center. Provide locking protective cover with twelve (12) spare keys by Safety Technology, Inc. (STI) Model 6560. See Drawing.

2.4 INDEPENDENT COMMAND CENTER KEYPAD

A. DMP 690 Remote Control Center, independent zone control for separation of zoned point from main system.

2.5 POWER SUPPLIES

A. System shall utilize sufficient power source for operation of all devices.

B. Provide signal boosters to ensure sufficient operation of equipment.

2.6 ALARM SIRENS

A. Provide alarm sirens, where indicated. Security sirens shall be clearly distinct from the fire alarm and other paging or signaling systems in the building.

B. Interior sirens shall be mounted flush in wall with plastic grill. Minimum sound output shall be 88 dB at 10 feet. Provide Bosch Model D116, or equal, and compatible with Security System furnished.

C. Provide all required power supplies, siren drivers, etc., for operation.

D. Exterior sirens shall be UL listed for outdoor use. Sirens shall be 120 dB at 10 feet, cone type speaker horn. Sirens shall be Bosch Model D117, or equal. Unit shall contain a built-in siren driver. Provide either a steady or yelp output.

2.7 DOOR CONTACTS

A. Door contact switches shall be wide gap, magnetic type, with all contacts hermetically sealed against dirt, moisture, etc. Units shall be recessed in doors and frame unless not possible. Provide armored leads. Where surface mounting is required, obtain approval for mounting and device type prior to work. Contacts shall be supervised for open circuits, wiring shorts, etc. Unit shall not be affected by normal temperature swings, vibration, shock, etc. Provide Sentrol #2505A, Bosch TAP-SD70W or approved equal. Mount contacts on top of door, approximately 3 inches from the opening edge.

B. It shall be the responsibility of the alarm installing contractor to verify that work efforts are coordinated for the installation of door contact hardware and wiring during the very early phase of construction. Coordinate the exact location and size of each opening required in each door buck frame, lintel, etc., for raceway, backbox, etc. All wiring shall be installed in raceway run concealed in wall to door contact. Exposed wiring will not be allowed.

C. Interior and exterior door contacts: Each shall be individually home run, zone-wired and indicate alarm.

2.8 OVERHEAD CONTACT

A. Provide a floor mount magnetic door contact, Sentrol 2202A with a 3-foot armored cable for each overhead exterior door. See Drawings.

2.9 GLASS BREAK SENSORS

A. Glass break sensors shall be C&K, Intellisense FG730. Sensors shall be installed to *Latch* and stay *latched* until released by utilizing the keypad function (Command 47), alarm system reset feature, on the keypad. Provide relays as required to facilitate this reset function.

2.10 DROP THERMOSTATS

A. Drop thermostats shall be set at 50□F.

B. Thermostats shall be installed at locations which will give adequate warning when the heating system has failed. Provide suitable flush wall-mounted backbox and conduit run concealed in wall and turned out above accessible hung ceiling for wiring.

C. Each thermostat must be wired independently from sensor to interface junction box.

2.11 LONG RANGE DUAL TECHNOLOGY MOTION SENSORS

A. Motion detectors shall be passive infrared (PIR) devices that use motion analyzer II signal processing to reduce false alarms. Devices shall have a built-in Popit with tamper sensor. Devices shall use mirrored optics with four coverage patterns (35' by 35'; 35' by 10'; 70' by 10'; or pet 35' by 35' with 70' long range. A tamper condition shall be signaled through the Zonex bus and displayed at the keypads when the cover is removed. Detector shall not be adversely affected by air currents, heat, temperature, light, sound, vibration, etc. Provide vandal-resistant mounting brackets for all detectors. . Provide a combination AP633A-ADT Long Range and Intellisense DT6360STC Ceiling and Bosch DS8351 Dual Technology Motion Detectors.

B. Provide a recessed device box at height of detector for wall mounting, adjacent to mounting bracket. Box shall have a stainless steel cover with center rubber grommet for wiring penetration. Allow a minimum of 12" of cable coiled inside box following connection to detector.

2.12 POINT OF PROTECTION DEVICES

A. Point of protection addressable modules shall be DMP 711E Single Point Zone Expander.

B. Each sensor shall have a corresponding point of protection device attached.

C. Provide a standard double gang electrical box with corresponding zone number displayed on box cover. Covers shall be painted blue. Devices shall be installed in a location near their protected device and also where easily serviced.

2.13 MISCELLANEOUS DEVICES

A. Provide programmable output relays as required for a complete system.

B. Provide one (1) multiplex signal booster to ensure sufficient operation of equipment to be installed and for future additions to multiplex data loop.

C. Provide wire guards or clear Lexan protective covers for all devices located in exterior locations and where subject to damage (i.e., gyms or alternate gyms).

D. Provide end-of-line resistors (if required) at the end of each alarm zone. Resistors shall be located in a wall junction box, 8'-0" AFF and labeled security resistor.

E. Furnish 100 alarm decals (50 interior and 50 exterior), self-adhesive type to Owner.

F. Fire Alarms:

1. The security system shall be utilized to dial out all security and fire alarm signals. Fire alarm signals shall include alarm, trouble and supervisory conditions.

2. Wiring between the fire alarm and security panel shall be installed in conduit.

G. Tamper Circuits:

1. It is the intent of the contract to provide tamper protection for all motion detectors, control units, and the cable.

2. Any breaks or disconnects of cables or any tampering disturbances to motion detectors or control boxes shall trigger a system alarm.

H. Area Junction Boxes:

1. The Contractor shall install a minimum of seven (7) area junction boxes 12 x 12 x 4 with a hinged locking cover.

2. The purpose of these junction boxes will be to provide a splice point between individual motion detectors and interface junction cabinet. Each cable pulled to these junction boxes shall have a minimum of three feet (3') of excess wire.

2.14 ELECTRICAL POWER

A. Primary power for the system control panel shall be obtained from the 120/208 volt AC power system, as indicated. A system circuit breaker shall be clearly marked *SECURITY ALARM* on the panel directory. The panel containing this breaker shall be equipped with a lockable hinged cover.

B. Secondary emergency power shall be provided by a battery integral with the security alarm control panel cabinet. The battery(ies) shall be rated for 10 hours of non-alarm 400 mA standby current.

C. Battery operation shall be automatic upon loss of primary power to the system.

D. Two (2) 120-volt NEMA 5-20R duplex receptacles shall be installed to allow direct plug-in connection of the subscriber's reporting control unit without extension cords.

E. Electrical power for the two (2) duplex receptacles shall be provided from an independent and separate 20 amp circuit breaker from emergency service equipment. Wiring shall be 2 #12+G run in 3/4" conduit from the panelboard to the receptacles.

