FOOTHILL-DE ANZA
COMMUNITY COLLEGE DISTRICT

TELECOMMUNICATIONS and MULTIMEDIA STANDARDS

Educational Technology Services (ETS)
April 11, 2008
Updated February 2010
Message to the Telecommunications Designer from the District IT Director:

There have been many lessons learned from recent construction projects at the District. Based on these experiences I am bringing to your attention some critical aspects of the telecommunications and multi-media design.

1. Equipment in telecommunications closets remains running 7x24x365. Therefore independent cooling is required. Often times during the quarter breaks, the District shuts down HVAC to buildings occupied by classrooms and labs. Therefore it is imperative the cooling for the telecommunications rooms be designed to run independent of the building HVAC system.

2. The optimum operating temperature in the telecommunications rooms is critical. Going above 74 degrees will reduce the life of the electronic equipment. Although the District has funding from a Bond for the next 15 years, the funds available are not enough to replace equipment that fails prematurely due to poor environmental conditions.

3. These facilities may not have the opportunity to be renovated (again) for 30 years. Therefore, building an infrastructure that is flexible for a 30-year future is critical. With technology changing every 18 months, there is no way to predict the precise use over the next 30 years.

4. In the next three years, the District telephone system will be replaced. Most likely with VoIP. This means more equipment will be installed into Telecommunication closets. Therefore, we must design appropriately sized telecommunication rooms with the intent additional equipment will be added to the rooms over the next 30 years. Since VoIP equipment is mission critical, any equipment failures related to cooling will bring down the phone system (please see 1 and 5).

5. There is the misperception that computer equipment is getting smaller. This may be true for personal desktop and laptop computers however; it is not true for telecommunications equipment. With the demand for more and faster throughput of data (voice and video streaming) the equipment is getting larger and producing more heat. Capacity planning and independent cooling for the telecommunications spaces is critical.

6. Appendix A provides a list of materials required and preferred for use in telecommunications projects at the District. Parts are discontinued frequently, part numbers change. Therefore any changes to parts in the bid specification need to be brought to the attention of the technology group, ETS.

7. Areas to focus on (which have caused space utilization problems) are:

   A. Planning for clearances around equipment that will be installed by District staff.
   B. Fill Ratios of cables - these buildings need to be able to support 30 years of technology use - capacity planning.
   C. Conduit Size - when a structure does not allow for the minimum required as stated in this document, consulting with ETS is the first step. “Future proofing” is critical. It is not okay to replace four - 4” conduits with three - 3” conduits.
D. Do not exceed the maximum number of 90-degree bends in cable pathways and do not exceed cable bend ratios.

E. Cable length limitations. There may be an irrigation controller located beyond the 275' copper limitation and therefore fiber is required.

F. Outside Plant (OSP) - For some projects the architect designed to five feet outside of the building. Therefore the connection to the District telecommunications backbone, plumbing, electrical and HVAC sources were ignored. Unnecessary costs were incurred. Telecommunications has a connection to the campus infrastructure just like plumbing, HVAC, and electrical.

G. Dedicated circuits in telecommunication rooms and for multi-media equipment is critical.

H. ADA requirements for Instructional Consoles are critical.

I. Working closely with ETS staff with regards to multi-media installations will produce better results:
   1. Shortfalls have been in location of power for the ceiling projector
   2. The mounting pole for the projector mount not being installed per seismic regulations.
   3. The instructor console not being built per the specification
   4. Coordination with the light fixtures in the room - blocking part of the image from the projector.
   5. Cable pathways between the instructor console and the projector not installed.
   6. Lighting Controls near the instructor console so the instructor may turn down or off the lights near the projection screen.
   7. Network /Telecommunication wall connections are usually difficult to find when connecting workstations and phones

8. Telecommunication rooms are only for telecommunications equipment. Avoid sharing these rooms with electrical, fire and other utilities.

9. Telecommunications rooms should not be located next to any sources of water such as break rooms, restrooms, janitor's closet, etc. Nor should any of these water sources be located above the telecommunications room.

10. The designer must provide specific instructions in the bid specification document on how to layout the patch panel and rack for individual each project. ETS will have final approval/ sign-off prior to installation and termination of the rack and patch panel layout. ETS will also have approval on the labeling scheme too.

11. Audio Visual cables are owner furnished and installed. However, the required CAT6 and Fiber cables for Multimedia support are contractor purchased and contractor installed.
May 2009 Changes to the Document


2. 13.1.4.1 added: Normally, the cables in 13.1.4.2 through 13.1.4.8 will be Owner Furnished

3. Removed: If the projector harness cable exceeds 100 feet then the VGA, S-Video and composite cables shall be replaced by three (3) shielded 5 wire (RGBHV) cables. District standard is Extron video cables. from 13.1.4.1 paragraph and placed into its own paragraph as 13.1.4.2.


5. In 13.2.3.1 changed: 1 ½ to 1.5 to be consistent throughout document.

6. In 13.2.3.2 added: used for display data cables

7. In 13.2.4.1 changed: 1 to 1.25

8. In 13.2.6.2 changed wording to clarify: Locate on the wall 12 inches away from each side of the projection screen/flat panel display; Lined up with the top of the projection screen/flat panel display

February 2010 Changes to the Document

1. Appendix A has been updated with more detailed Telecommunications Performance Specifications. Remaining to be updated is the Multimedia portion.

2. Replaces current link/web address with a new Link/web address in 13.5.3.1.

3. Changed one item in 6.1 the table - the Telephone cords are purchased by the District not the contractor.

March 2010 Changes to the Document

1. The section: BROADCAST COAXIAL PARTS LIST in Appendix A was modified to detailed performance specifications. The standard did not change.
TABLE OF CONTENTS

STATEMENT OF PURPOSE

1. INTRODUCTION
   1.1. GENERAL REQUIREMENTS
   1.2. ACADEMIC SPACES AND TECHNOLOGY SYSTEMS
   1.3. KEY POINTS FOR ARCHITECTS, FACILITY PLANNERS AND ENGINEERS
   1.4. RENOVATION

2. ROLE OF THE DESIGN TEAM.
   2.1. ARCHITECT AND GENERAL DESIGN TEAM
   2.2. THE TELECOMMUNICATIONS DESIGNER AMD THE CONSTRUCTION PACKAGE

3. THE ROLE OF THE DISTRICT AND ETS
   3.1. PLANNING AND DESIGN PERIOD
   3.2. CONSTRUCTION AND ACCEPTANCE PERIODS

4. QUALIFICATIONS OF THE TELECOMMUNICATION INSTALLER

5. CODES/COMPLIANCE
   5.1. LOCAL, NATIONAL, AND INTERNATIONAL CODES
   5.2. CODES AND STANDARDS

6. SCOPE OF WORK MATRIX FOR DISTRICT PROJECTS
   6.1. THE FOLLOWING MATRIX REFLECTS TYPICAL RESPONSIBILITIES

7. MAIN DISTRIBUTION FACILITIES (MDF)
   7.1. DEFINITION
   7.2. DESIGN CONSIDERATIONS
   7.3. CABLE PATHWAYS

8. INTERMEDIATE DISTRIBUTION FACILITIES (IDF)
   8.1. DEFINITION
   8.2. DESIGN CONSIDERATIONS
   8.3. CABLE PATHWAYS
8.4. POWER REQUIREMENTS FOR EQUIPMENT AND TELECOMMUNICATION ROOMS
8.5. REQUIREMENTS FOR LIGHTING

9. BACKBONE CABLE SYSTEM

9.1. DEFINITION
9.2. COLOR CODE IDENTIFICATION
9.3. OUTSIDE PLANT CABLING SYSTEMS
9.4. OUTSIDE PLANT UNDERGROUND STRUCTURES
9.5. TELECOMMUNICATIONS SERVICE Entrance AND TERMINATION
9.6. RISER CABLE SYSTEM

10. HORIZONTAL DISTRIBUTION SYSTEM

10.1. DEFINITION
10.2. WORK STATION OUTLET DISTRIBUTION
10.3. HORIZONTAL CABLING
10.4. CABLE TYPES
10.5. HORIZONTAL CONNECTING HARDWARE
10.6. HORIZONTAL CABLE TERMINATION IN THE TELECOMMUNICATIONS CLOSET
10.7. HORIZONTAL PATHWAYS AND SPACES

11. GROUNDING AND BONDING

11.1. TELECOMMUNICATION BONDING AND GROUNDING
11.2. ANSI/TIA/EIA - 607 STANDARDS

12. HEATING, VENTILATION AND AIR CONDITIONING

12.1. GENERAL REQUIREMENTS

13. MULTI-MEDIA SPACES

13.1. MULTI-MEDIA CABLE REQUIREMENTS
13.2. CONDUIT AND PATHWAY REQUIREMENTS
13.3. POWER REQUIREMENTS
13.4. PROJECTION SCREENS
13.5. CEILING MOUNT REQUIREMENTS
13.6. FLATPANEL REQUIREMENTS
13.7. CASEWORK BASIC REQUIREMENTS
13.8. LIGHTING CONSIDERATIONS
13.9. GENERAL INSTRUCTOR SPACE CONSIDERATIONS
13.10. AUDIO REQUIREMENTS
13.11. BUILDING (RF) MATV / CATV DISTRIBUTION SYSTEM

14. TESTING
14.1. FIBER OPTIC CABLE
14.2. COPPER CABLE

15. DOCUMENTATION
15.1. AS-BUILT DRAWINGS
15.2. CABLE AND FIBER TEST RESULTS
15.3. AUTOCAD ARCHITECTURAL DRAWING CONTENT
15.4. FACILITY PRINT –THIRD PARTY SERVICE ENTRANCE POINTS
15.5. BACKBONE AND RISER CABLE AND CONDUIT PLANS AND DETAILS
15.6. MAIN DISTRIBUTION FACILITIES AND TELECOMMUNICATIONS CLOSET DETAILS.
15.7. “STRUCTURED CABLE SYSTEM” WARRANTY FOR ALL FIBER AND COPPER INFRASTRUCTURE
REVIEWED AND APPROVED (by FHDA):

APPENDIX A - STANDARD VENDORS AND MATERIALS LIST
APPENDIX B - DIVISION 27 SPECIFICATIONS TABLE OF CONTENTS
APPENDIX C - REQUEST FOR MODIFICATION / CLARIFICATION / SUBSTITUTION
APPENDIX D - GLOSSARY
APPENDIX E - MULTI-MEDIA DETAILS
APPENDIX F – VOICE AND DATA LOGICAL DIAGRAMS
APPENDIX G – VIDEO LOGICAL DIAGRAMS
PURPOSE

The purpose of this document is to set forth industry accepted baseline standards to assist in the design and planning of new facilities, renovations or remodels at any of the Foothill – De Anza Community College District campuses or facilities as relates to communications infrastructure. This document is also intended as a guideline in clarifying communications, electrical, and mechanical specifications as to ensure an acceptable level of performance for any new or renovation communications infrastructure or general construction projects.

The standards presented in this document will establish engineering and technical requirements to allow interoperability of components, products, or systems from multiple vendors. This will allow the Foothill – De Anza Community College District to receive the maximum competitive value and quality from all new projects. Further standards shall be adopted, established or set forth by the District at some future date for the specific selection or application of materials.

If a particular site is deemed to have requirements that differ from those indicated herein, those requirements shall be indicated in a separate document. Any such requirements supersede those indicated herein.

The standards listed in this document ensure the district an acceptable level of performance, and shall not supersede any electrical, fire, building, or safety codes. All installation methods and electrical products shall conform to local building code requirements.

This document is subject to review and revision. Questions or clarifications shall be directed to the Educational Technology Services (ETS), department of the Foothill-De Anza Community College District or Designated Appointee.
1. INTRODUCTION

1.1. GENERAL REQUIREMENTS

1.1.1. The Foothill –De Anza Community College District has committed itself in recent years to very large investment programs for academic facilities and associated technology infrastructures, hardware and software to serve perceived system-wide mission-critical needs. Management of that investment of public resources requires that all possible strategies be adopted to assure its long-term viability and flexibility. Among those strategies, a principal focus is assurance that the products and services being acquired are of the highest possible quality.

1.1.2. It shall be emphasized that the technical material incorporated in this document should be regarded by the planning and design personnel considering them as minimum standards governing the development of technology resources across the FHDA system. At the same time, it is also recognized that that system incorporates several Campus sites and/or facilities with potentially varied and differing physical environments. Given that situation, it shall sometimes be necessary to implement Campus-specific planning and design practices that shall depart from strict adherence to these Standards—but no departure from the implicit minimum level of quality is expected. The use of this document is not intended to relieve design consultants of their basic professional and contractual obligations for careful project analysis, strict adherence to sound design principles and best practices, and responsible oversight of construction and installation activities.

1.2. ACADEMIC SPACES AND TECHNOLOGY SYSTEMS

The following sub-sections summarize the evolving needs in academic spaces throughout the District. The District has come to rely upon a state-of-the-art communication’s infrastructure. This is needed to attract top teaching and administrative professionals and students. The District goals in this area can be adversely impacted by a lack of focus upon the ever-expanding reliance on the unhampered continual deployment of the latest information technology services available to faculty, students and staff.

1.2.1. Classrooms - Classrooms shall be equipped with voice, data, and video services in a wide variety of configurations. Increased use of multimedia-generated displays requires new techniques for providing technical interconnection (power and signal) between the instructor's location and room displays and beyond. Significantly improved methods of lighting, acoustical treatment, and heating and cooling shall be adopted to permit the successful integration of technology into the traditional classroom learning environment.

1.2.2. Laboratories - In addition to "standard" classroom technology services, many laboratory spaces now require conditioned power and communications to every student workstation. This is especially important in those spaces with built-in counters and freestanding laboratory benches. If adequate pathways are not provided for these components during initial construction, the addition of future information technology improvements could well prove prohibitively expensive. In particular, computer laboratories shall obviously be designed to support the constant evolution of technology, equipment, and student stations. In some cases, these facilities shall provide dedicated space to house stand-alone computing and network equipment, with an associated increase in electrical, cooling, and security services.
1.2.3. Libraries - Library facilities play a central role in the use and application of electronic information, and are now often referred to as "information or media centers". Extensive support for both technology users and equipment is required at all levels, including public electronic access areas, image and other multimedia access points, and group research and study areas. In addition, library buildings frequently act as centers for: instructional media production, television head-ends, and distribution centers; centralized and distributed computing; specialized computing and/or training labs; and teleconferencing resources.

1.2.4. Common Areas - Common areas throughout the campuses (such as lobbies, student activities, large hallways, and registration areas) are critical to the educational experience and shall be equipped to provide voice, data, and video services. Wall phones for internal use within the District are as important as coin telephones and should be just as accessible. Video monitors shall be used to display the status of class registration, campus news or event announcements, or items of local or national interest. Information kiosks and electronic card access points may be required throughout a campus to support on-going information, Building Automation, Security, Cash Machines, Paging and other applications. Increasing use of wireless technologies and remote on-line services will influence the technology design, use and application for common areas.

1.2.5. Conference Rooms - Conference rooms may require the capability to be utilized as teleconference or videoconference facilities and should be appropriately connected to the campus network. The increased use of voice and data communications for a variety of meetings requires that conference rooms shall support all forms of communications from multiple sources. For rooms likely to be designated as specific teleconferencing locations, particular attention shall be paid to lighting, sound, room design, and HVAC parameters in order to establish an environment suitable to effective use of technology.

1.2.6. Office Spaces - Office spaces shall be designed to support multiple technology configurations and provide multiple media and communications outlets. The technology infrastructure concept shall focus on workspace support rather than simply "how many jacks are located in each room". If the basic infrastructure makes it costly or difficult for an office occupant to operate a new type of information device shortly after that infrastructure is installed, the design obviously did not reflect adequate space utilization planning for the use of technology.

1.3. KEY POINTS FOR ARCHITECTS, FACILITY PLANNERS AND ENGINEERS

1.3.1. Initial building modeling shall accommodate space planning for telecommunication space footprints, power requirements, riser pathway and media systems and adequate heat dissipation.

1.3.2. Facilities shall be designed to support standards-based infrastructure solutions providing long-term flexibility.

1.3.3. Designs in support of a specific technology shall be avoided.

1.3.4. Intermediate Distribution Facilities and Main Distribution Facilities shall be dedicated to the support of telecommunications systems only.

1.3.5. Any telecommunications space housing or expected to house electronic equipment shall be designed with 24 hour a day/365 days a year environmental services configured for the specific campus conditions.
1.3.6. Each project shall have a specific telecommunications pathway plan prepared from
the point of network origination on campus into and throughout the facility. Outside
Plant (OSP) pathways planning is critical to the project.

1.3.7. All instructional areas shall be designed to support the distribution of technology for
faculty, staff, and students and the use of multi-media systems.

1.3.8. High technology spaces should be designed with flexible access flooring and/or
telecommunications pathways built in to student furniture.

1.3.9. The identification of the telecommunications infrastructure shall be in compliant with
ANSI/EIA/TIA 606 and the Districts Standards. It shall allow for future transition to an
infrastructure/documentation management system.

1.3.10. When updating the infrastructure in renovation projects, the designer shall be aware
of the limitations imposed by older electrical and HVAC systems, outdated ceiling
systems, existing wiring methods, and hazardous materials.

1.3.11. A prime goal of electrical service design is to reduce or eliminate power-related
problems to the sensitive network equipment, while providing adequate power for
current and future applications.

1.3.12. The telecommunications grounding system shall be designed and installed as
defined in ANSI TIA/EIA-607. The designer shall use a common point of ground for
all services (power and telecommunications) within the same building.

1.3.13. Any telecommunications space designed to support electronic equipment requires an
air handling system on a 24 hour a day/365 days a year bases.

1.3.14. Telecommunications pathways shall be designed as a specific part of an overall
telecommunications infrastructure plan, not as a system or technology-specific
component.

1.3.15. All telecommunications related infrastructure issues shall be based upon published
industry standards such as the TIA/EIA series and RUS bulletins. Vendor-specific
requirements shall be analyzed and approved by ETS in light of an overall "standards
based" approach.

1.4. RENOVATION

1.4.1. As part of the construction process for renovation, project plans shall include the
removal of any abandoned cable(s) that shall be in the space. The 2005 California
Electrical Code requires removal of accessible abandoned cable. All cabling reserved
for future use, shall be identified as such and tagged.

1.4.2. The most frequent and challenging consideration in renovation design, however, is
often the requirement to continue telecommunications service while a new system is
being installed. With only a few exceptions, Foothill-De Anza Community College
District buildings are occupied almost year-round. There is seldom a time when a
building is truly empty, unless a full-scale renovation is being conducted. Consideration
shall be given to the fact that a major HUB location may need to remain running thru-out a renovation project.
1.4.3. Questions for which the designer shall provide answers in programming a renovation project include the following:

1.4.3.1. What is the real scope of work when taking into consideration the daily operation of the facility?
1.4.3.2. Are there limits on noise, dust, movement of equipment or furniture, specialized systems?
1.4.3.3. How will the current systems be kept running if new media is to be installed in existing pathways?
1.4.3.4. How will the project address potential damage to existing media to remain in place?
1.4.3.5. How will a transition be made from old media to new, assuming a re-use of pathways and equipment?
1.4.3.6. How will the project address making system transitions and cutovers, testing and troubleshooting, and documentation?
1.4.3.7. Will the work have to be undertaken at night? If so, how will it be managed and tracked? How will the District address the security and general disruption concerns of faculty, students, and staff?
1.4.3.8. If existing spaces are not adequate, where will space be found and how will it be assigned?
1.4.3.9. Will the work undertaken within the facility necessitate review in terms of Americans with Disabilities Act (ADA) requirements?
1.4.3.10. Will the work undertaken within the facility necessitate review in terms of current fire code compliance, hazardous materials management, etc.? Will the required changes fit within the District’s mandated master plan requirements and architectural guidelines? Who will make decisions on aesthetics?
1.4.3.11. If additional electrical or air handling services are required to support the telecommunication improvements, should such additions factor in the impact of all forms of technology throughout the building?

2. ROLE OF THE DESIGN TEAM

2.1. ARCHITECT AND GENERAL DESIGN TEAM

2.1.1. The Architect is usually the focal point for coordinating the various engineering consultants during the design process. In order to provide an effective architectural design, the Architect needs to understand what the specific requirements are to support current and future telecommunication connectivity and services. The Architect shall engage ETS or its representative in design meetings and coordination sessions beginning at the programming phase.

2.1.2. The Architect shall supply background drawings to the various members of the design team. It is very important for the proper design of the Information Technology Infrastructure that the drawings for the Electrical and Telecommunication Consultants contain furniture information. This will be needed by both Electrical and Telecommunication Design team members to correctly locate and coordinate power and communication outlets.

2.1.3. The Architect shall ensure that where other Design Engineers or Consultants need a separate wiring infrastructure to support their systems, that those consultants coordinate their design and infrastructure requirements with the ETS staff. This includes, but not limited to design items such as cable type, cable color, use of supplemental or common pathways and support systems. For any Design Engineers or Consultants that need any communication connection of any sort from the building...
to any other place on or off the Campus, the Architect shall ensure that these Engineers/Consultants request and coordinate with ETS for this connectivity.

2.1.4. As full participants in the design process, comments and requests submitted by ETS shall be incorporated into the reviewed documents in full for the next review of documents, or an explanation shall be provided to ETS, regarding the status of comments and requests.

2.2. THE TELECOMMUNICATIONS DESIGNER AND THE CONSTRUCTION PACKAGE

2.2.1. The Telecommunications designer shall use these standards to produce a comprehensive set of drawings and specifications that address all the specific design requirements of each construction project. This includes:

2.2.1.1. Drawings shall be provided as a discrete Telecommunications Set or “T” set.
2.2.1.2. The “T” set drawings shall be stamped and signed by a qualified communications designer.
2.2.1.3. “T” set drawings shall be coordinated with electrical engineering staff for suitable placement of power outlets.
2.2.1.4. “T” set drawings shall include the following: Outlet locations in all buildings using the ETS standard symbol.
2.2.1.5. The Specification shall follow the Division 27 format.
2.2.1.6. Drawings of standard outlet details.
2.2.1.7. Backbone riser diagrams.
2.2.1.8. Detailed drawings of Information Technology Rooms including cable runway design, wall space allocation/usage, and rack/cabinet equipment layout shall be provided.
2.2.1.9. Multimedia details shall be included in the telecommunication or Audio Visual drawings. Details to include AV pathways, Projection mounting, and screen.

3. THE ROLE OF THE DISTRICT AND ETS

3.1. PLANNING AND DESIGN PERIOD

As indicated throughout this standard ETS will take an active role in all aspects of the design, construction and acceptance of the network infrastructure. ETS shall participate in the inspection and acceptance of all cabling installations. During the construction process, inspections will be coordinated with the Inspector of Record and Engineering teams. As a minimum, periodic inspections will occur at the following phases of construction (conduit rough-in, cable installation and termination of cables). The ETS staff shall do design reviews, design issue resolution, construction monitoring and testing result reviews.

3.1.1. Specifically, throughout the design period the Architect and design team can rely on proactive support from ETS to resolve any design issues and mitigate any adverse impacts upon the final network infrastructure design. Throughout the design, the following process will be employed to assure a system that meets the needs of the District.

3.1.2. Review design of equipment installation and cable terminations in the MPOE. Verify system operational readiness and that the new installation does not impact operation of any existing systems.
3.1.3. Verify proper labeling of equipment at the MPOE.

3.1.4. Verify method of cable slack storage is stored and secured properly at the MPOE.

3.1.5. Determine by looking at a representative number of maintenance holes between the MPOE and the Project Building Entrance that cables are placed and supported in a proper manner.

3.1.6. Verify that conduit pathway capacity for the building service is adequate.

3.1.7. Verify that electrical outlets placed in telecommunication rooms for network equipment service are the correct voltage for the network equipment procured by the campus.

3.1.8. Verify that heat loads used for room air conditioning calculation are consistent with the switching equipment to be procured by the District.

3.1.9. Verify that cable routing and management, as installed in telecommunication spaces facilitate current and future requirements.

3.1.10. Verify that rack and wall field management capacity is adequate for all cabling to be supplied by the Project.

3.1.11. Confirm all cable labeling for consistency with District standards.

3.2. CONSTRUCTION AND ACCEPTANCE PERIODS

ETS will participate in the monitoring and commissioning of the installed systems. In addition to generally monitoring the construction progress, special attention will be paid to the follow areas:

3.2.1. Termination of inter-building outside plant (OSP) cabling at campus MPOE facilities or outside plant splice point.

3.2.2. Placement of inter-building pathways – underground structures.

3.2.3. Proper installation of OSP high-count copper and optical fiber cabling.

3.2.4. Installation of telecommunication room equipment and cable management.

3.2.5. Termination and testing of cabling at building entrances in MPOE and the Project Building.

3.2.6. Intra-building (inside plant-ISP) equipment associated with copper and fiber optic building riser systems.

3.2.7. Intra-building pathways associated with building riser systems.

3.2.8. Intra-building pathways associated with placement of station cabling and multimedia systems.

3.2.9. Intra-building horizontal premise cable management.

3.2.10. Testing and labeling of OSP and ISP cabling throughout the project.
3.2.11. Proof-of-performance (witnessed) testing of OSP and ISP cabling system.

3.2.12. Acceptance of the long-term Structured Cable System warranty.

4. QUALIFICATIONS OF THE TELECOMMUNICATION INSTALLER

The following requirement shall be included in the project specifications. All subcontractors employed by the Contractor shall have a minimum of 5 years' experience in satisfactory completion of jobs of similar scope and amount. Each subcontractor employed by the Contractor to perform telecommunications work on the project shall possess a C-7 Limited Specialty License for Telecommunications and shall be certified to install, terminate, splice, testing of copper and fiber optic cables. Each employee of the telecommunications system installer shall be certified by the Structured Cable System solution supplier.

5. CODES/COMPLIANCE

5.1. LOCAL, NATIONAL, AND INTERNATIONAL CODES

In general, building codes and standards are enforced by the local agency that issues building permits. Foothill-De Anza Community College District shall have compliance issues in addition to federal, state, or local codes. This shall also include additional safety aspects of working conditions and sites due to public access.

5.1.1. Local, national, and international authorities publish rules that govern:

5.1.1.1. Local Carriers.
5.1.1.2. The Telecommunication Industry.
5.1.1.3. Inter-Exchange Common Carriers.

5.1.2. At the federal level in the United States, the Federal Communication Commission’s (FCC) Part 68 Rule provides regulations for connecting premises wiring and customer-provided equipment to the regulated networks.

5.1.3. The FCC also publishes numerous Reports and Orders dealing with specific issues.

5.1.4. Building codes and standards encompass most, if not all, aspects of the construction industry. Installation methods and electrical products shall conform to local code requirements in the construction of telecommunication facilities.

5.1.5. In all circumstances, local regulations concerning safety and electrical codes shall be met. Equipment shall be installed in conformance with the manufacturer’s guidelines.

5.1.6. American with Disabilities Act (ADA) 1990 Covered in “Title IV”: Telecommunications,” covering hearing impaired, speech impaired, and accessibility to telephones and communications devices.

5.1.7. The Designer shall be cognizant of implication of recent code enactments and their impact on the planning and design in process (for example removal of abandoned cable in renovation projects). The Designer should make the District aware of issues such as these to allow the District to make an informed project decision.

5.2. CODES AND STANDARDS

All work shall be performed in compliance with the most restrictive of Municipal, State, and/or Federal Codes that shall govern this work and shall conform to the following codes and
specifications: The designer shall be responsible to update the construction documents to the most current adopted electrical and building codes.

5.2.1.  APPLICABLE CODES

5.2.1.1. National Fire Protection Association NFPA 70
5.2.1.3. Federal Communications Commission (FCC) Part 15 and Part 68
5.2.1.4. Title 24 - State of California Code of Regulations
5.2.1.5. Latest Adopted California Building Code.
5.2.1.6. Latest Adopted California Electrical Code
5.2.1.7. ANSI C2-1981 National Electrical Safety Code
5.2.1.8. The California Mechanical Code.
5.2.1.9. Americans With Disabilities Act (ADA)

5.2.2.  ANSI SPECIFICATIONS

5.2.2.1. ANSI C80.3 Specification for Zinc-coated Electrical Metallic Tubing
ANSL/UL 797 Electrical Metallic Tubing
5.2.2.2. ANSI/ICEA S-83-596-1994 - Fiber Optic Premises Distribution Cable Technical Requirements
5.2.2.3. ANSI/EIA/TIA 568-B.1, B.2, B.3 – Commercial Building Telecommunications Wiring Standard.