F. Under no condition shall the circuit be integrated or made a part of the emergency lighting circuit.

G. Power is to be supplied from the 120-volt emergency service electrical panel.

H. Provide lock clip devices on circuit breakers serving power to security system equipment to prevent unintentional shutting *off* of power, but allowing tripping.

2.15 SURGE PROTECTION

A. Provide silicone avalanche lattice matrix solid state type surge protectors for each individual 120-volt circuit serving security alarm components. Also provide surge protection on phone line connections to automatic dialers.

B. All surge protectors shall be hard-wired and contained within enclosures. Plug-in units are **not acceptable**. Units shall be grounded per NEC and manufacturer's recommendations, and mounted adjacent to circuit source panel. Phone line protectors shall be mounted adjacent to the main control panel. Provide Transtector Systems Type ACP100BW3 (power) and ACP100PR Series (phone), or approved equal by Ditek or others.

METAL DETECTORS

2.16

A. Provide Two (2) Walk Through Metal Detectors, Garrett Model MT5500.

B. Provide four (4) Hand-held Metal Detector, Garrett Super Scanner

C. Garrett Local Sales Representative: Rich Brown, Perpetual Marketing, 1340-1272 N. Great Neck Rd., #329, Virginia Beach, VA 23454-2230. Telephone 757-496-8431.

X-RAY BAGGAGE INSPECTION UNIT

2.17

A. Provide two (2) X-ray baggage inspection units, Rapid Scan Systems Model 515.

B. Rapid Scan Systems, Marc Gregorio, 301-922-4271, 888-258-6684. 2805 Columbia St., Torrance, CA 90503.

VIDEO INTERCOM / DOOR ENTRY SYSTEM

2.18

A. Provide Aiphone Video Intercom System complete with master station JF-2MED,

B. Provide Aiphone Outdoor Video Intercom Stations JF-DVF (three locations),

C. Provide Door Release Adaptor RY-3DL,

D. Provide Power Supply PS -1820

PART 3 - EXECUTION

3.1 GENERAL:

A. Installation shall be supervised and tested by the Manufacturer-authorized installer of the system equipment. The work shall be performed by skilled technicians under the direction of experienced engineer, all of whom shall be properly trained and qualified for this work.

3.2 WIRING

A. Conduit: Conduits shall be installed as required to conceal wiring in walls for keypads and motion detectors. Provide a complete conduit system for all security cabling.

B. Wire and Cable: All wiring shall be installed concealed above accessible ceiling and in walls. Conductors shall be carefully cabled and laced. Individual conductors shall be tagged with E-Z Code Markers indicating circuit number and type. Markers shall be used on all conductors at each outlet or pull box at each equipment enclosure.

C. Each conductor used for the same specific function shall be distinctively color-coded. Two different color codes shall be used for initiating device circuits. Two separate colors shall be used for the alarm bell circuit. Power supply and wiring connecting the secondary source of power shall be as indicated.

D. All 120-volt connections for security alarm system shall be made from emergency panels only.

E. Provide a 3/4-inch conduit to the main telephone backboard from the automatic telephone dialer for telephone wiring. Provide all station wiring and jacks.

F. All concealed conduit and junction boxes for security system shall be painted blue with permanent methods for quick field identification in all areas.

G. No power supplies shall be installed above ceilings. All shall be installed in electrical wiring closets or electrical rooms. Provide labeled circuit breakers with lock-on clips.

H. Install power supplies and other auxiliary components for detection devices at control units, unless otherwise indicated. Do not install such items near the devices they serve. Provide tamper switches where mounted separately from control units.

I. Alarm conductor terminations in control panels shall be made on terminal strips with separate point for each conductors. All such strips to be number-identified as shown in wiring diagram attached to inside of door of control panel. Connect wiring neatly to terminal strips. Lace wiring with nylon cable straps. Set up termination of cabling so that sections of the system may be isolated or shorted out of servicing.

J. Ground system components and conductor cable shields to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

3.3 INSTALLATION

A. Alarm conductor terminations in control panels shall be made on terminal strips with separate point for each conductors. All such strips to be number identified as shown in wiring diagram attached to inside of the door of the control panel. Connect wiring neatly to the terminal strips. Lace wiring with nylon cable straps. Set up termination of cabling so that sections of the system may be isolated or shorted out of servicing.

B. From the digital communicator, provide conduit wiring and connections of telephone company equipment. Provide Category 3 telephone line interface equipment compatible with telephone company equipment.

C. All outlet and mounting boxes required as apart of the mounting arrangements for devices, control cabinets, and signals shall be in accordance with the manufacturers' Specifications, and shall be installed as directed by the manufacturers' instructions and diagrams. All equipment shall be installed at the location and heights shown on the drawings or as directed by the Architect.

D. Test completed system in presence of Owner's representative, Architect, Consulting Engineer, General Contractor, and Manufacturer's technical representative. Upon completion of a successful test of the system, the Electrical Contractor shall so certify in writing to the Owner, the Architect, and the General Contractor.

E. Warrant the alarm system, including equipment and wiring, free from inherent electrical and mechanical defects for a period of one year form the date of Owner's acceptance of the system.

F. Equipment manufacturer shall provide a gratis testing and inspection contract during the warranty period, with option for paid extension at expiration of the gratis period.

G. Provide end of line resistors at the end of each alarm zone. Resistors shall be located in an electrical wall junction box and labeled *security resistor*. The cover shall be painted blue.

H. Mounting height for individual devices shall be as follows (above finished floor):

1. Motion Detectors - 8 feet (6" below clg if less than 8 feet).
2. Remote Arming Stations - 54 inches.
3. Interior Sirens - 8 feet or above lay-in ceiling tiles.
4. Exterior Sirens - 12 feet.

3.4 TESTING, GUARANTEE, SERVICE

A. Prior to installation of any equipment, the Contractor shall provide the Engineer with copies of submittals for approval. Submittals shall include typical one-line risers and equipment specification sheets.

B. The Contractor is responsible for assuring that conduit size and wire quantity, size, and type are suitable for the equipment supplied. The Contractor shall review the proper installation of each type of device with the equipment supplier. Final connections between the wiring and equipment shall be made under the supervision of the equipment supplier's representative.

C. Upon completion, the Contractor shall conduct a functional test of the System for the Owner, Architect, and Engineer. To assure that wire size, power supply, number of devices on a circuit, etc., are suitable to support 100% of devices being in alarm or operated simultaneously, this test shall include the following:

1. Place all sensors, modules, and devices in alarm. Each shall display its address and alarm condition at both the control panel and the keypads.
2. Reset all alarmed and operated devices. The panel shall display the address of any off-normal devices.

D. All components, parts, and assemblies supplied by the Manufacturer shall be guaranteed against defects in materials and workmanship for a period of 24 months.

E. The equipment manufacturer shall have a local branch office staffed with trained, full-time employees who are capable of performing testing, inspection, repair, and maintenance services for the life of the System.

F. All testing shall be coordinated with and approved by the engineer. A letter certifying that the installation is complete and fully operable shall be forwarded to the Engineer. The Contractor and an authorized representative from each supplier of equipment shall be in attendance to make necessary adjustments related to the testing.

G. As minimum requirements, the system shall be tested to show that:

1. The complete system is free from grounded or open circuits.
2. Each alarm initiating device functions as specified and produces the specified alarm actions.
3. Abnormal condition of any circuit device required to be electrically supervised shall result in the specified trouble signals.
4. The emergency power source is capable of operating the system.
5. The system shall be operable under the specified trouble conditions.
6. Any test such as loss of power supplies, will initiate the proper system response in compliance with specification.
7. All addresses of devices are reported correctly and to Owner's nomenclature and satisfaction.
8. All addressable functions described are sounded and/or executed as programmed upon particular alarm conditions, etc.
9. All auxiliary functions are executed correctly, completely and as required.
10. Autodialer has successfully contacted the UL Central Station and transmitted all signal conditions.

H. Upon completion of the security system installation, the alarm system installing contractor will demonstrate the functions and operations to the Owner's security system representatives. All devices are to be activated during the test. The demonstration will be held after hours when the building is unoccupied.

I. It is incumbent upon the contractor to have tested all security alarm devices and walk-tested the total system prior to the demonstration.

J. Failure of any part of the alarm system will result in a non-acceptance of the installation.

K. Future demonstration walk-tests will be done at a time and date convenient to the school.

3.5 COORDINATION OF MAINTENANCE, MONITORING, AND PROGRAMMING

A. It shall be the responsibility of the Representative of the Equipment Manufacturer to arrange for meetings between the Owner's Representatives and the Representatives of the qualified companies who specialize in the maintenance, testing, and central station monitoring of Security Systems.

B. Programming shall conform to Modem IIIa format with definable zones reporting as required to the Owner's service provider's central station. No lockout codes are acceptable.

3.6 GUARANTEE

A. Upon completion of the system installation and before final inspection, thoroughly check the detection system. Certify in a letter to the Architect that each detector, all devices, and the complete system have been checked and are as specified, that all items have been labeled, that as-built wiring diagrams have been prepared, and that the Owner's representatives have been instructed in the detection system.

3.7 DEMONSTRATION AND TRAINING

A. Provide a trained factory-authorized technician for on-site instruction of Owner's personnel in the proper programming, operation, maintenance and use of the equipment. Training and instruction shall be held at the project site, following Owner-acceptance and all final tests and adjustments. Training shall be minimum of eight (8) hours.

3.8 KEYS

A. Keys and locks for all equipment shall be identical. Not less than six (6) keys shall be provided. Keys shall be identified by an appropriate number stamped on the key or on a metal tag attached thereto.

3.9 RECORD DRAWINGS AND DOCUMENTS

A. The Contractor shall furnish three (3) copies of all plans, drawings and schematics to the owner after the acceptance test. The drawings shall show all terminal cabinets, devices, wiring and conduit routings.

B. The alarm installing contractor must provide, directly to the project electrical engineer, a 1/8" scale *as-built* schematic drawings of the complete security system installation indicating:

1. Building Layout - Interior and Exterior Floor Plan.
2. Room Location, Names and Numbers.
3. Device Equipment Connection Points, Color-Coded.
4. Device Locations.
5. Interface Junction Cabinet.
6. Area Junction and Splice Boxes.

C. Project Record Documents: Provide for the security system, in addition to documents required by Section 16010, three Record and Information Booklets containing a description of the system, operating and maintenance instructions on each piece of equipment, including descriptive bulletin and parts lists. Booklet shall be a three-ring looseleaf binder on 8-1/2" x 11" sheets and shall contain name, address, and loose-leaf binder on 8-1/2" x 11" sheets and shall contain name, address, and telephone number of the local representative of the equipment.

D. Provide 8-1/2" x 11" building room layout based on the contract drawings in a suitable frame with plexiglass panel, indicating intrusion zones and all intrusion detectors. Install adjacent to the intrusion alarm control panel.

3.10 ADJUSTING

A. Occupancy Adjustment: When requested, within twelve (12) months of date of substantial completion, provide on-site assistance in adjusting and reprogramming to suit actual occupied conditions. Provide up to two visits per Project for this purpose without additional cost.

END OF SECTION 16800 Security Systems

3.5 CCTV

[Reference: DCPS DIVISION 16 – ELECTRICAL, SECTION 16880 – VIDEO SURVEILLANCE SYSTEM]

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes a new IP-based video (CCTV) system for security surveillance, consisting of Cisco VS Media Servers for recording and Vision Security Software's Vision Interface Server including Axis IP cameras, video server, software, camera licenses, client connections, power supplies, mounting hardware, monitors, UPS, LAN switch, data rack, and all cabling and connectors required to complete the system.

1.2 RELATED SECTIONS

A. Requirements applicable to electrical work specified in Division 16 apply to work of this section.

1.3 SYSTEM DESCRIPTION

This Section includes a new IP-based video (CCTV) system for security surveillance, including IP Axis cameras, Cisco VS Media server for Recording and Vision Security Software's Vision Interface Server, camera licenses, client connections, power supplies, mounting hardware, monitors, UPS, LAN switch, data rack, and all cabling and connectors required to complete the system. The video can be viewed and archived locally as well as remotely via the LAN.

1.4 SUBMITTALS

A. General: Comply with Division 1 and Section 16010.

B. Product data:

1. Include data on features, components, ratings, and performance.

C. Shop drawings:

1. Include dimensioned plan and elevation views of components and enclosures and details of control panels. Show access and working space requirements.

2. Wiring diagrams detailing internal and interconnecting wiring for power, signal, and control and distinguishing between field-installed and factory-installed wiring.

3. Coordination drawings: Plans drawn to scale, showing the locations of the CCTV equipment. Include mounting details.

C. Certificates: Signed by manufacturer, certifying products comply with specified requirements.

D. Qualification data for manufacturer and installer as specified in "Quality Assurance" below.

1. Include evidence of installer's RCDD from BiCSi.

E. Field test reports for tests specified in Part 3.

1.5 QUALITY ASSURANCE

A. Manufacturer qualifications:

1. Firms experienced in manufacturing systems and equipment of the same types and capacities used for this project that have a record of successful in-service performance. The equipment for this project must be as manufactured by Cisco System's Vision Security Software and Axis or approved equal.