5.2.3.  ELECTRONICS INDUSTRY ALLIANCE/TELECOMMUNICATIONS INDUSTRY ASSOCIATION

5.2.3.1. EIA(TIA) EIA/TIA 569 - Commercial Building Standard for Telecommunications Pathways and Spaces 1998 and Addendum #1& 2, 2000
5.2.3.2. EIA/TIA TSB 36 - technical Systems Bulletin Additional Cable Specifications for Unshielded Twisted Pair Cables
5.2.3.3. EIA/TIA TSB 67 - Transmission Performance Specifications for Field Testing of Unshielded Twisted-Pair Cabling Systems.
5.2.3.4. EIA/TIA TSB 72 - Centralized Optical Fiber Cabling Guidelines. EIA/TIA 75 – Additional Horizontal Cabling Practices for Open Offices
5.2.3.5. EIA/TIA 606A - Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.
5.2.3.6. EIA/TIA 607 - Commercial Building Grounding and Bonding Requirements for Telecommunications. 1994
5.2.3.7. EIA - 310-D - Cabinets, Racks, Panels, and Associated Equipment
5.2.3.8. EIA/TIA 526-14A - Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant.
5.2.3.9. EIA/TIA 455-57A - Optical Fiber End Preparation and Examination. EIA/TIA 455-59 - Measurement of Fiber Point Defects Using and OTDR
5.2.3.10. EIA/TIA 455-60 - Measurement of Fiber Cable Length Using an OTDR
5.2.3.11. EIA/TIA 455-61 - Measurement of Fiber Cable Attenuation Using an OTDR
5.2.3.12. EIA/TIA 455-95 - Absolute Optical Power Test for Optical Fibers and Cables.
5.2.3.13. EIA RS-458A Standard Optical Waveguide Fiber Material Classes and Preferred Sizes.
5.2.3.14. EIA-472 Generic Specification for Optical Waveguide Fibers
5.2.4. SAFETY CODES
  5.2.4.1. Occupational Safety and Health Administration (OSHA) Specifications
  5.2.4.2. National Electrical Safety Code

5.2.5. IEEE STANDARDS
  5.2.5.1. IEEE 802.2 Logical Link Control Working Group
  5.2.5.2. IEEE 802.3 Carrier Sense Multiple Access with Collision Detection (CSMA/CD) NEMA VE1 Cable Tray Systems

5.2.6. UNDERWRITERS LABORATORIES SPECIFICATIONS
  5.2.6.1. UL 497 Electrical Grounding and Bonding Equipment
  5.2.6.2. UL 1479 Fire Tests of Through-Penetration Fire-stop
  5.2.6.3. UL Building Materials Directory; Through-Penetration Fire-stop Systems, and Fill, Void or Cavity Materials

5.2.7. ASTM SPECIFICATIONS
  5.2.7.1. ASTM E 814 Methods of Fire Tests of Through-Penetration Fire Stops
  5.2.7.2. ASTM E 136 Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees C. Rural Utilities Services (RUS), Bulletin 345-63, RUS Specifications for Acceptance Tests and Measurements of Telephone Plant
6. SCOPE OF WORK MATRIX FOR DISTRICT PROJECTS

6.1. THE FOLLOWING MATRIX REFLECTS TYPICAL RESPONSIBILITIES. HOWEVER ARE SUBJECT TO CHANGE FOR EACH PROJECT.

<table>
<thead>
<tr>
<th>Item / or Material</th>
<th>District Purchased</th>
<th>District Installed</th>
<th>Contractor Purchased</th>
<th>Contractor Installed</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Telecommunications Wiring Voice/Data (Standard)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Telephone System (select one:</td>
<td>Standard)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Termination boxes and terminals</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>coordinate with ETS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modular jacks and plates</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Telephones</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Telephone cords</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Programming</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Account setup, voicemails, etc</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analog Technology</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Final cross connection to switch if required</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site conduits and boxes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interior raceways, cable trays and boxes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fiber optic cable tube cells</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fiber optic cables</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BDF/IDF racks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Copper cables</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fiber TDU</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fiber patch panel</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patch panel</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jacks and plates</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BDF/IDF (racks, backboards, air c., wiring,) Per specs.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cable testing and reports (both copper &amp; fiber)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patch cords</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Active electronics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Programming, network implementation</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Final As-built drawings and documentation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Broadband Television System</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site conduits and boxes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interior raceways, cable trays and boxes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fiber optic cable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single mode fiber optic cables</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coax cables</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Splitters, directional couplers at new building</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Line extender amplifier at new building</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fiber optic transceivers, terminations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connection to headend</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Testing and reports</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Final As-built drawings and documentation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CCTV Surveillance Systems</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site conduits and boxes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Item / or Material</td>
<td>District Purchased</td>
<td>District Installed</td>
<td>Contractor Purchased</td>
<td>Contractor Installed</td>
<td>Note</td>
</tr>
<tr>
<td>----------------------------------------------------------------------------------</td>
<td>--------------------</td>
<td>--------------------</td>
<td>----------------------</td>
<td>----------------------</td>
<td>------</td>
</tr>
<tr>
<td>Interior raceways, cable trays and boxes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fiber optic cables from new building to MDF</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coax, power and control cables for new building</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power testing and reports</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cable testing and reports (both copper &amp; fiber)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Camera low voltage power supplies</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Head-end recorders, switchers, monitors &amp; controls</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cameras</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Camera brackets</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Final As-built drawings and documentation</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Security & Access**

| Site conduits and boxes                                                          |                    |                    |                      |                      |      |
| Interior raceways, cable trays and boxes                                          | X                   | X                  |                      |                      |      |
| Fiber optic cable tube cells                                                      |                    |                    |                      |                      |      |
| Fiber optic cables                                                                | X                   | X                  |                      |                      |      |
| Interior wiring (CAT6 Rated Cable, AWG) per specs.                                | X                   | X                  |                      |                      |      |
| Schedule interior building wiring                                                 | X                   | X                  |                      |                      |      |
| Cable testing and reports (both copper & fiber)                                   | X                   | X                  |                      |                      |      |
| Headend equipment and software at MPOE/MDF as needed.                             |                      |                    |                      |                      |      |
| Electric door hardware                                                            | X                   | X                  |                      |                      |      |
| Card Reader                                                                       | X                   | X                  |                      | X                    |      |
| Door switches                                                                     | X                   | X                  |                      | X                    |      |
| MDF/IDF electronic control enclosures/ logic boards                               | X                   | X                  |                      |                      |      |
| Connection to head-end, programming, implementation                               | X                   | X                  |                      |                      |      |
| Final As-built drawings and documentation                                         | X                   | X                  |                      |                      |      |

See **Appendix F** for Voice / Data System Logical Riser Schematic Diagram – Foothill and De Anza Campus

See **Appendix G** for Video System Logical Schematic Riser Diagram - Foothill and De Anza Campus
7. MAIN DISTRIBUTION FACILITIES

7.1. DEFINITION

7.1.1. A Main Distribution Facility (MDF) is a dedicated room that provides spatial and controlled environmental conditions for placement and operation of communications and/or computer equipment. MDF’s will differ from Intermediate Distribution Facilities (see section 3 below) in that a single MDF is generally considered to serve an entire building, structure or campus, where a Intermediate Distribution Facility (IDF) will serve a specific portion of a building, structure, or campus. Multiple IDF’s within a structure(s) are connected through backbone pathways to a single MDF. MDF’s are connected to backbone pathways or raceways that run within and between structures. The MDF contains the main entry point of telecommunications from the building or buildings. In certain situations, a second or additional MDF’s shall be added to a building design in order to accomplish the following –

7.1.1.1. Redundancy, for mission critical or disaster recovery scenarios.
7.1.1.2. Versatility MDF rooms need to be designed to accommodate current and forthcoming communication system applications and equipment. They shall allow for on-going growth and equipment upgrades with minimal disruption of service to users.
7.1.1.3. Reliability Above all else, an MDF room shall provide reliable services. This is accomplished by using only the highest quality components, using state of the art design standards and professional installation methods.

7.1.2. MDF rooms typically house:

7.1.2.1. Demarcation(s) for communication utilities.
7.1.2.2. PBX switching equipment. (If applicable)
7.1.2.3. Voice mail equipment. (If applicable)
7.1.2.4. Automatic Call Distribution. (If applicable)
7.1.2.5. Inter-building backbone cross-connects.
7.1.2.6. Horizontal and vertical cross-connects.
7.1.2.7. Communications station racks and cabinets.
7.1.2.8. Network LAN/WAN equipment.
7.1.2.9. Termination point for all Horizontal station wiring.
7.1.2.10. Horizontal and vertical cross-connects. (HC’s)
7.1.2.11. Communications station racks and cabinets.
7.1.2.12. Active electronic network access points (switches and hubs)
7.1.2.13. Active wireless Access equipment.

7.2. DESIGN CONSIDERATIONS

7.2.1. Acceptable Size & Location

7.2.1.1. The square footage allocated for the MDF room shall be in proportion to the square feet of useable space and the equipment needed for each specific building. The minimum room size shall be 150 square feet of useable space. The room shall have a minimum width of 10 ft. in order to provide adequate front and rear clearance for communications racks/cabinets. If possible, provide 1 square foot of MDF floor space for
every 100 square feet of usable floor space, but never less than the 150 square feet.

7.2.1.2. Proximity to utility service entrance conduits for telecommunications and electrical power.

7.2.1.3. Locate the MDF and size the entrance so that it is accessible for the delivery of large equipment throughout its useful life.

7.2.1.4. Locate the MDF far enough away from sources of EMI to reduce the interference.

7.2.1.5. The capability to expand the MDF for future growth shall be considered when determining the room location.

7.2.1.6. A central location close to the building core is preferred in order to minimize horizontal distribution system cable runs. All wiring runs shall be kept to a 275' maximum for basic link distance.

7.2.1.7. The MDF shall be square or rectangular in order to maximize available space.

7.2.1.8. Access through the MDF to reach other areas shall not be allowed.

7.2.1.9. Wall, ceiling, and floors in this room shall be sealed, dust free, and with fire retardant white color paint.

7.2.1.10. Clearances and layout of internal racks, cabinets, and equipment shall be in accordance with code and/or manufacturer’s recommendations for access.

7.2.1.11. The MDF shall be dedicated solely to telecommunications and related facilities. Equipment that does not support the MDF shall not be allowed (i.e. pipes, duct work, distribution of building power, Fire equipment, and Energy management equipment.) to be located in or pass through the MDF.

7.2.1.12. The MDF shall have a dedicated HVAC system that provides air 24/7/365.

7.2.1.13. Source of water such as kitchens, rest rooms, etc. shall not be located next to or above the MDF.

7.2.1.14. Shared use of MDF space with other building facilities shall not be allowed.
7.2.2. A typical telecom room is show below. Note the physical and space considerations to be considered.

7.2.3. Locations Shall Be Avoided

7.2.3.1. Locations which are unsatisfactory for the MDF would include space in or adjacent to the following.

- 7.2.3.1.1. Transformers – four foot clearance required
- 7.2.3.1.2. Janitor's closets
- 7.2.3.1.3. Boiler rooms
- 7.2.3.1.4. Storage rooms
- 7.2.3.1.5. Kitchens and break rooms
- 7.2.3.1.6. Restrooms
- 7.2.3.1.7. Loading Docks
- 7.2.3.1.8. Sources of excessive EMI
- 7.2.3.1.9. Hydraulic equipment and other heavy machinery that causes vibration- use maximum distance allowable.
- 7.2.3.1.10. Steam pipes or water piping other than fire suppression
- 7.2.3.1.11. Overflow drain areas or basements susceptible to flooding
- 7.2.3.1.12. Drain clean-outs or sump areas
- 7.2.3.1.13. To avoid damage to electronic equipment, any spaces that contain water pipes or water sources shall be avoided.
7.2.4. Wall Field

7.2.4.1. Walls shall be provided with plywood installed 6” above finished floor.
7.2.4.2. Plywood shall be 4ft X 8 ft high and ¾” thick and mounted vertically using full length securely fastened with flush hardware to support anticipated loads.
7.2.4.3. Walls shall be painted with white color fire retardant paint also in accordance with local building codes and district standards.
7.2.4.4. Shall be void-free AC-grade and fire-rated or treated.

7.2.5. Raised Floor – When required

7.2.5.1. A raised floor would be utilized in computer room environments only. This would require specific design, installation and environmental planning considerations prior to installation. It is that 2” cable floor (flex space or equal) will be utilized in some areas. Any use of raised floors will be an architectural consideration based on building design criteria.
7.2.5.2. Conduits shall be stubbed below raised floor with enough clearance to ensure cable bend radius is not exceeded.
7.2.5.3. The load-bearing capacity shall meet the testing requirements of the CISCA test methods. For Main Distribution Facilities the uniform Load capacity shall be 100 lb/ft.
7.2.5.4. A tile remover for the access floor tiles shall be provided and hung at a convenient location on brackets.
7.2.5.5. 6” x 9” cutouts shall be provided for cabling access. These cutouts shall be trimmed and have chaffing guards installed to eliminate sharp edges. Floor cutout locations shall be provided on drawings with floor grid layout.

7.2.6. Slab Floor

7.2.6.1. If raised floor is not required or provided, the contractor shall provide a ladder rack system, minimum 18" wide or larger as required for routing of all cabling. Exact design to vary with size and layout of specific room.
7.2.6.2. Floor loading capacity in the MDF shall be designed for a minimum distributed load rating of 100 lb/ft and a minimum concentrated load rating of at least 2000 lb/ft.
7.2.6.3. Anti-Static Vinyl Coated Tile (VCT) flooring or equivalent shall be installed with appropriate bonding strips as required.
7.2.6.4. A floor drain is required if there is a risk of water entering the facility.
7.2.6.5. Concrete Slab floors without (VCT) shall be sealed and polished.

7.2.7. Ceiling

7.2.7.1. Suspended ceilings shall not be allowed in the MDF to provide maximum accessibility for management of pathway and cable entrances and support the room. Ceiling shall be sealed to minimize dust.
7.2.7.2. Minimum ceiling height shall be 8'-ft 9"-in above finished floor.