2. Maintains a service center capable of providing training, parts, and emergency maintenance and repairs at the project site with a 24-hour maximum response time.

B. Installer qualifications: Factory-authorized service representative of the product manufacturers.

1. Installer shall have on its regular full-time staff a registered communications distribution designer (RCDD) with LAN specialization, who shall approve and supervise cabling work and network integration.
2. Installer shall obtain the equipment and materials from a fully factory authorized dealer, with a signed agreement from the manufacturer.
3. Installers must be factory-trained and certified on the Cisco VS product line and Vision Security Software system. Provide proof of the certification and provide at least five completed installations using the specified or approved equal equipment. Provide building name and contact person information. Owner reserves the right to inspect the systems used as references. Companies not certified at time of bid will not be considered.

D. Comply with NFPA 70, National Electrical Code.

E. Comply with FCC Part 15, Rules and Regulations, Radio Frequency Devices.

F. NRTL Listing: Provide listed and labeled system components for which there are listings and labeling services.

1. The Terms "listed" and "labeled": As defined in the National Electrical Code, Article 100.
2. Listing and labeling agency qualifications: A Nationally recognized testing laboratory (NRTL) as defined in 29 CFR 1910.7.

1.6 PROJECT CONDITIONS

A. Environmental limitations: System components shall be equipped and rated for the environments where installed.

1. Service conditions for outdoor equipment: Rate equipment for continuous operation under the following environmental conditions, unless otherwise indicated:

a. Temperature: Minus 22 deg F (30 deg C) to plus 122 deg F (50 deg C).
b. Relative humidity: 5 to 100 percent.
c.. Weather: Enclosure housings shall prevent entry of moisture including ice & driven rain or snow.

2. Service conditions for indoor equipment: Rate equipment for continuous operation under the following environmental conditions, unless otherwise indicated:
   a. Temperature: 32 deg F (0 deg C) to 122 deg F (50 deg C).
   b. Relative humidity: 0 to 95 percent.

1.7 COORDINATION

A. Coordinate layout and installation of CCTV equipment and suspension system components with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. GE Security SymSecure products was used as a basis of design for the project. District of Columbia Public Schools uses products by Cisco Systems (http://www.cisco.com), Vision Security Software (http://www.vision-security.com/) and Axis (http://axis.com).

B. Local Contact Vision Security Software LLC, Victoria H. Newsome, 866-823-7233, ext 701,

vnewsome@vision-security.com , fax 678-868-4009.1818 New York Ave, Suite 214-G, Washington, DC 20002.

2.2 CAMERAS AND POWER SUPPLIES

A. Exterior PTX Cameras shall be Axis 232D+ IP Dome PTZ camera.

1. Provide appropriate mount for location. Either wall-mount, wall mount with corner mount adapter, ceiling panel w/T-Bar support kit.
2. Provide appropriate housing for location. Either plenum rated flush mount, pendant mount, wall mount, with or without heater and fan. All exterior cameras need heater and fan.
3. Dome bubble shall be smoked acrylic or smoked polycarbonate.
4. PTZ assembly shall be 26X day/night camera NTSC.
5. PTZ camera shall have day/night functionality and built-in IR

A. Central power supply: Power shall be provided via Cisco POE switch(es) with fiber port.

C. Interior cameras shall be IP-based vandal-resistant Axis 225FD with POE support to provide 30 fps at 640x480 resolution.

2.3 SIGNAL TRANSMISSION COMPONENTS

A. Cable: CAT6 plenum cable for Ethernet and POE cameras. Manufacturer provided power cables for PTZ, to each camera location.
B. Fiber Optics: Furnish and install multi-mode fiber optic cabling between wiring closets and MDF. Install ST connectors and test fiber optic links using an OTDR meter.

2.4 MONITORS

A. Color units designed for continuous operation. LCD, 1024 x 768 pixel format.

B. Screen size (diagonal dimension): 32inches, or as indicated on the drawings.

C. Minimum front panel devices and controls: Power switch, power-on indicator, and brightness, contrast, color, and tint controls.

D. 500 Lines of resolution.

E. Color system.

F. Mounting: Rack mount.

G. Electrical: 120-V ac, 60 Hz.

H. GE Security KLC- LCD Monitor with mount kit.

2.5 DIGITAL RECORDING SERVER

A. Provide a Cisco Systems VS Media Server model CIVS-MS3R-1200 for recording. Capable of supporting a minimum of 14 days recording in JPEG mode at 640x480 with 1 fps/camera continuous and18 fps/camera on motion. Motion estimated at 8 hours per days..

B. SATA hard drives for video storage. Internal video storage capacity of supporting requested recordings.

C. Standard SVGA video card.

D. 10/100/1000 Ethernet network interface card.

E. CD ROM Drive.

2.6 DIGITAL GUI SERVER

A. Provide a Vision Security Software Interface server model V-IP-AW32-500 for providing user interface, site maps, connectivity and integration to existing DCPS Security Camera System and integration with site crash-bar door system and site alarm system.

B. 500 Gb SATA hard drive for video storage.

C. Standard SVGA video card

D. 10/100/1000 Ethernet network interface card

E. CD/DVD R/W Drive

2.7 Camera Connection Licenses

A. Provide one Cisco Stream Connection license for each camera on the project.

B. Provide one Vision Interface Camera license for each camera on project.

2.8 SOFTWARE

A. Provide Cisco VS software for recording that includes:

- Support for 40 cameras
- Media Server 5.0 Software
- VS Operations Manager 3.0

B. Provide Vision Software for the Graphical User Interface that includes:

- Support for 40 cameras
- Infinite Matrix
- Camera Looping
- Site Maps

2.9 EQUIPMENT RACKS

A. 72" Floor Standing modular metal racks arranged to house standard mounting electronic equipment, 21 inches wide, steel shelf enclosure with 16-gauge ends and 18-gauge shelves, six pieces bolted together, with four mounting holes on 16-inch centers for mounting to wall studs. Finish: Standard black powder coat.

2.10 ETHERNET SWITCHES

A Cisco 24-Port POE switch with fiber support for Server Room.
B. Cisco 12-Port, quantity of three. Install one each of the IDF rooms.
C. Provide six fiber media converters.
D. Provide wall mounted lockable security cabinets for switches.

2.11 POWER PROVISIONS

A Contractor shall provide all power to server cabinet and switches.
B. Each location shall include a dedicate 120 volt 20 amp power circuit, and receptacle.
C. Provide quad (double duplex) receptacle in the MDF (Server) Room
D. Provide duplex (dual) receptacle for each switch location in each IDF.

PART 3 – EXECUTION

3.1 PREPARATION

A. Camera location test: Support each camera temporarily at the location indicated and connect to monitor. Adjust location and mounting and substitute fixed lenses, if required to obtain clear image at monitor. These adjustments shall be included in the contract sum.

B. Coordinate, obtain & provide IP addresses for all devices from site's OCTO representative. All devices shall be programmed to comply with District standard.

C. Coordinate V-LAN configuration with site's OCTO representative. All devices shall be designated to the security V-LAN at sites.

3.2 INSTALLATION

A. Comply with requirements of Sections 16050, 16120, and 16131.

B. Outdoor installation: Conform to ANSI C2, National Electrical Safety Code.

C. Install wiring in raceways except as otherwise indicated. All wiring shall be concealed. Wiring passing through exposed / open ceiling areas shall be installed in conduit. No exposed wiring shall be allowed.

D. Wiring in enclosures: Bundle, lace, and train the conductors to terminal points with no excess. Provide and use lacing bars and distribution spools.

E. Pulling Cable: Do not exceed manufacturers recommended pulling tensions. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between indicated termination, tap, or junction points. Remove and discard cable where damaged during installation and replace it with new cable.

F. Equalization of video signals: Where system performance may be degraded in certain operating modes because of varying connections of multiple devices from mode to mode, revise component connections and install video distribution amplifiers and attenuators as required to provide consistent acceptable performance.

G. Taps, and terminations: For power and control wiring use numbered terminal strips in junction, pull, and outlet boxes, terminal cabinets, and equipment enclosures. Tighten connection to comply with tightening torques specified in UL 486A.

H. Grounding: As recommended by manufacturers except as otherwise indicated.

I. Installer's RCDD shall supervise each final connection to equipment.

J. Install cameras in the locations indicated, adjusted to final locations defined by camera location tests. Provide adequate headroom below cameras and their mountings. Where necessary, change the type of mounting to provide adequate headroom.

K. Pan units and pan and tilt units: Set stops to suit final position and mounting and field required to be viewed by the camera.

L. Install central power supply, server, UPS, monitor and other auxiliary components in equipment rack.

M. Install PTZ power supplies per manufacturer specifications.

N. Install switch cabinets and switches at designated locations.

3.3 CONFIGURATION

A. Cisco VS Media Servers shall be configured to record 1 fps continuous and 18 fps on event.

B. Vision GUI Server shall be configured for customer-defined security profiles and users.

C. System shall be configured for Customer provided camera names.

D. System shall be configured with Vision Interface Server site maps specific to site.

E. System shall be integrated with existing DCPS Security Camera System.

F. System shall be accessible and useable from site. DCPS Command Center and UCC.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals according to Section 16050.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's field services: Provide services of factory-authorized service representatives to supervise the field assembly and connection of components and system pretesting, testing, and adjustment. Installer's RCDD personnel shall supervise cabling and network integration.

B. Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified.

C. Pretesting: Align and adjust the system and pretest all components, wiring, and functions to verify they conform to specified requirements. Replace malfunctioning or damaged items with new items. Retest until satisfactory performance and conditions are achieved.

D. Final acceptance testing schedule: Schedule tests after pretesting has been successfully completed and system has been in normal functional operation for at least 2 weeks. Provide a minimum of 10 days notice of acceptance test performance schedule.

E. Operational acceptance tests: Perform operational system tests to verify conformance to specifications. Include all modes of system operation. Methodically test for proper system operation in each functional mode.

F. Record results of tests.

G. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.

3.6 ADJUSTMENT

A. Occupancy adjustments: When requested, during the correction period required by the General Conditions and Section 16010, provide on-site assistance in adjusting the system to suit actual occupied conditions. Provide visits for this purpose without additional cost.

3.7 CLEANING

A. Clean system components including camera housing windows, lenses, and monitor screens. Use methods and materials recommended by manufacturer.

3.8 OPERATING INSTRUCTIONS

A. As specified in Section 16050, provide operating instructions.

B. Arrange and pay for the services of a factory-authorized service representative to demonstrate adjustment, operation, and maintenance of the system and to train Owner's personnel. Include demonstration of methods to determine optimum settings for system controls.

C. Conduct a minimum of 6 hours of training for the system specified in this section. Schedule training and adjustment with at least 7 days advanced notice.

3.9 MAINTENACE & SUPPORT

A. Provide annual remote and on-site service and maintenance including but not limited to daily system "health" checks, daily camera checks, daily image quality checks, all labor repair, cleaning, camera re-aims, modification of configuration, optimization training and unlimited toll-free support.

B. Include all software patches and upgrades to all software products.

END OF SECTION

3.6 HVAC

A. GENERAL

1 The overall system design must contribute to efficient use of energy to allow the Energy Star rating for the school to be achieved. Refer to Section 7000.

2 EPA Energy Star Rating is required, based on estimated energy use for the school, an estimate of monthly energy use, by fuel, must be prepared. Refer to Section 7400. The tools listed in Part B of this section provide the capabilities to develop monthly energy use estimates, although other means may also be used, subject to approval prior to use.

3 Reference section HVAC-SYSTEMS. This section includes pre-approved heating, ventilating, and air conditioning systems. The pre-approved HVAC systems are to ensure/promote systemic operation and maintenance throughout the District of Columbia Public School system. Use of pre-approved HVAC systems eliminates Life Cycle Cost Analysis requirements, however the HVAC Design Professional shall still provide sizing analysis and the site specific annual operating and maintenance cost analysis. Systems other than those pre-approved may be considered but require a complete LCC evaluation to those pre-approved and address all benefits and costs of operation and maintenance.

B. APPROVED COMPUTER ENERGY PROGRAMS

1. The following programs are acceptable for use in generating a detailed evaluation of proposed heating, ventilating, and air conditioning systems. Further, the building load calculations necessary for the design of each building will require the use of computer-generated data. Equivalent computer programs that are able to generate the necessary data for evaluation of the proposed heating, ventilating, and air conditioning systems and for generation of the building

load data will be considered, but must be submitted for approval prior to use.

a. Trane Trace 600

1 The Trane Trace 700 program is a PC based program used by the HVAC Design Professional for generation of detailed building system air conditioning loads, energy consumption analysis, and economic analysis. The current version can be obtained from the Trane Company, Customer Direct Service (CDS) Network, La Crosse, WI, 608-787-2000.

b. Carrier HAP

1 The Carrier Hourly Analysis Program is a PC based program used by the HVAC Design Professional for generation of detailed building system air conditioning loads, energy consumption analysis, and economic analysis. The current version can be obtained by contacting the local Carrier equipment representative or by calling Software Systems Network, Syracuse, NY, 315-432-7072.

c. DOE-2.1E

1 The DOE-2.1E is a detailed energy analysis program developed through the United States Department of Energy. A number of vendors across the country have developed software that operates to meet the intent of the DOE-2.1E program.

d. B.L.A.S.T.