7.2.8. Entrances (doors)

7.2.8.1. Doors shall be a minimum 42-in. wide and 80-in tall, without doorsill. Double doors, without center posts, shall be installed to facilitate large equipment installation and removal.
7.2.8.2. Doorways shall open outward 180 degrees to provide additional useable space when code allows.
7.2.8.3. Doorways shall be properly sealed to avoid dust and pest from entering the room.

7.2.9. Security

7.2.9.1. Entry access into the MDF should be auditable such as a card reader or electronic key system. If this is not possible, a key made specifically for these rooms shall be provided to insure only authorized personnel have access. This equipment is normally owner furnished, owner installed.

7.2.10. Space Allocation & Layout

7.2.10.1. The MDF shall provide enough space for:

7.2.10.1.1. All planned equipment to support data, voice and video.
7.2.10.1.2. All planned equipment provided by Service Providers (CATV, Telco, etc.).
7.2.10.1.3. Access to the equipment for maintenance and administration.
7.2.10.1.4. Future growth.
7.2.10.1.5. Space for any environmental control equipment, power distribution/conditioners, MDF room cooling equipment, and UPS systems that shall be installed in the room.

7.2.11. Working Clearances and Electronic Isolation

7.2.11.1. A Main Distribution Facility shall have a layout that is easy to use and maintain.
7.2.11.2. For equipment installation in the United States, NEC Section 110-16 provides requirements for working space and clearances around electrical equipment. (Generally 3 ft.)
7.2.11.3. Clearance from wall field components (110 termination fields, protection blocks, etc) shall be no less than 12” to the adjacent 90-degree walls to the left and right.
7.2.11.4. Isolation kits shall be provided for all floor mounted racks and cabinets. B-Line SB-2541-01 Chatsworth, Panduit or equal
7.2.11.5. Electronic frame Isolation kits will be provided for all overhead structural support systems. B-Line, Chatsworth, Panduit product or equal as required for specific installation method employed.

7.2.12. Floor Standing Racks and Cabinets

7.2.12.1. Station racks and equipment cabinets shall be secured to the building structure and grounded according to the manufacturer’s guidelines. Standard color is Black.
7.2.12.2. Additional bracing shall be required to meet seismic bracing recommendations. Consult Uniform Building Code (UBC) for specific zone four requirements. All racks, cabinets should be most current UL listed for Zone 4 installations. Additional seismic engineering studies or certifications shall be required by local building codes. If racks are located over raised floors, the racks shall be installed with Raised Floor Rack support kits that include threaded rod, z-braces and anchors that securely attach the rack to the building structure (slab)
7.2.12.3. Each rack shall be equipped with a 10 inch vertical wire manager on each side.
7.2.12.4. Fiber patch panels shall be placed at the highest point possible in the rack or cabinet. Single mode fiber patch panels will be mounted above the multimode fiber patch panels. Fiber patch panels will have integrated cable management in the front and cable guides in the rear.

7.2.12.5. Copper patch panels will be installed below the fiber patch panels. Wire management will be integrated in the copper patch panels.

7.2.12.6. The horizontal wire managers shall be supplied to route patch cords to the network equipment. One horizontal wire manager is required for each 48-port patch panel or 48-port network switch.

7.2.12.7. All network equipment shall be installed such that wire management is located directly above and below each network switch, alternating down the rack. NOTE: Network equipment shall not be included as part of any construction bid, but the designer shall provide racking and cabinet layout details.

7.2.12.8. Rack mounted dedicated outlets are to be added along the ladder rack above the freestanding rack. Outlet strips with visible ampere readouts shall be located just above the UPS rack position.

7.2.12.9. Where rack-mount Uninterruptible Power Supplies (UPS) are provided, UPS units shall be installed at the base of the rack. Surge-protected power strips shall be installed midway in the rack/cabinet, above the network equipment, to allow for easy access to equipment power cords. This space shall be provided in each rack, whether or not UPS is anticipated in the project budget, leaving it the prerogative of the District to independently install UPS capability.


7.2.12.11. Note: Designs should consider the types of equipment planned for the room and future equipment needs. Space should be allocated to accommodate 24"width x 30"depth equipment cabinets installed in rows. In general, telecommunication racks are preferred over equipment cabinets in dedicated MDF rooms.

7.2.13. Labeling of Telecommunication Space

7.2.13.1. Each Intermediate Distribution Facility shall be named and numbered with an individual numeric identifier (1.1, 1.2, etc). Current room naming conventions at the campuses use a unique room number that also correlates to the floor and building number.

7.2.13.2. The FHDA Community College District will work with the Telecommunications Consultant to implement a consistent and unique labeling scheme across all buildings. The Contractor shall confirm specific labeling requirements with the ETS or its Representative prior to cable installation or termination.

7.2.13.3. The labeling shall meet the requirements of ANIS/TIA/EIA-606.

7.2.13.4. All labels shall:

7.2.13.4.1. Meet the legibility, defacement, exposure and adhesion requirements of UL 969

7.2.13.4.2. Be pre-printed or laser printed type

7.2.13.4.3. Be a label with a vinyl substrate and white printing area and a clear "tail" that self laminates the printed area when wrapped around the cable shall be provided.

7.2.13.4.4. Be a label color different than that of the cable to which it is attached.

7.2.13.4.5. Use clear plastic covers to go over label when insert type labels are used.
7.2.13.4.6. The standard is black lettering on a white background.

7.3. CABLE PATHWAYS

7.3.1. When lying out cable pathways entering the MDF or within the MDF, ensure that the layout:

7.3.1.1. Avoids cable congestion.
7.3.1.2. Allows access to the cables.
7.3.1.3. Provides cable slack.
7.3.1.4. Provides a minimum of 10’ service loop for cable at MDF.
7.3.1.5. Provides a minimum of 3’ service loop for cable at station.
7.3.1.6. Minimizes cable stress such as tension, twisting, and bending, bend ratios, maximum number of bends.

7.3.2. Overhead Ladder Rack

7.3.2.1. Ladder racks shall be provided and installed by the contractor for routing of cabling.
7.3.2.2. The minimum size for all ladder rack in telecommunications shall be 18-inch and 6” side posts to contain cabling shall be provided at 3-foot intervals.
7.3.2.3. This ladder rack shall be installed so that the bottom of the ladder rack is installed on the top of the equipment racks or cabinet. Horizontally, a variance of +/- 6” from plan will be allowed as required to clear lighting fixtures, sprinkler heads, etc. The ladder rack shall be suspended from the ceiling or attached to racks or cabinets and/or securely anchored to the wall. Standard color is Black.
7.3.2.4. Cable support system shall be made of straight sections, fittings, and accessories as defined in the latest NEMA standards publication VE-1. Standard ladder racks shall be UL classified as equipment grounding conductors.
7.3.2.5. Ladder rack shall be installed to support cable groupings of more than 70 4-pair cables from the MDF or IDF. Flex-tray (or equivalent flexible tray) capable of supporting the size and weight of the cables shall be installed in major pathways originating from the MDF or IDF towards the workstation locations. Trays should be installed to ease entry and exit to the room. As the cable density decreases towards the workstations J-hooks or cable trapeze assemblies can be used.
7.3.2.6. Ladder rack shall be installed below the cable sleeves or slots entering the room and provide distribution to the wall field and/or telecommunication racks.
7.3.2.7. Horizontal ladder rack shall be installed directly above the row of racks or cabinets in the room. Electrical outlets shall be mounted outside of the tray and should face the wall and not the floor.
7.3.2.8. Spillways, waterfalls, saddles or “J” hooks are required in all transitions where cable leaves the ladder rack, raceway or ladder rack. The ladder rack manufacturer shall provide transitional cable support devices associated with ladder racks.

7.3.3. Floor Cores, slots and sleeves

7.3.3.1. A minimum of four Trade Size 4” conduits shall be provided. New buildings OSP require (4) 4 inch size conduits. Maxcell inner-duct product shall be used. Place (3) Three cells for each 4-inch size conduit.
7.3.3.2. Fire Stop sealing is required for wall and ceiling and floor penetrations. EZ-PATH products for floors, walls and ceilings shall be specified. Duct plugs for OSP applications shall be required.

7.3.3.3. Terminate conduits that protrude through the structural floor 4 inches above the surface to prevent cleaning solvents or other fluids from flowing into the conduit.

7.3.3.4. Design sleeves with 4-in. diameters unless a structural engineer requires a smaller size or obstructions are present. Smaller diameters do not cost any less, do not save a significant amount of space, and unnecessarily limit the backbone cable capacity.

7.3.3.5. Fill ratios shall not exceed 40% fill or exceed minimum bend radius (see chart 7.3.4).

7.3.4. Wall Cores

7.3.4.1. If required, a minimum of four Trade Size 4” conduits shall be provided.

7.3.4.2. Design sleeves with 4-in. diameters unless a structural engineer requires a smaller size or obstructions are present. Smaller diameters do not cost any less, do not save a significant amount of space, and unnecessarily limit the backbone cable capacity.

7.3.4.3. EZ-PATH products shall be used after core is completed actual required core size shall vary.

7.3.4.4. Fill ratios shall not exceed 40% fill or exceed minimum bend radius.
### 7.3.5. CONDUIT Fill Ratio % / Bend Radius Chart

#### Table 3.3.4

<table>
<thead>
<tr>
<th>Size Designator</th>
<th>Internal Diameter</th>
<th>Total Area 100%</th>
<th>Maximum Recommended Occupancy</th>
<th>Minimum Bend Radius</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(in)</td>
<td>(in²)</td>
<td>A Fill</td>
<td>B Fill</td>
</tr>
<tr>
<td>mm (in)</td>
<td>mm (in)</td>
<td>mm² (in²)</td>
<td>Fill</td>
<td>Fill</td>
</tr>
<tr>
<td>21</td>
<td>20.9 (.82)</td>
<td>.533</td>
<td>182</td>
<td>1.66</td>
</tr>
<tr>
<td>(3/4)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>26.6 (.50)</td>
<td>5.90</td>
<td>295</td>
<td>1.72</td>
</tr>
<tr>
<td>(1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>35.1 (.14)</td>
<td>9.68</td>
<td>313</td>
<td>3.00</td>
</tr>
<tr>
<td>(1-1/2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>40.9 (.16)</td>
<td>13.14</td>
<td>696</td>
<td>4.07</td>
</tr>
<tr>
<td>(1-1/2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>53</td>
<td>53.5 (.21)</td>
<td>21.65</td>
<td>1147</td>
<td>6.71</td>
</tr>
<tr>
<td>(2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>63</td>
<td>69.4 (.27)</td>
<td>37.83</td>
<td>2000</td>
<td>11.73</td>
</tr>
<tr>
<td>(2-1/2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>78</td>
<td>85.2 (.33)</td>
<td>57.91</td>
<td>3022</td>
<td>17.67</td>
</tr>
<tr>
<td>(3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>91</td>
<td>97.4 (.38)</td>
<td>74.51</td>
<td>3949</td>
<td>23.10</td>
</tr>
<tr>
<td>(3-1/2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>103</td>
<td>110.1 (.43)</td>
<td>95.21</td>
<td>5046</td>
<td>29.51</td>
</tr>
<tr>
<td>(4)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
7.4 POWER REQUIREMENTS FOR MDF AND IDF ROOMS

7.4.1 Telecommunications equipment is sensitive to power fluctuations. Because of this sensitivity, provisions shall be made for:

7.4.1.1 Dedicated power feeders.
7.4.1.2 Individual branch circuits.
7.4.1.3 Back-up power UPS
7.4.1.4 Grounding and bonding.
7.4.1.5 Generator Power
7.4.1.6 PDU or Power Distribution Units

7.4.2 The MDF shall have its own dedicated panel board to support all communications equipment in the room. Minimum panel and breaker size shall be 100 ampere in buildings of less than 50,000 sq ft and 225 ampere for buildings equal to or greater than 50,000 sq ft. The designer is to verify actual anticipated load and provide power panel to accommodate an additional 40 percent capacity in AMPS for future growth. All panel boards placed in telecommunications spaces or that provide service to telecommunications spaces shall be equipped with TVSS (transient voltage suppression). TVSS units shall be contained within the panel board. If the building is provided with an emergency generator, these panel boards shall be connected to the emergency bus supply system.

7.4.3 IDF’s shall have its own dedicated panel boards to support all communications equipment in the room. Minimum panel and breaker size shall be 100 ampere in building IDF’s. The designer is to verify actual anticipated load and provide power to accommodate an additional 40 percent capacity in AMPS for future growth. All panel boards placed in telecommunications spaces or that provide service to telecommunications spaces shall be equipped with TVSS (transient voltage suppression). TVSS units shall be contained within the panel board. If the building is provided with an emergency generator, these panel boards shall be connected to the emergency bus supply system.

7.4.4 Power shall be mounted on cable trays when installed above equipment. Typically, each equipment rack requires two dedicated 20-amp Nema L520 twist lock receptacle. UPS equipment shall require a dedicated 30-amp Nema L630 twist lock receptacle.

7.4.5 A minimum of four convenience outlets shall be installed around the room (one per wall).

7.4.6 UPS distribution requirements are full N+1 redundancy, Scalable, PDU Distribution, and SNMP manageable.

7.4.7 PDU shall be mounted on the back or rear of any Telecom rack or Server rack which requires to have a twist lock receptacle to match existing power or new power supplied Nema rated. All PDU units require a digital load amp read out indicator and also SNMP with remote monitored and managed capability.
7.5 REQUIREMENTS FOR LIGHTING

7.5.1 Install building standard florescent lighting to provide a minimum 50 foot-candles of illumination three feet above the floor. Light fixtures shall be arranged to not result in shadowed areas affecting working conditions at the front or rear of equipment racks or cabinets. Power for lighting shall be sourced from building electrical service panels and not from dedicated telecommunication space electrical panel boards. The lights shall be under control of a readily accessible switch. Emergency lighting shall be provided.

7.6 FIRE SUPPRESSION

7.6.1 If sprinkler heads are in the area, they shall be designed to operate at more than 212 Degrees Fahrenheit. Sprinkler heads shall be equipped with a guard to prevent accidental operation. A pre-action system is an acceptable method of providing protection.

7.6.2 If an access raised-floor system is to be installed in any Information Technology Room and a fire detection system is required under the floor, the system shall be a cross-zone detection system.