1 Building loads analysis and system thermodynamics. This program may be obtained by contacting:

CERL Attn: Ms. Linda K. Lawrie Operations Research Analyst PO Box 9005 Champaign, IL 61826-9005 Phone - (217) 373-7260

C. SYSTEMS EVALUATION REQUIREMENTS

1. In the event the HVAC Design Professional elects to pursue recommending a system other than those pre-approved, (see section HVAC SYSTEMS) the Design Professional shall prepare a report based on comparative LCC evaluations. Report shall include operation, maintenance, repair procedures, competitive commercial availability, and shall identify previous installation examples in this area with date in service and owner contact information. Report shall be presented in an organized form to the District of Columbia Public Schools for review and consideration and shall include the following:

a. Installed cost per square foot
b. Annual operating cost per square foot
c. Annual maintenance cost per square foot

3.7 COMPUTERS

Apple Laptops

Component	MacBook Pro	MacBook
Estimated cost	Base unit (no upgrades or options) **$2,650**	Base unit (no upgrades or options) **$1,400**
Enclosure	Precision aluminum unibody	Precision aluminum unibody
Processor	2.4GHz Intel Core 2 Duo	2.0GHz Intel Core 2 Duo
L2 cache	3MB shared	3MB shared
System bus	1066MHz	1066MHz
Memory	4GB (two 2GB SO-DIMMs) of 1066MHz DDR3 SDRAM;	2GB (two 1GB SO-DIMMs) of 1066MHz DDR3 SDRAM
Hard drive	250GB Serial ATA; 5400 rpm	160GB Serial ATA; 5400 rpm
Slot-loading optical drive	8x SuperDrive (DVD±R DL/DVD±RW/CD-RW)	8x SuperDrive (DVD±R DL/DVD±RW/CD-RW)
Graphics	NVIDIA GeForce 9400M graphics processor with 256MB of DDR3 SDRAM shared with main memory[3]	NVIDIA GeForce 9400M graphics processor with 256MB of DDR3 SDRAM shared with main memory[3]
Display	15.4-inch (diagonal) LED-backlit glossy widescreen display, 1440-by-900 resolution	13.3-inch (diagonal) LED-backlit glossy widescreen display, 1280-by-800 resolution
Operating System	OS 10.5 or higher	OS 10.5 or higher
USB	Two USB 2.0 ports (up to 480 Mbps)	Two USB 2.0 ports (up to 480 Mbps)
Audio	Built-in stereo speakers, built-in omnidirectional microphone, combined optical digital input/analog line in, combined optical digital output/analog line out	Built-in stereo speakers, built-in omnidirectional microphone, combined optical digital input/analog line in, combined optical digital output/analog line out

Networking	Built-in 10/100/1000BASE-T (Gigabit) Ethernet	Built-in 10/100/1000BASE-T (Gigabit) Ethernet
Wireless	Built-in AirPort Extreme; built-in Bluetooth 2.1 + EDR (Enhanced Data Rate) module	Built-in AirPort Extreme WiFi; built-in Bluetooth 2.1 + EDR (Enhanced Data Rate) module
Software	Computrace 3-year activation	Computrace 3-year activation
Hardware accessories	AppleCare Protection Plan (MB588LL/A)	AppleCare Protection Plan (MB578LL/A)
	Apple Mini DisplayPort to VGA Adapter (MB572)	Apple Mini DisplayPort to VGA Adapter (MB572)
Options		
Software	Parallels	Parallels
Docking Station	AirPort Express Base Station (MB321LL/A)	AirPort Express Base Station (MB321LL/A)
Keyboard	Apple Keyboard (MB110LL/A)	Apple Keyboard (MB110LL/A)
Mouse	Apple wired Mighty Mouse (MB112LL/A)	Apple wired Mighty Mouse (MB112LL/A)
Spare battery	Rechargeable Battery for MacBook Pro (MB772)	Rechargeable Battery for MacBook (MB771)

Apple Desktop

Component	iMac 17”
Estimated cost	$1,450 (with 20” display)
Processor	2.4GHz Intel Core 2 Duo
Memory	1GB memory
Hard drive	250GB hard drive[1]
Slot-loading optical drive	8x double-layer SuperDrive
Graphics	ATI Radeon HD 2400 XT with 128MB memory
Display	17 inch LCD
Operating System	OS 10.5 or higher
USB	five USB 2.0 ports: three ports on computer, two ports on keyboard
Audio	Built-in stereo speakers, 24-watt digital amplifier, Headphone/optical digital audio output, Audio line in/optical digital audio input, microphone
Networking	10/100/1000BASE-T Gigabit Ethernet (RJ-45 connector)
Wireless	Built-in AirPort Extreme WiFi IEEE 802.11a/b/g compatible
Software	Computrace 3-year activation
	Parallels
Services	AppleCare Protection Plan