7.6.3 FM200 fire suppression system is the Foothill-De Anza standard for fire suppression.

7.7 REMOTE SENSOR

7.7.1 HVAC sensors and controls shall be located in the Main Distribution Facilities. The sensors shall be placed at a minimum of 5 ft. above the finished floor.
8. INTERMEDIATE DISTRIBUTION FACILITIES (IDF)

8.1. DEFINITION

8.1.1. IDF’s are commonly used to provide environmentally suitable locations for horizontal cable termination points, network connections, and connection points between backbone and horizontal distribution pathways. There shall be a minimum of one IDF per floor/area, excluding the floor containing the MDF. There is no maximum number of IDF’s per floor/area, as they shall be installed to maintain horizontal cabling distances of less than 275 ft.

8.1.2. Intermediate Distribution Facilities (IDFs) have the same requirements as described for the MDF with the addition or replacement of the information in this section. Typically only the MDF is the Demarcation for communication utilities into the building or building complex.

8.2. DESIGN CONSIDERATIONS

8.2.1. Acceptable Size & Location

8.2.1.1. The square footage allocated for this room shall be in proportion to the square feet of useable space and the equipment needed for each specific office. The minimum room size shall be 100 square feet of useable space. The room shall have a minimum width of 10 ft. in order to provide adequate front and rear clearance for communications racks/cabinets. Standards and guidelines recommend a room 10 ft. x 10 ft.

8.2.1.2. The room shall be square in order to maximize available space.

9. BACKBONE DISTRIBUTION SYSTEM

9.1. DEFINITION

A backbone building cable system is the part of a premises distribution system that provides connection between the main telecommunications service entrance facilities, MDF(s), and IDF(s).

9.1.1. A backbone system normally provides:

9.1.1.1. Inter-building connections in campus-like environments.

9.1.2. Components

9.1.2.1. Main telecommunications service entrance facility - An area or location where off-site outside plant cables enter a campus for distribution to campus buildings.
9.1.2.2. MDF - An area where telecommunications systems are housed and connected to the main telecommunications wiring system.
9.1.2.3. IDF - Areas or locations that contain telecommunications equipment for connecting the horizontal cabling to the backbone cabling systems.
9.1.2.4. Cable pathways - Shafts, conduits, raceways, and floor penetrations, which provide routing space for cables.
9.1.2.5. Transmission media.
9.1.2.6. Cables to include: fiber optic, twisted-pair copper, and coaxial cable.
9.1.2.7. Hardware to include: connecting blocks, patch panels, interconnections, and cross connections.
9.1.2.8. Miscellaneous support facilities

9.2. COLOR CODE IDENTIFICATION

9.2.1. Use color-coded cross-connect fields to facilitate cable plant administration. The color codes for cross-connect fields are:

- **Orange**  Demarcation point
- **Green**  Network connections (i.e., network and auxiliary equipment).
- **Purple**  Common equipment, PBX, LANs, Muxes (i.e., switching and data equipment).
- **White**  First level backbone (i.e., main cross-connect to horizontal cross connect).
- **Gray**  Second level backbone (i.e., intermediate cross-connect to horizontal cross-connect).
- **Blue**  Horizontal cable (i.e., horizontal connections to Telecommunications outlets).
- **Brown**  Interbuilding backbone (campus cable terminations).
- **Yellow**  Miscellaneous (i.e., alarms, security)
- **Red**  Key telephone systems

Accepted methods for color-coding cross-connect fields include the use of colored backboards, connections, covers, or labels.

9.3. OUTSIDE PLANT CABLELING SYSTEMS

9.3.1. The Design Process

9.3.1.1. The campus outside plant consists of cables and structures needed to interconnect the Minimum Point Of Entry (MPOE) and nodes, campus data centers and MDF’s and IDF’s located within existing and new buildings. The supporting structure includes underground (in conduit) cables, maintenance holes (MH), hand holes (HH), pole lines, pedestals and outside terminals. The campus segment shall be designed and installed to the ANSI/EIA/TIA758 and 758-1 Specifications for Outside Plant Construction.

9.3.1.2. This section describes the policies and procedures for design activities associated with identifying cable routes from building to building, selecting cable distribution methods, determination of maintenance hole and hand hole requirements and electrical protection and bonding/grounding requirements.
9.3.2. Cable Distribution Methods

9.3.2.1. The District and appointed layout engineers shall be contacted to determine the best cable distribution method along the proposed cable route. The method shall be schedule 40 PVC underground conduit.

9.3.2.2. An underground cable system consists of cables placed in buried conduits connected to maintenance holes (MH) and hand holes (HH). Splices shall be located in maintenance holes only, when required.
9.4. OUTSIDE PLANT UNDERGROUND STRUCTURES

9.4.1. The following table shows the vertical or horizontal separations that shall be maintained between telecommunications facilities and other facilities sharing a common trench.

<table>
<thead>
<tr>
<th>Adjacent Structure</th>
<th>Minimum Separation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power or other foreign conduit</td>
<td>3 inches of concrete, or 4 inches of masonry, or 12 inches of well-tamped earth</td>
</tr>
<tr>
<td>Pipes (gas, oil, water, etc.)</td>
<td>6 inches when crossing perpendicular 12 inches when parallel</td>
</tr>
<tr>
<td>Railroad crossings (except street railways)</td>
<td>50 Inches below top of rail 12 feet from the nearest rail terminating on a pole 7 feet from the nearest rail terminating on a pole at a Siding.</td>
</tr>
<tr>
<td>Street railway</td>
<td>3 feet below the top of the rail</td>
</tr>
</tbody>
</table>

9.4.2. The following figure indicates a typical trench cross section for paved areas.
9.4.3. The following figure indicates a typical trench cross section for unpaved areas.

9.4.4. MH’s or HH’s are required where maximum cable reel lengths are exceeded, at the intersection of main and branch conduit runs, and at other locations where access to the cable in a conduit system is required.

9.4.5. MH’S or HH’S shall be design for telecommunications use only. Splices shall not be located in HH’s.

9.4.6. MH’s and HH’s shall meet the weight-bearing standards required under CPUC’s General Order Number 128. MH’s, HH’s, and subsurface equipment enclosures in street areas, which are subject to vehicular traffic, shall be constructed to withstand a minimum of H-20-44 highway loading as designated by the American Association of State Highway Officials. The strength of concrete used for MH’s shall be at least 3,500 psi.

9.4.7. Precast approved for telecommunication use MH/HH’s shall be used. Site-cast MH/HH’s shall be used when the size required exceeds precast sizes, obstructions prohibit placing precast MH/HH’s or a custom design is required.

9.4.8. All hardware in MH/HH’s shall be galvanized. Maintenance holes shall be equipped with bonding and grounding attachments, pulling eyes shall be at least 7/8 inches in diameter, and at a minimum, be located opposite of each conduit entrance point.

9.4.9. Provide proper grounding according to the latest National Electrical Code.

9.4.10. All conduits shall be sealed in a MH/HH system to prevent water entry and a sump of at least 8 inches in diameter shall be provided.

9.4.11. All MH covers shall be a minimum of 30” in diameter and marked with a unique identifier for easy identification (T for telephone), and have a permanently attached label indicating the assigned MH/HH number.

9.4.12. MH’s shall be sized to meet the maximum conduit requirements and be located to optimize the use of the associated conduit routes and be equipped with racking for cable support and management of cable.
9.4.13. All cables shall be properly coiled, racked, supported and secured to the MH/HH racks and cable steps. In addition, all cable splice closures shall be secured to the MH/HH racks, supported on their own cable steps and shall be bonded together, and grounded to the MH/HH ground attachment point.

9.4.14. MH’s that are between 12 feet and 20 feet long shall use two covers. MH’s over 20 feet long shall use three covers.

9.4.15. Permanent steps in the MH shall be installed in the neck rings at the same time as the MH is being installed, per manufacture recommendations.

9.4.16. Conduit entry points shall be located at opposite ends have the MH/HH, and preferably, the main conduit formations shall enter the end walls. For wall racking considerations, design splayed duct bank entrances at the end walls rather than center placement to ease in the racking of the cables and splices.

9.4.17. Provide pull ropes 3/8 size or mule tape in all empty unused conduits

9.4.18. Properly seal all conduits both ends with duct plugs.

9.4.19. Conduits shall enter at the lower level. The upper space shall be reserved for future additions.

9.4.20. No more than two 90° sweeps or bends shall be allowed between buildings, MH/HH’s, and MH/HH to MH/HH’s. 45° conduit angles are preferred. All bends and sweeps shall be concrete encased to prevent the pull rope from cutting through the conduit during the cable installation.

9.4.21. The following figure is an example of a typical MH
9.4.22. The following figure is an example of a typical Hand Hole

9.4.23. Pull boxes rather than utility vaults are used only in situations in which the maximum number of conduits in that route is never expected to exceed two four-inch conduits. A small unit (16" wide by 26" long by 18" deep) is used exclusively for a single conduit not to exceed two inches in diameter, such as might serve an isolated coin telephone or parking lot emergency phone. The standard size unit (3' wide by 5' long by 4' deep) shall be fitted with a hinged, traffic-capable lid (H-20 rating) with a locking mechanism. In all cases, the conduit feeding pull boxes shall enter and leave the pull box in-line parallel with the top of the box. A pull box shall not be used as a location in which to make a turn in the conduit routing.

9.5. TELECOMMUNICATIONS SERVICE ENTRANCE AND TERMINATION

9.5.1. Telecommunication facilities shall enter and terminate in the most suitable location needed to serve the occupants of a building.

9.5.2. The manner and position of the entrance is dependant upon the:

   9.5.2.1. Type of facility.
   9.5.2.2. Path of the services.
   9.5.2.3. Facility layout.
9.5.2.4. Landscape design and building appearance.

9.5.3. Underground Entrances

9.5.3.1. Underground entrances conduit shall be provided to service a building. The conduit for an underground entrance:

9.5.3.1.1. Runs from the building entrance location to a manhole.
9.5.3.1.2. Shall be blocked with expandable plugs to prevent rodent, water and odor ingress into building service entrances and telecommunication spaces.

9.5.3.2. Sizing of Underground Entrances

9.5.3.2.1. The amount and trade size of conduits for underground service entrances based on the eventual number and types of cables that the entrance will need to support. Standard quantity is four 4-inch size conduits to any new building. For multi-story buildings or multi-building complexes more may be required.

9.5.3.3. Copper cable demarcation pairs shall be terminated on rack mounted 110 termination blocks.

9.5.3.4. Multi-mode and single mode fiber shall be terminated in a fiber enclosure and mounted in the equipment racks. SC terminations are preferred for all fiber. Differentiate Single-Mode and Multi-mode SC connectors by color and labeling.

9.5.3.5. An Inter-exchange Common Carrier: For the community antenna television (CATV) network at De Anza, a .0500 hard-line trunk cable is required between all campus buildings – Main Distribution Facility (MDF) to Intermediate Distribution Facilities (IDF) as specified or required.

9.5.3.6. Campus fiber and copper distribution.

9.5.3.6.1. Between the main campus hubs (MCH) service entrance facility and campus main building hub (MBH). Strand count 36 multi-mode 50 micron and 36 single-mode fiber strands.
9.5.3.6.2. Between the main building hub (MBH) and secondary campus hubs (SBH). 24 multi-mode 50 micron and 12 single-mode fiber strands.
9.5.3.6.3. Multi-pair copper cable (100 pair increments) for PBX.

9.5.3.7. Fire alarm system shall have dedicated fiber optic cable stands or copper cable. The District Facilities department provides the specification.

9.5.4. Dual Entrances

9.5.4.1. Consideration installing dual service entrances (two 100 percent diverse routes) for buildings, which serve as a Data Center.

9.5.5. Maxcell Inner-ducts

9.5.5.1. Outside Plant (OSP) cables require Maxcell Inner-duct products installed prior to installation of cables.

9.5.6. Expandable duct plugs shall be used.
9.5.7. Outside plant to inside plant slice cases shall be hard casing and be rated for inside use.

9.6. RISER CABLE SYSTEM

9.6.1. Building Riser

9.6.1.1. The building riser cable system shall be installed in a physical star wiring topology to facilitate voice/data network connections. Each IDF shall be provisioned with both fiber optic and copper riser cable to support voice and data requirements and shall be terminated directly in the MDF and IDF with no intermediate cross-connects.

9.6.1.2. Vertically aligned closets with connecting sleeves or slots are the most common type of backbone pathway.

9.6.1.3. Position cable sleeves or slots adjacent to a wall on which the backbone cables can be supported.

9.6.1.4. Sleeves or slots shall not obstruct wall-terminating space.

9.6.1.5. EZ-PATH fire stopping products shall be specified.

9.6.1.6. Ensure that the minimum cable bend radius and the maximum vertical rise recommended by the cable manufacturer are not exceeded.

9.6.2. Code Considerations

9.6.2.1. Chapters 7 and 8 of the National Electrical Code (NEC) list strict requirements for building backbone-cabling installations. These are designed to stop the spread of flame and/or smoke in a facility.

9.6.2.2. The following list defines some of the NEC copper cable markings:

- MPP - Multipurpose plenum
- CMP - Communications plenum
- MPR - Multipurpose riser
- CMR - Communications riser
- MP - Multipurpose
- CM - Communications
- CMX - Communications, limited use (residential)
- CMUC - Under carpet

9.6.2.3. The following list defines some of the NEC fiber optic cable markings:

- OFNP - Nonconductive plenum
- OFCP - Conductive plenum
- OFNR - Nonconductive riser
- OFCR - Conductive riser
- OFN - Nonconductive
- OFC - Conductive

9.6.2.4. All backbone cable systems shall comply with local and national codes.
9.6.3. Cable Types

9.6.3.1. Copper Riser Cable
9.6.3.2. The copper riser cables shall be 24 AWG solid conductors, twisted-pair, cable insulated with expanded polyethylene covered by a PVC skin that meets the NEC low-flame requirements. All riser cable shall be compliant with EIA/TIA-568A Commercial Building Wiring Standard.
9.6.3.3. As minimum a 100 pair shall be provisioned between the MDF and each IDF.

FIBER OPTIC Cable: With 36 Single Mode and 36 Multimode:

9.6.3.4. Multi-Mode Fiber

9.6.3.4.1. The fiber optic cable shall be a single hybrid cable with a multi-mode fiber shall consist of a count of 36 individual color-coded multimode 50/125 micron laser optimized performance code 80 or performance code 90 type fibers. Corning or equal.
9.6.3.4.2. Fibers shall be terminated with 568SC (duplex SC) connectors on each end and shall not exceed .5db loss per mated pair.
9.6.3.4.3. Fibers shall be terminated in a fiber enclosure with duplex SC connectors and mounted in the equipment racks.
9.6.3.4.4. Higher fiber counts shall be required for some applications and/or network equipment. This shall be determined by ETS on a site-by-site basis.
9.6.3.4.5. Within the building orange color inner-duct is shall be provided to protect the cable.

9.6.3.5. Single Mode Fiber

9.6.3.5.1. The single mode fiber optic cable shall be a single cable with a fiber count of 36 individual color-coded single mode 8-10/125 micron fibers.
9.6.3.5.2. Fibers shall be terminated with 568SC (duplex SC) connectors on each end and shall not exceed .5dB loss per mated pair.
9.6.3.5.3. Fibers shall be terminated in a fiber enclosure with duplex SC connectors and mounted in the top of the station racks.
9.6.3.5.4. Single mode ports shall have a different color bulkhead than multi-mode ports within the same enclosure.
9.6.3.5.5. Appropriate warning labels for laser transmitters shall be highly visible on the fiber enclosure.

9.6.3.6. Coaxial Cable (For De Anza Campus Only as of April 08)

9.6.3.6.1. Trunk lines, 0.500-jacketed 75ohm, shall be installed between MDF room and all IDF rooms.
9.6.3.6.2. Trunk lines, 0.500 jacketed 75ohm, shall be installed between IDF rooms to connect all floors in multi-floor riser configurations
9.6.3.6.3. Distribution lines, RG6 drop cables, shall be installed in a star configuration from the corresponding IDF on each floor to the required workstation outlet.
9.6.3.6.4. To allow for a balanced system, all distribution lines run from any IDF/MDF room tap shall be the same length as the longest
run emanating from that room. Any cable slack on distribution lines shall be coiled in ceiling.

9.6.3.6.5. Provide one gigahertz taps as required in all IDF/MDF rooms for termination of all installed Trunk and lines

9.6.3.6.6. A power level of +10dBmV per channel is recommended for each receiver. The college's Video Systems Engineer shall be consulted for specific design criteria as needed.

9.6.3.6.7. 0.500 hard-line cables shall be terminated with 75-ohm Pi Type (Stinger) connectors.

9.6.3.6.8. Future or unused 0.500 shall be terminated with 75-ohm cable terminator connectors.

9.6.3.6.9. Provide a complete system design, including power supplies, taps, amplifiers, splice points, filters, couplers, etc. to be reviewed and approved by ETS dept.

9.6.4. Riser and backbone labeling

9.6.4.1. Backbone and riser cables shall be marked at each endpoint and at all intermediate access points or junction boxes. Label shall indicate origination and destination Telecommunication Rooms, sheath ID and strand or pair range.

9.6.4.2. All backbone riser cables shall be labeled at each end of the cable bundle at the furthest point where the sheath is intact (before breakout).

9.6.4.3. All outside plant backbone cables shall be labeled at each end and in each handhole/maintenance hole that they pass through. Labels shall be metal tags and waterproof so they do not decay when exposed to the elements. All labels shall be visible at point of access.

9.6.4.4. All cables shall be labeled according to the guidelines as set forth in the EIA/TIA 606-A standard.

10. HORIZONTAL DISTRIBUTION SYSTEM

10.1. DEFINITION

10.1.1. Horizontal cabling systems consist of two basic elements:

10.1.2. Horizontal Cable and Connecting Hardware - Provides the means for transporting telecommunications signals between the telecommunications outlet in the work area and the MDF or IDF.

10.1.3. Horizontal Pathways and Spaces used to distribute and support horizontal cable and connecting hardware between the work area outlet and the Intermediate Distribution Facilities include the following:

10.1.3.1. Under floor duct systems
10.1.3.2. Cellular floor systems
10.1.3.3. Conduit
10.1.3.4. Cable tray/wire basket
10.1.3.5. Access (Raised) floor systems
10.1.3.6. Open Ceiling distribution (j-hooks and approved supports)
10.1.3.7. No power poles are allowed for voice/data pathways.

10.1.4. Security Systems Support From ETS.
10.1.4.1. Campus security systems equipment, such as emergency telephones and associated devices is procured by others (police services in this case) and provided to the Project for installation.

10.1.4.2. The telecommunications scope of each project is responsible for provide necessary pathways, media and power for the connection of devices to the network operated by ETS.

10.2. WORK STATION OUTLET DISTRIBUTION

10.2.1. General Requirements

10.2.1.1. Telecommunications outlets are provisioned with double -gang back boxes and faceplates. Each telecommunications outlet shall have a 1 1/4-inch conduit that extends from the back box to the accessible ceiling space or to the nearest cable tray.

10.2.1.2. When back boxes serving different building services (i.e. telecommunications, electrical and mechanical) are located in common area such as adjacent to doorways (light switches, temperature control devices and telecommunication outlets) space shall be provided around all devices to allow cable access.

10.2.1.3. Telecommunications outlet locations shall be coordinated with the furniture layout. In offices and conference rooms, the typical outlet placement is +18” above the finished floor (AFF) and within three feet of a general-purpose, single-gang electrical outlet. This shall be altered based on the proposed furniture designs. Desks that have modesty panels placed against the wall will obstruct access to the electrical and telecommunications outlets. As such, outlets shall be located to the right or left of the desk location or at +6” above the desk surface. Wall phones shall be placed at 48” AFF.

10.2.1.4. In rooms with built-in counters, work surfaces and cupboards, the outlets shall be placed at +6 above counter/surface height, coordinating with the placement of the electrical outlets. In office spaces with built-in work surfaces, computers may be on the work surface or may be tower or floor-standing. For the floor standing, the telecommunications and electrical outlets shall still be located at +18” A.F.F., to preserve a clean wall surface. However, this will require the Architect to arrange for the drilling of routing holes in the work surface, installed with grommets, to facilitate the clean routing of patch cords and electrical cables. The grommet will be a minimum of two inches in diameter, made of plastic or rubber, oval or circular in shape, fitted to the hole drilled in the work surface with a replaceable cover that can hold the cabling snug after routing.

10.2.1.5. Outlets will not be placed such that they are located inside of cupboards and cabinets unless this specific purpose is desired (such as for a multimedia applications, concealed fax machine, printer, TV or computer) the designer shall provide the appropriate ventilation for the equipment.

10.2.2. Offices

10.2.2.1. A minimum of two telecommunications outlets shall be installed on opposing walls per single-person office. Each outlet location shall be equipped with one 6-port faceplate with four initial wired connections. In fixed configuration offices or if built-in furniture is to be constructed, it is preferred that the electrical and data outlets be located at +6” above the height of the desk surface or +36” A.F.F. If the office is large enough to support a visitor/conference table, an additional telecommunication outlet
shall be installed, normally at +18” A.F.F. Electrical outlets shall be placed consistent with the data outlet height.

10.2.2.2. Open office space modular office locations shall be equipped with one 6-port faceplate with four initial wired connections.

10.2.3. Conference Rooms

10.2.3.1. Conference Rooms shall require one communication outlet for every 10-feet of wall space on three sides of the room. The wall that is considered to be the “front” of the room shall have one communication outlet where the “whiteboard” is located. In addition, provisions shall be made to have a power and communication outlet flush mounted to the ceiling. Electrical outlets shall be placed consistent with the data outlet height.

10.2.3.2. Conference rooms shall require one floor mounted outlet box to allow access under the conference table.

10.2.3.3. For conference rooms scheduled for deployment of more extensive multiple media applications, refer to the Multi Media section of this standard.

10.2.3.4. For a standard conference room capacity of 25 persons or less, there shall be a minimum of one wireless access point. For a typical large conference room over 25 persons, there shall be a minimum of two wireless access points.

10.2.4. Standard Instructional Classrooms

10.2.4.1. Instructional Classrooms that have a specific teaching wall orientation will be provided with a minimum one communication outlet on each of the three non-teaching walls. On the teaching wall, a communication outlet shall be located under or in close proximity to the classic or electronic whiteboard. If an instructor’s podium is provided, an outlet will be required.

10.2.4.2. AV systems for classrooms shall be installed in a three gang box with a 2” conduit. The number and type of network cables included in each outlet will be defined by the instructional technology defined for each standard and smart classroom. Electrical outlets shall be placed consistent with the data outlet height.

10.2.4.3. At the designated main entrance to the classroom, a communication outlet for a wall mounted telephone will be provided. This outlet shall be positioned such that it does not interfere with light switches, whiteboards, projection screens, or access to the door. Wall mount telephones outlets are steel with a single port and a stud for phone mounting. The mounting height shall be +48” AFF to ensure compliance with ADA requirements.

10.2.4.4. Refer to the Multi Media section of this standard for treatment of classrooms designated as smart classroom being equipped with extended multimedia applications.

10.2.4.5. Each classroom shall have a minimum of two wireless access point (WAP). Number of WAP to be determined at time of programming.

10.2.5. Teaching Support Spaces (Work Rooms)

10.2.5.1. Faculty or Administrative workrooms will vary in size, configuration and function. These workrooms shall be equipped with shared departmental resources including facsimile machines, laser printers, desktop computers, and copiers. A variety of supplemental office devices, such as pencil sharpeners, laminators, electric staplers, etc. shall also be located in the workroom.
10.2.5.2. To facilitate the use of these devices, numerous communication and power outlets are needed. Workrooms are typically configured with counters and storage cupboards. Along counter tops where facsimile and printers shall be placed, communication outlets, with appropriate electrical outlets, will be distributed every six feet. Depending upon the size and configuration of the room, ETS and the project's need will define the number of wired connections required. These will be placed at +6” above counter height. For self-standing copier machines, a communication outlet will be provided with appropriate dedicated electrical outlets.

10.2.5.3. At the entrance to the workroom, a wall-mount telephone outlet will be required. Wall mount telephones outlets are steel with a single port and a stud for phone mounting. This outlet will be situated to avoid space conflict with door-swing, light switches, cupboards, fire extinguishers, water coolers, panels and any other fixture or devices that could interfere with the accessibility of the telephone.

10.2.6. Storage Spaces

10.2.6.1. All storage areas that will be accessed by FHDA staff on a daily basis will be provided with an outlet for a wall-mount telephone. If the storage area will be provisioned with general-purpose electrical outlets, at least one communications outlet (pathway, back box and faceplate) will be provisioned on each wall where there is an electrical outlet. Frequently, storage areas are redefined in purpose and shall change into small meeting rooms, offices or other work areas requiring connectivity.

10.2.7. Maintenance Spaces

10.2.7.1. A Maintenance space is defined as any room that contains materials, supplies, equipment or tools used for the performance of maintaining systems on campus. These can include but shall not be limited to electrical rooms, security rooms, mechanical rooms, control rooms, boiler rooms, garages and larger janitorial closets.

10.2.7.2. In these spaces, the minimum communications outlet shall be an outlet for a wall-mount telephone. The estimated size of the wall-mount telephone is 10”H x 12”W, centered on the outlet. This outlet will be located on the same wall as the doorway to the space, with sufficient clearance so that the outlet (and potential equipment placement) is not obstructed by light switches, equipment or storage shelves. If the door swings into the room, the outlet will be located on the wall beside the door lock, i.e. NOT beside the door hinges, so that the door can swing open and damage the telephone.

10.2.7.3. If the Maintenance Space is a room with operating mechanical and electrical equipment or will also be used as an office (or workroom) for maintenance personnel, the space will be equipped with additional communication outlet(s), located on the wall within three feet of a general-purpose electrical outlet. One communications outlet will be provided for each desk area assigned to the maintenance space with the standard 6-port faceplate configuration with four wired connections. (Refer to the section on Offices)

10.2.7.4. If the Maintenance Space contains panels, control systems or other devices that need to remotely communicate status and operation via modem or network connection, each of these devices will be separately equipped with a dedicated data outlet cable. The definition of which devices/panels need cabling will be done in conjunction with engineering
specialists for each device type. These can include HVAC monitors, elevators, EMS panels, electronic locks, irrigation controllers, etc.

10.2.8. Roof Tops

10.2.8.1. Control equipment that is located on building rooftops frequently requires special provisioning of communications connectivity. This equipment can include HVAC monitors, cellular/wireless antennas, broadcasting equipment, telescopes, communication relays, photo voltaics, etc. Some of these systems shall be added after the building is built. It is more important to provide a clear pathway through which connections can be added later. Any control systems that require network connectivity need to be located within 275 feet of a technology space (MDF or IDF).

10.2.9. Break Rooms

10.2.9.1. Break rooms will require one campus standard outlet with a six-port faceplate with four wired connections.

10.2.9.2. At the entrance to the room, a wall-mount telephone outlet will be required. Wall mount telephones outlets are steel with a single port and a stud for phone mounting. This outlet will be situated to avoid space conflict with door-swings, cupboards, fire extinguishers, water coolers, panels and any other fixture or devices that could interfere with the accessibility of the telephone.

10.2.10. Health Screening and Exam Rooms

10.2.10.1. Any health care rooms will require one campus standard outlet with a six-port faceplate with four wired connections.

10.2.10.2. At the entrance to the room, a wall-mount telephone outlet will be required. Wall mount telephones outlets are steel with a single port and a stud for phone mounting. This outlet will be situated to avoid space conflict with door-swings, cupboards, fire extinguishers, water coolers, panels and any other fixture or device that could interfere with the accessibility of the telephone.

10.2.11. Security Devices

10.2.11.1. TCP/IP-enabled security devices, such as cameras, will be connected to the network. These devices shall be located on building exteriors, light poles or other internal and external structures. Cabling to these devices shall require copper or fiber cable, electrical, possibly with outside plant sheaths. Pathway and routing to these security devices will be designed on an individual basis.

10.2.12. Wireless Access Points

10.2.12.1. For support of wireless access points, a ceiling communications outlet shall be installed adjacent to a power outlet 6” below the ceiling. This shall take the form of a flush-mount outlet.

10.2.12.2. Every Lab and Classroom shall have wireless access points (WAP). With 50 or less students/occupants, minimum of two (2) connection points shall be provided. With more than 50 students/occupants, minimum of four (4) connection points shall be provided. A connection point shall have separate conduits for data and Power (mounting hardware/preparation for
the device will be specified if necessary). Pull two data wires to each WAP location. Mounting location is within 6 inches of the ceiling except where when noted a different location is required.