3.8 DOCUMENT CAMERAS

Attribute	**Elmo Teacher's Tool TT-02s Document Camera**	**AverMedia AVerVision CP300 Document Camera**	**Elmo HV-5100XG**
MFG Part #	9419	VISNCP300	9330
Brand	Elmo Projectors	AVerMedia	Elmo Projectors
Control Interface	N/A	RS-232C	RS-232C
Focal Length Control	Motorized zoom	Motorized zoom	Motorized zoom
Max Digital Video Resolution	1024 x 768	1280 x 720	1024 x 768
Supported Video Signals	VGA, Composite Video	Composite video, DVI, S-Video, VGA	Composite video, RGB, S-Video
Depth	14..6 in	18.3 in	21.3 in
Height	16.25 in	19.8 in	21.9 in
Weight	6.4 lbs	5.3 lbs	21.6 lbs
Width	13.85 in	7 in	27.4 in
Compatibility	Mac, PC	Mac, PC	PC
Manufacturer	Elmo Projectors	Avermedia	Elmo Projectors
Model	TT-02s	CP300	5100XG
Packaged Quantity	-	1	1
Product Line	Elmo	AVerMedia AVerVision	Elmo HV
Interface	Composite video output, VGA input	Composite video output, DVI-Digital output, RS-232C/S-video output, VGA input, VGA output	Composite video output, RS-232C, S-video output
Total Pixels	850,000 pixels	3.2 Mega Pixels	850,000 pixels
Attribute	**Elmo Teacher's Tool TT-02s Document Camera**	**AverMedia AVerVision CP300 Document Camera**	**Elmo HV-5100XG**
Support Details Full Contract Period	-	5 years	-
Support Details Type	Limited warranty	Limited warranty	Limited warranty
Frame Rate	-	24 fps	20 fps
Camera Type	-	Document camera	Document camera
Color or B&W	Color	Color	Color
Computer Interface	Hi-Speed USB	Hi-Speed USB	USB
Digital Zoom	8	8	-
Features	-	Auto exposure control, Auto white balance, Digital image freeze, Image mirror, Manual exposure, Manual white balance, Picture-in-picture capability	Remote control, USB compatibility, White balance
Focus Adjustment	-	Automatic, Manual	Automatic, Manual
Optical Zoom	8	2	18

3.9 TELEVISION SYSTEMS

Please use the LCD Projector Room Design Calculator (available upon request from OCTO) for screen size standards.

3.10 DIGITAL WHITEBOARDS

The following part numbers should be used for Promethean digital whiteboard related products:

Promethean Part Number	Description
AB+2V2-78-AMER-AS	Activboard+2 Adjustable 78" System with Activstudio (MS & HS)
AB+2V2-78-AMER-AP	Activboard+2 Adjustable 78" System with Activprimary (ES)
AB+2F-78-AMER-AS	Activboard+2 Fixed Height 78" System with Activstudio (MS & HS)
AB+2F-78-AMER-AP	Activboard+2 Fixed Height 78" System with Activprimary (ES)
AE1KIT32AMEU	Activexpression 32
AE1KIT25AMEU	Activexpression 25
RS202	Activslate 2.4 GHz
ACTIV-STAND4C	Moveable Activstand
ASOUND75	Activsound 75 (incl receiver, US psu, teardrop microphone, 2 x AA batteries, dome sensor)

For SMART Technology boards, the following part numbers should be used:

SMART Part Number	Description
SB660i	64” Board with Integrated Projector
Senteo 24	Student Response devices

3.11 PRINTERS

Printers should go in a designated copy room, administrative offices, and the library/media room in a school. They should explicitly not be in every classroom. There should only be one or two Multi-Function printers in each school. The other printers in the school should be printers only.

Multi-function printers should be HP LaserJet 3027 MFP or equivalent.
Single function printers should be HP LaserJet 2035N or equivalent.

3.12 LAPTOP CARTS

- model option for notebook slot count: capacity of either ~15 or ~30 notebooks
- heavy duty castors
- heavy duty locking doors
- two power connections for the power supply charging circuits
- wire management features for the AC adaptors and cords
- external electric outlet for peripherals
- ethernet connection for peripherals

- automatic timer for charging circuits
- ease of access to power supplies for wiring
- minimum 5 year warranty

Laptop Cart Standard still under review 2/4/2009

3.13 VIDEO TELECONFERENCING

Video Teleconferencing is used for electronic field trips, point-to-point or multi-point meetings or collaborations. The educator's vision determines the range of usage. If Digital Whiteboards are present in the school, then SightSpeed web-based video teleconferencing software should be used. Please contact OCTO for license and installation information.

If a digital whiteboard is not present in the school, Tandberg equipment can also be used. The recommended model is the Media Place MXP Series:

Design Features

- Designed as a mobile multimedia and video system
- Integrated TANDBERG set-top, high resolution projector, DVD/VCR and high quality audio system
- Secured with a lockable Lexan cover panel to protect the system
- Sturdy base with castor wheels, simple a/v interface panel, secure cable/microphone storage space and security screws throughout

Application Features

- Join up to 4 video sites and 1 audio site with embedded MultiSite functionality
- View presentations and presenter simultaneously with either DuoVideo or H.239 on single large display
- Share images of live video, PCs, DVD/VCR, document cameras and other input devices

Performance Features

- Choice of network: IP, ISDN and other external network
- Choice of TANDBERG set-top solution
- Bandwidth: up to 1152 kbps IP and 384 kbps ISDN or 384 kbps V.35
- PC card slot for wireless LAN connection
- Superior video quality incorporating the H.264 standard
- Highest level of standards-based embedded encryption AES) is included

3.14 WIRELESS

The OCTO recommended DCPS solution for wireless schools is Cisco's Unified Wireless Networks Aironet families of products.

The recommended frequency range will be 802.11a, b and g:
802.11b – 2.4 GHz range, 11Mbps
802.11g – 2.4 GHz range, 54Mbps
802.11a – 5 GHz range, 54 Mbps

Dual-Band
Dual-band is running both the 802.11a & 802.11b/g radios at the same time. This solution allows more bandwidth when running devices on a single access radio.

802.11a has less interference and allows for more non-overlapping channels. 802.11b/g has 3 non-overlapping channels; 802.11a has 8 non-overlapping channels.

By allowing 802.11a capable devices to connect on the 802.11a radios, the AP can seamlessly use both radios to it fullest potential, using the advantages of 802.11a & 802.11b/g.

Lightweight Access Point Protocol (LWAPP)

There is a trend in the WLAN space toward centralized intelligence and control. In this new architecture, a WLAN controller system is used to create and enforce policies across many different lightweight access points. By centralizing intelligence within these devices, security, mobility, quality of service (QoS), and other functions essential to WLAN operations can be efficiently managed across an entire wireless enterprise. Furthermore, by splitting functions between the access point and the controller, IT staff can simplify management, improve performance, and increase security of large wireless networks.

Aironet 1240AG Series Wireless Access Points

Cisco Aironet 1240AG Series IEEE 802.11a/b/g access points deliver the versatility, high capacity, security, and enterprise-class features demanded by WLAN customers. Designed specifically for challenging RF environments like factories, warehouses, and large retail establishments it has the versatility associated with connected antennas, a rugged metal enclosure, and a broad operating temperature range.