10.2.13. Student Carrels

10.2.13.1. Student carrels require a minimum of one faceplate with two wired connections. The designer shall provide power at each location.

10.2.14. Computer Laboratories

10.2.14.1. Instructional Lab – slab floor - In an Instructional Computer Lab, the student computers will be oriented towards a whiteboard or teaching wall upon which the Instructor’s workstation shall project images and perform demonstrations. This lab is typically sized for a class of 40 student computers and an instructor’s computer. Lab design shall include ADA. The lab may also contain 3-4 printers, scanners and other network devices. The tables are typically arranged to allow the students to all face in one direction and not need to twist around to watch the instruction. Tables are usually positioned against the walls. Printers, scanners and other network devices are distributed around the room as space permits. The preferred outlet arrangement for this layout is to provide a divided metal raceway around the periphery of the room with outlets at intervals corresponding to the table spacing. Tables will be situated flush against the walls to prevent the stretching of power or data cables across aisles or walkways. At the front of the classroom, on either side of the whiteboard, outlets are provisioned. Normally District representatives design the layout of the room. ADA requirements are to be considered.

10.2.14.2. Computer Lab for Student Self-Study - In a computer lab where students come to work on assignments, there is typically no formal instruction. As such, the lab layout is oriented to provide the highest number of student stations, with little or no space reserved for an instructor’s workstation or whiteboard. The layout of this type of computer lab will vary with room dimensions and shape. In an arrangement of long tables, typically one computer workstation is provided for every 3.5 feet of tabletop. Circular Computer Kiosks vary in size, typically 6-8 stations per kiosk. Outlets for these computer labs shall follow the general design guidelines.

10.2.14.3. All data and power outlets on walls in self-study labs shall be provisioned in metal raceway at a height of +6” above the table top, typically +36” A.F.F. Outlets will be provisioned intervals corresponding to the table spacing. All rooms, which support islands of tables or kiosks, will be configured with flush-mount floor boxes. Dual-purpose floor boxes (communication and power) are acceptable providing that there is adequate separation maintained so that all power outlets and all communication jacks can be used simultaneously without the cords interfering with each other’s access. The preferred design is a flush mount brass floor box with brass covers that can be accessed when an outlet is used. All floor outlets will be provisioned in the floor slab. No cabling will extend across the floor. Floor mounted raceway (pancake raceway) is not acceptable. Sufficient floor boxes will be provided to support the required number of computers, plus supplemental printers, scanners and other network devices.

10.2.15. Raised Floor computer Labs

10.2.15.1. In new buildings with rooms that are designed for permanent computer labs, the computer lab design shall include a raised floor environment. For
ground floor implementations, a depressed slab is preferred to allow for the raised floor environment without losing rooms space due to ramps or stairs. The raised floor environment will provide an accessible cabling system. The raised floor will provide a depth of 12 inches, with removable floor tiles to grant unhindered access to the floor space.

10.2.15.2. Within the raised floor, there will be a matrix of power and communication outlets that provides sufficient density to computer tables. Typically, this will be communication outlets each equipped with four data jacks, spaced every four feet, and equivalent power plugs and circuits to power computers and network devices plugged in to every network jack and powered on concurrently. The number and location of communication and power outlets will vary with room size and orientation. Each matrix will be custom designed with the ETS.

10.2.15.3. Other low profile raised floor systems are permitted on a case-by-case basis similar to the floor system shown below.

10.2.15.4. Cables routing to the data outlets will be fully enclosed in a metallic raceway system that provides sufficient space so that the enclosed cabling does not exceed a 40% fill. The raceway system shall consolidate to suitable junction boxes that route conduits back to the serving Intermediate Distribution Facility. Sufficient conduits shall be provide as not to exceed a 40% fill.

10.2.15.5. Raceway system will be suspended from the floor and mounted so that the communication and power outlets face horizontally. This will minimize the possibility of dust, particulate matter, and liquid falling into the network jacks. The removable floor tiles will be provided with notched access so that patch and power cords can be routed from the raised floor to the computer tables. Floor tiles will be re-locatable so that as room configurations change, cable notches can be positioned underneath tables and avoiding circulation paths.

10.2.16. Specialty Locations

10.2.16.1. The campus will have specialty locations that will require custom configuration at the time of building design. These locations include but are not limited to theatres, lecture halls (seating capacity > 200), auditoriums, athletic broadcasting venues and control rooms, scoreboards, electronic advertising boards, and others that cannot be envisioned at this time. At the time of design, the requirements for each of these locations will be individually determined with ETS.

10.2.16.2. Floor duct systems (Walker-type) are permissible when routing horizontal cable to otherwise inaccessible locations in the center of slab floors. The sizing of these ducts is to be based upon 100% spare capacity allocated
within the duct fill allowance (space for future additions). Floor duct and conduit system shall provide sufficient space so that the enclosed cabling does not exceed a 40% fill.

10.3. HORIZONTAL CABLING

10.3.1. Topology

10.3.1.1. Horizontal cabling shall be installed in a star topology. Each work area outlet shall be cabled directly to a patch panel in the MDF and/or IDF. Horizontal cabling shall be terminated in the MDF and/or IDF, which is on the same floor as the area being served.

10.3.1.2. Splices and bridge taps are not permitted in horizontal cabling.

10.3.1.3. Use of plastic tie wraps or cable ties are prohibited, Velcro tie wraps or cable ties shall be used.

10.3.2. Jack Table Preparation and Sample

10.3.2.1. For each project the design shall prepare a “jack table” reflecting the connectivity planned for the project.

10.3.2.2. This table will be used to verify the correlation between wired connections and patch panel port counts during the design and demonstration of the connectivity provided to each space in the project building or area.

10.3.2.3. This table will also be maintained throughout the project and turned over to ETS several months prior to completion so that ETS can utilize it to develop end use equipment lists and interface with the terminations at the MPOE and at network equipment (switches) being provided by ETS.
10.3.2.4. The following is a sample of the content needed in the jack table.

<table>
<thead>
<tr>
<th>SAMPLE BUILDING</th>
<th>BUILDING JACK TABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Bldg Floor</td>
<td>Voice</td>
</tr>
<tr>
<td>1st Total</td>
<td>9</td>
</tr>
<tr>
<td>2nd Total</td>
<td>11</td>
</tr>
<tr>
<td>3rd Total</td>
<td>12</td>
</tr>
<tr>
<td>Roof Total</td>
<td>1</td>
</tr>
<tr>
<td>Grand Total</td>
<td>33</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bldg Floor</th>
<th>Room</th>
<th>Rm. Name</th>
<th>Voice</th>
<th>Data</th>
<th>Video</th>
<th>TC Room</th>
<th>Serial</th>
<th>Loc</th>
<th>Campus Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>101</td>
<td>Lobby/Gallery</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>148</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st</td>
<td>102</td>
<td>Gallery</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>148</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st</td>
<td>103</td>
<td>Exhibit/Storage</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>148</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st</td>
<td>105B</td>
<td>Special Studies</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>148</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st</td>
<td>108</td>
<td>Info Center</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>148</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st</td>
<td>108A</td>
<td>Office</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>148</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st</td>
<td>110</td>
<td>Faculty</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>148</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st</td>
<td>114</td>
<td>Director</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>148</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st</td>
<td>115</td>
<td>Secretary</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>148</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st</td>
<td>144</td>
<td>Elec./Rate</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st</td>
<td>146</td>
<td>Comm. Rm - ER</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>148</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st</td>
<td>156</td>
<td>Hall</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>148</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st Total</td>
<td>9</td>
<td>22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd</td>
<td>202</td>
<td>Lecture</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>270</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd</td>
<td>202</td>
<td>Lecture</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>270</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd</td>
<td>206</td>
<td>Dept. Office</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>270</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd</td>
<td>206A</td>
<td>Faculty</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>270</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd</td>
<td>206B</td>
<td>Faculty</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>270</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd</td>
<td>206C</td>
<td>Dept. Chk</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>270</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd</td>
<td>208B</td>
<td>Counselor</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>270</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd</td>
<td>208C</td>
<td>Assessment</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>270</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd</td>
<td>209D</td>
<td>Director Office</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>270</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd</td>
<td>250</td>
<td>Classroom</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>270</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd</td>
<td>268</td>
<td>Electrical</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd</td>
<td>270</td>
<td>Comm. Rm</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd</td>
<td>272</td>
<td>Janitor</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd</td>
<td>292</td>
<td>Hall</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>270</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd Total</td>
<td>11</td>
<td>28</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd</td>
<td>302</td>
<td>Instruction</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>372</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd</td>
<td>302</td>
<td>Instruction</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>372</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd</td>
<td>302</td>
<td>Instruction</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>372</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd</td>
<td>314</td>
<td>File Server</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>372</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd</td>
<td>318</td>
<td>Storage</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd</td>
<td>320</td>
<td>Dept. Offices</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>372</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd</td>
<td>320</td>
<td>Dept. Offices</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>372</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd</td>
<td>320A</td>
<td>Dept. Chk</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>372</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd</td>
<td>320B</td>
<td>Secretary</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>372</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd</td>
<td>322</td>
<td>Faculty</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>372</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd</td>
<td>360</td>
<td>Support</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>372</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd</td>
<td>362</td>
<td>Math. Comp.</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>372</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd</td>
<td>364A</td>
<td>Math Support</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>372</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd</td>
<td>372</td>
<td>Comm. Rm</td>
<td>0</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd</td>
<td>374</td>
<td>Jan</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd</td>
<td>382A</td>
<td>Vendoring</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd</td>
<td>384</td>
<td>Hall</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>372</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd Total</td>
<td>12</td>
<td>26</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roof</td>
<td>500</td>
<td>Elevator Mach. Rm</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>678</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

10.3.3. Cable Slack

10.3.3.1. Cable runs shall provide additional slack at both ends to accommodate future cabling system changes. The recommended minimum amount of slack is:

- 10.3.3.1.1. 10 ft for cables in the MDF and/or IDF.
- 10.3.3.1.2. 10 ft. for fiber optic cables in the ceiling above workstation.
- 10.3.3.1.3. 3 ft. for copper cables at the workstation.
10.3.3.2. Ensure minimum cable bend radius (less than 90 degrees) is maintained in the slack loop for all fiber, coaxial and copper cables.

10.3.3.3. For Coaxial distribution or drop cables, all slack loops will be maintained and supported above ceiling to meet requirements for equal length cables.

10.3.4. Grounding and Bonding

10.3.4.1. Horizontal cabling and connecting hardware shall be grounded and bonded in compliance with ANSI/NFPA 70 requirements and practices, except where other authorities or codes impose requirements that are more stringent.

10.3.4.2. An approved ground shall be installed in the telecommunications closet for:

10.3.4.2.1. Cross-connect frames.
10.3.4.2.2. Patch Panel racks.
10.3.4.2.3. Active telecommunications equipment.
10.3.4.2.4. Racks
10.3.4.2.5. Cable Tray
10.3.4.2.6. Ladder Racks
10.3.4.2.7. All outside Plant connectivity
10.3.4.2.8. Technology Equipment Cabinets

10.3.5. Labeling

10.3.5.1. All cable terminating in the MDF and/or IDF shall be labeled according to the District standards and the ANSI/TIA/EIA-606 standard.

10.3.5.2. All components in the MDF, IDF and in the work areas shall be labeled with machine generated labels. No hand written labels shall be used on any component of the telecommunications cabling system.

10.3.5.3. Both ends of all installed cables shall be labeled with machine-generated labels. No hand written labels shall be used on any component of the telecommunications cabling system. Lettering shall be black, with a white background, unless otherwise specified. Lettering shall be made as large as possible, while maintaining all required information in available space.

10.3.5.4. All fiber optic components, including cables, patch panels, inner-ducts and conduits shall be identified with a label indicating fiber optic cables and light sources are present.

10.3.5.5. OSP plant cables in every manhole, vault, inside of the building all require metal tag labels.

10.4. CABLE TYPES

10.4.1. Copper Cable

10.4.1.1. The voice and data workstation cable shall be Category 6, 4 pair, 22 to 24 AWG unshielded solid conductor twisted pair cable. Four Category 6 cables shall be pulled to each location except where noted on site-specific drawings. The cable shall meet or exceed all requirements for Category 6 cable specified in ANSI/TIA/EIA-568-B.2-1. Refer to the latest ANSI/TIA/EIA 568 standard for current approved standards.

10.4.1.2. Plenum or PVC requirements will be determined by local codes.
10.4.2. Fiber Optic Cabling

10.4.2.1. The fiber optic cable for a workstation shall be a single plenum-rated cable with a fiber count of four individual color-coded multimode 50/125 micron laser optimized performance code 80 fibers. Corning or equal.

10.4.2.2. Fibers shall be terminated with 568SC (duplex SC) connectors on each end and shall not exceed .5db loss per mated pair. In the telecommunications closet, fibers shall be terminated in a fiber enclosure with duplex SC bulkheads and mounted in the equipment rack or cabinet. Higher fiber counts shall be required for some applications and/or network equipment.

10.4.2.3. Within the MDF/IDF, plenum rated inner-duct is required to protect the cable in the overhead cable trays. The quantity of fibers to be terminated at the workstation and in the MDF/IDF will be specified on a site-by-site basis.

10.4.2.4. Fiber patch panels shall be marked using adhesive labels indicating the range of fibers installed in it. Each panel shall be labeled with the origination and destination Telecommunication Spaces and the strand count. Each fiber strand shall be labeled

10.4.3. Patch Cords

10.4.3.1. The Contractor is to provide stranded category 6 patch cords, manufactured by the supplier of the station cable, for the District’s connection of data connectivity throughout the project.

10.4.3.2. Quantity and lengths shall be as specified by the designer in the plans and in accordance with the request of ETS.

10.4.4. Cross-connect wire

10.4.4.1. On all projects the Contractor shall provide approved CommScope or equal Category 3 cross connect wire to complete the transition from outside plant copper cable building entrance protector to local building MDF cross connect fields. A minimum of three-1,000 foot reels shall be provided in the building MDF. (1) Reel shall be yellow/blue and (2) white/red.

10.4.4.2. The IDF’s in the project building shall each be provisioned with two-1,000 foot reels. (1) Reel shall be yellow/blue and (1) white/red.