Unified Wireless Basic Network Components:
Client devices: Cisco Compatible Extensions client devices, Cisco Aironet client devices and Cisco Secure Services Client.
Access points: Cisco Aironet 802.11a/b/g and 802.11n lightweight access points and Cisco wireless LAN bridges.
Network unification: Cisco 4400 and 2100 Series wireless LAN controllers, Cisco Catalyst 6500 Series Wireless Services Module (WiSM), the Cisco Wireless LAN Controller

Module (WLCM) for Integrated Services Routers and the Cisco Catalyst 3750 Series Integrated Wireless LAN Controller.
Network management: Cisco Wireless Control System (WCS) and Cisco WCS Navigator.
Mobility services: Cisco Wireless Location Appliance, Cisco Self-Defending Network, Network Admission Control, and single and dual mode Wi-Fi phones such as Cisco 7900 Series Unified IP Phones.

Security

The use of a good security solution cannot be stressed enough. Controlling who can and cannot access the school's network is crucial. The security standards will allow control of who has access and the data is protected. This makes for a secure and dependable network for students and facility.

The standard security configuration is using 802.1x & WPA/WPA2. This will require a RADIUS server and a Certificate Authority (CA).

The RADIUS server will need to be installed on a server running Microsoft Windows 2003 Enterprise.

The recommendation is to use the Windows 2003 CA integrated with Microsoft Active Directory.

An exception to this would be legacy devices (older computers, projectors, etc.), which do not do WPA. The minimum recommendation is

128-bit WEP
MAC filtering
Separate SSID
Separate VLAN

VLANs (Virtual Local Area Network)
VLANs break up large physical networks into smaller virtual networks.
The minimum requirement is to separate public/guest access and school staff/student access with a VLAN. Public/guest access should only access the internet and not any internal school devices. You may also want to extend the VLANs to separate staff and student access.
The Layer 3 switch that is recommended to manage the VLANs is a Cisco 3560 switch.
Also recommended is a Power over Ethernet (POE) switch is a Cisco 500 series switch.

Site Survey
The first step in the building of a wireless network is called a "site survey". A site survey is important because it identifies where access points need to be located and what

issues might be present in the building. This is very important for a dependable and efficient wireless network. Site surveys for DCPS schools are scheduled through OCTO's Wireless Group.

The site survey includes:

Brief review of the existing wired network to support the wireless
Review of the physical site and wireless coverage
Retrieval of site/building floor plans
Rough design of layout
Investigate Potential interference

To perform a Site Survey, OCTO's Wireless Group requires a detailed floor plan of each floor and building to be surveyed. An electronic document version of the building layout is the preferred method. This will allow the Wireless Group to give the school the appropriate documentation for signal coverage.

After the site survey is completed, OCTO's Wireless Group will provide a list of Cisco hardware, additional wiring, pricing and other requirements to install the network.

Basic Wireless Network Parts Equipment List:

DCPS School Modernization Technology Standard Equip List for Wireless

Network Equipment

#	Description	Model #
1	Cisco 1242 Indoor Lightweight Wireless Access Points (LWAPs)	AIR-LAP1242AG-A-K9
2	Cisco 1242 AP 2.4 GHz Antenna, 2dBi (2 per AP)	AIR-ANT4941
3	Cisco 1242 AP 5.8 GHz Articulated Dipole Antenna, 3.2dBi (2 per AP)	AIR-ANT5135D-R
4	WAP Controller: Cisco 6509-E WISM Bundle and extra modules to support "multiple" WAPs; permits central control of all WAPs in group.	WCS-APLOC-UPG-
5	WLAN Controller Server: Dell Quad CPU 8G DRAM 320G HD	DELL Server
6	WAP Licenses: Cisco WCS with Location License (one per AP)	WCS-APLOC
7	Integrated Service Router: Cisco 3825 with 2GE; 1-2 WAN/2FE Network module	CISCO3825
8	Firewall: Cisco ASA 5510 Adaptive Security Appliance for firewall and VPN services.	ASA5510-SEC-BUN-K9

Client Equipment

#	Description	Model #
1	Cisco Aironet 802.11a/b/g Wireless CardBus Adapter for Laptop	AIR-CB21AG-A-K9
2	Cisco Aironet 802.11a/b/g Wireless PCI Adapter for Desktop	AIR-PI21AG-A-K9

A. GLOSSARY

ACP - Association of Cabling Professionals. A telecommunications body serving the cabling and building industries that develops standardized installation practices.

ANSI - American National Standards Institute. The administrator and coordinator for the United States private sector voluntary standardization system.

BICSI - Building Industry Consulting Services International. An international telecommunications body serving the building industry that develops standardized installation practices. The Telecommunications Distribution Design Manual (TDMM) published by BICSI is used as the reference for the installation practices for telephone and data cabling. All references to the BICSI TDMM refer to the current edition.

CENELEC - European Committee for Electro technical Standardization. The administrator and coordinator for the European private sector voluntary standardization system.

CSA - Canadian Standards Association. A Canadian testing and certification agency comparable in function to the Underwriter's Laboratories.

CTO - Chief Technology Officer. The CTO has oversight and approval of all technology projects conducted within the District of Columbia as prescribed by District law.

ECMA - European Computer Manufacturer's Association - An international industry association that promulgates and publishes industry-wide standards insuring compatibility between devices and systems.

EIA/TIA - Electronic Industries Association, Telephone Industries Association. Electronic and telephone Industry associations that promulgate and publish industry-wide standards insuring compatibility between devices and systems.

ETL - Electrical Testing Laboratories. An independent testing laboratory that provides product testing and certification.

IDC - Insulation Displacement Contact

IEEE - Institute of Electrical and Electronics Engineers, Inc. An international organization that is responsible for promulgating and publishing minimum standards insuring compatibility between devices and systems.

FCC - Federal Communications Commission. The US Government agency having the power to regulate all electrical communications systems originating in the United States including radio, television facsimile, telegraph, telephone and cable systems.

ISO - International Organization for Standardization. An international organization with the responsibility for developing, promulgating and publishing international standards that relate to health, safety and practices.

NEMA - National Electrical Manufacturers Association. An industry association with the responsibility for developing, promulgating and publishing standards that relate to health, safety and practices.

NFPA 70 NEC - National Fire Protection Association, National Electrical Code. A nationally recognized code containing provisions that detail the practical safeguarding of persons and property from hazards relating to the use of electricity. All references to the NEC refer to the current edition.

OCTO - Office of the Chief Technology Officer. See CTO.

Outside Plant (OSP) - Cable and equipment designed for exposure to the elements or burial without enclosing in conduit or other protective sheathing.

TIA/EIA - See EIA/TIA.

UL - Underwriter's Laboratories. A non-profit corporation established to maintain and operate laboratories for the examination and testing of devices, systems and materials to determine their relation to hazards to life and property.

WAO - Work Area Outlet. The outlet at which horizontal cabling is terminated at the user's workstation location. A WAO may be located in a floor, wall or systems furniture space.