10.4.4.3. The campus MPOE shall be provided with three-1,000 foot reels.

10.4.5. Coaxial Cables

10.4.5.1. Coaxial drop cables shall be RG6 type 75-ohm standard construction. 18-gauge copper covered steel center. Outer shield of 34 AWG bare aluminum braid. Flame retardant PVC jacket. Meets NEC article 820. 90% braid shield. CommScope or equal
10.5. HORIZONTAL CONNECTING HARDWARE

10.5.1. All connecting hardware used for horizontal cable connections shall meet the requirements for reliability, safety, and transmission performance specified in:

10.5.1.1. ANSI/TIA/EIA-568-B.
10.5.1.2. ANSI/NFPA 70.

10.5.2. Telecommunications Outlets In The Work Area

10.5.2.1. The standard voice/data outlets shall be four (4) CAT6 cables with RJ45 conductor jacks with a modular faceplate. All modular jacks shall conform to TIA-568B wiring and color-coding. Factory supplied blanks shall be provided for all port positions not populated on the project.

10.5.2.2. Standard hard wall locations shall be provisioned with a flush-mounted 6-port faceplate. Mount outlets at the standard electrical outlet height if unobstructed by office furniture or above desktop. The faceplate and outlets shall be white, ivory or stainless steel in color coordinated with electrical outlet in color unless otherwise noted on the site-specific requirements. Provide blank inserts as needed.

10.5.2.3. Modular furniture locations shall be provisioned with a compatible flush-mounted modular 4-port faceplate where appropriate. If flush mounting is not possible, a surface-mounting box (secured with self-tapping screws) with four outlets shall be installed along the bottom raceway in the back corner of the cubicle. Color of mounting box and outlets shall be black unless otherwise noted.

10.5.2.4. Wireless Access Point (WAP) shall be located in all common areas, including meeting rooms and all classrooms. WAP standard outlet is a face plate mounted and installed 6 inches below ceiling. WAP outlets include (2) CAT6 cables with modular RJ45 female Cat6 connectors. Power duplex outlet is required and located 6 inches apart from the WAP typical installed at same height. Same Power circuit can share up to 6 locations with in the building.

10.5.2.5. All faceplates/outlets for station cable terminations will be labeled. This includes wall outlets, wall phones, faceplates in floor boxes and all other termination points. For faceplates equipped with a label trough and plastic cover, the Contractor shall include the jack designation in the label trough.

10.5.2.6. All faceplates/outlets will be labeled according to the following guidelines

10.5.2.6.1. Unique faceplate/outlet number incrementing numerically

10.5.2.7. Jack labels are indicated by letters (A, B, C, D, E, F) labeled left to right, top to bottom.
10.5.2.8. RJ 45 jack colors are A (blue) B (orange) C (green) and D (ivory).
10.5.2.9. For large bundles of Category 6 cables (up to 50 max), each cable bundle shall be independently labeled every 50 feet if in overhead cable tray or J-hooks. Bundle labels shall state the type of cable and the Telecommunications Space where that cable bundle will terminate.

10.5.3. Wall Voice Outlets / Telephone /Misc.

10.5.3.1. The wall voice outlets shall be a flush-mounted modular single gang faceplate for use with wall-mounted telephones, with one 8-position outlet connector.
10.5.3.2. Wall mount telephone outlets will be installed at height to meet current federal requirements for Title III ADA accessibility.
10.5.3.3. Wall voice outlets shall be run to projection booths and to the front of each lecture hall (Next to the teaching console).

10.5.3.4. Security Data ports (Single Cable) shall be installed next to duplex power outlets for security camera operation at the following locations. Primary entryways, large gathering areas, roof locations as designated (2 minimum) additional locations as specified.

10.5.4. Flush Floor Monuments

10.5.4.1. The flush floor monuments shall be Wiremold, Multiple Service Flush Poke-Thru. This monument will accommodate the Keystone outlets.

10.6. HORIZONTAL CABLE TERMINATION IN THE TELECOMMUNICATIONS CLOSET

10.6.1. Copper Patch Panels

10.6.1.1. Horizontal data cables shall be terminated on modular high-density Category 6 48-port angled patch panel with angled modular terminations. The patch panels and cable management panels shall be two rack units in height (3.5 inches). 10 inch Vertical cable management shall be installed between each station rack and on each end of a row when multiple station racks are present.

10.6.1.2. All data jacks from each workstation location shall be terminated in order, on the same patch panel and be adjacent to each other. Patch panel jack colors shall match workstation jack colors. In situations where you have single wall phones, they are to be terminated on a separate patch panel below all other connections in order to preserve color code integrity.

10.6.1.3. A minimum (2) 50 pair 110 wiring termination blocks shall be installed in the station racks. A tie cable shall be provided to the wall mounted 110 wiring termination block.

10.6.1.4. Use of plastic tie wraps or cable ties prohibited. Velcro tie wraps or cable ties to be used in their place.

10.6.1.5. All ports on the station patch panels shall be labeled with the station cable labels. Cables will be terminated in ascending outlet and jack order, and be so labeled. Exceptions are that wall phone locations are located in the lower area of the patch panel.

10.6.1.6. Voice riser and backbone pairs shall be terminated on rack mounted 110 IDC style termination blocks. Labeled using a similar convention as the backbone/riser cable labeling. The 110 block will be labeled with the cable name including: The origination point The destination point The type of cable.

10.6.2. Cross Connect System

10.6.2.1. The Main Distribution Facility and telecommunications closets will each have a designated plywood wall for installation of 110 IDC style termination blocks.

10.6.2.2. Termination blocks shall be fire-retardant molded plastic blocks with horizontal index strips.

10.6.2.3. Horizontal jumper troughs and a bottom express trough shall be installed with all 110-termination blocks.

10.6.2.4. 110C type clips shall be used for terminating all UTP trunk cables.
10.6.3. Fiber Enclosures

10.6.3.1. For installations of more than 24 strands of fiber, a fiber enclosure shall be installed in a station rack. Fiber enclosures shall be capable of support 72 type 568SC duplex connectors.

10.7. HORIZONTAL PATHWAYS AND SPACES

Horizontal pathways and spaces consist of structures that conceal, protect, and support horizontal cables between the workstation location and the telecommunications closet.

10.7.1. The horizontal distribution system shall be designed to accommodate all types of cable. When determining the type and size of the pathway:

10.7.1.1. Consider the quantity and size of cables that the pathway is intended to house.
10.7.1.2. Allow for 40% estimated growth of the area served over the planning cycle.
10.7.1.3. Accommodate cabling changes.
10.7.1.4. Minimize occupant disruption when horizontal pathways and spaces are accessed.
10.7.1.5. Facilitate ongoing maintenance of horizontal cabling.
10.7.1.6. Accommodate future additions to and changes in cabling, equipment, and services.
10.7.1.7. Consider appearance of cable in areas where there is not to be a drop ceiling.
10.7.1.8. No Power Poles allowed.

10.7.2. Clearances

10.7.2.1. To avoid electromagnetic interference (EMI), all pathways shall provide clearances of at least:

10.7.2.1.1. 4 ft. from motors or transformers.
10.7.2.1.2. 1 ft. from conduit and cables used for electrical power distribution.
10.7.2.1.3. 1.5 ft. from electrical fluorescent lighting and electrical power cables or conduits.

10.7.3. Interior Conduit Installation Guidelines

10.7.3.1. The Designer or Engineer will design conduits conforming to EIA/TIA 569 B Commercial Building Standard for Telecommunications Pathways and Spaces and the following.

10.7.3.1.1. Run in the most direct route possible (parallel to building lines), with no more than two 90-degree bends in any dimensional plane between pull points or pull boxes (PBs).
10.7.3.1.2. An accessible pull box shall be added to a conduit run if it contains more than the equivalent of two 90-degree turns in any dimensional plane.
10.7.3.1.3. No flex-conduit material or LB’s shall be used for telecommunication pathways.
10.7.3.1.4. No continuous sections longer than 100 ft. For runs that total more than 100 ft in length insert pull points.
10.7.3.1.5. All conduits shall have a minimum bend radius 10-times the diameter of the conduit.
10.7.3.1.6. All conduit stub-ups, up to trade size 1¼” shall have a bend radius 6-times times the diameter of the conduit. Conduit stub-ups that are trade size 2-inch or less shall only have a 45 degree bend above the wall.
10.7.3.1.7. Equip all conduits with a plastic or nylon line pull cord with a minimum test rating of 200 lb.
10.7.3.1.8. Minimum trade size for communication outlets EMT conduits is 1 ¾” inch for use with all communication back boxes.
10.7.3.1.9. All communication conduits from the outlet box shall stub up 6-inches above the walls.
10.7.3.1.10. Conduits will stub up to an accessible ceiling area.
10.7.3.1.11. The conduits shall have a bushing on the stub up end.
10.7.3.1.12. Conduits, which feed modular furniture, are considered “feed points”. These conduits are sized according to the number of cables and outlets served.

10.7.4. Cable Tray

10.7.4.1. The preferred method to support telecommunication cables is the use of wire basket tray. This approach allows for change in direction or elevation without having installing pre-manufactured assemblies. Design of the size and location of the communication wire basket tray will be coordinated with the ETS. Eighteen-inch (18") minimum width.

10.7.4.2. Cable tray routes will follow normal corridor routes. The tray shall be placed in the hallway ceiling space in such a manner that at least 12-inches of space exist above the sides of the cable tray and there are at least 12-inches to 18-inches of clearance on at least one side of the tray. There shall be working space on one side of the tray to facilitate the installation of cable.

10.7.4.3. Cable tray support shall ensure the support of the tray and is seismically braced. All metallic cable trays shall be grounded.

10.7.4.4. Clearly mark all cable trays and grounding conductors in accordance with ANSI/ TIA/ EIA- 606 and J-STD- 607-A.

10.7.5. Modular Furniture

10.7.5.1. Cubicle and partitioned offices will require “feed points”. A feed point is a large (usually a two-inch conduit or 4-gang box) used to route communication cables into the raceway system of modular furniture. The mounting height and exact location of the feed points will depend upon modular furniture system to be installed. The type of furniture system to be used shall be conveyed to both the Electrical and Telecommunication Consultants. The type of furniture selected shall be coordinated with the District during the design phase.

10.7.5.2. Each modular furniture location will be provisioned with at least one communications outlet. Modular units shall be evaluated for service to printers, scanners and other office ancillary equipment.

10.7.5.3. When laying out a modular furniture system it is very important to consider how power and communication cable will be connected to the furniture system.
10.7.5.4. Furniture pathways shall be entered from building walls, columns, ceilings, or floors. No Power Poles are allowed.

10.7.6. Floor Boxes

Floor boxes will be used in limited locations where connectivity is needed for islands of computers/desks, in order to alleviate the incidence of power and data cables straddling across floors. If outlets shall be installed in the floor there shall meet the following minimum requirements.

10.7.6.1. At no time shall conduit feeding the floor box run below the membrane barrier or be in the soil. Supporting conduits shall run in the slab and shall be PVC schedule 40 or better.

10.7.6.2. Supporting conduits shall be sized for 20% fill to allow for additional cabling.

10.7.6.3. Conduits feeding floor boxes will be dedicated runs and not chain through multiple floor boxes. Conduits will stub up to the closest wall.

10.7.6.4. Floor boxes will be of metal construction to support the anticipated weight and travel. Floor boxes will have lids that can be screwed down to hinder unauthorized access.

10.7.6.5. Floor boxes shall support a combination of data and electrical outlets. The design of the floor box shall be such that all data and electrical ports can be fully connected with cables without causing any obstructions that would limit the use of any jacks/plugs.

10.7.7. Pull Boxes

10.7.7.1. Determine if any pull boxes are needed along the conduit run. Pull boxes are required in sections of conduit that are 100 feet or more in length or that contain more than two 90° bends.

10.7.7.2. Pull boxes shall not be used in lieu of a bend. Cables shall feed straight through a pull box. Show the locations and sizes of the pull boxes on the floor plan.

10.7.7.3. The required size of pull box shall conform to the following chart.

<table>
<thead>
<tr>
<th>Maximum Trade Size of Conduit</th>
<th>Size of Box Width</th>
<th>Length</th>
<th>Depth</th>
<th>For Each Additional Conduit Increase Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>¼</td>
<td>4 in</td>
<td>12 in</td>
<td>3 in</td>
<td>2 in</td>
</tr>
<tr>
<td>1</td>
<td>4 in</td>
<td>16 in</td>
<td>3 in</td>
<td>2 in</td>
</tr>
<tr>
<td>1-1/4</td>
<td>6 in</td>
<td>20 in</td>
<td>3 in</td>
<td>3 in</td>
</tr>
<tr>
<td>1-1/2</td>
<td>8 in</td>
<td>27 in</td>
<td>4 in</td>
<td>4 in</td>
</tr>
<tr>
<td>2</td>
<td>8 in</td>
<td>36 in</td>
<td>4 in</td>
<td>5 in</td>
</tr>
<tr>
<td>2-1/2</td>
<td>10 in</td>
<td>42 in</td>
<td>5 in</td>
<td>6 in</td>
</tr>
<tr>
<td>3</td>
<td>12 in</td>
<td>48 in</td>
<td>5 in</td>
<td>6 in</td>
</tr>
<tr>
<td>3-1/2</td>
<td>12 in</td>
<td>54 in</td>
<td>6 in</td>
<td>6 in</td>
</tr>
<tr>
<td>4</td>
<td>15 in</td>
<td>60 in</td>
<td>8 in</td>
<td>8 in</td>
</tr>
</tbody>
</table>

10.7.8. Fire stopping
10.7.8.1. All horizontal pathways that penetrate fire-rated barriers shall be fire stopped in accordance with the applicable codes. EZ-PATH products shall be used for all installations.

10.7.9. Raised Floors

10.7.9.1. Raised floors with at least 8” inches of under floor clearance shall be designed with wire basket cable tray for under floor cable distribution.

11. GROUNDING AND BONDING

11.1. TELECOMMUNICATIONS BONDING AND GROUNDING

11.1.1. Telecommunications bonding and grounding is additional bonding and grounding specifically for communications systems. Network equipment performance and reliability issues are handled by additional, specific equipment manufacturer requirements. Communications bonding and grounding serves the following three basic purposes:

11.1.1.1. Minimizes electrical surge effects and hazards.
11.1.1.2. Augments electrical bonding.
11.1.1.3. Lowers the system ground reference potentials.

11.2. ANSI/TIA/EIA - 607

11.2.1. The Telecommunication Consultant will work with the Electrical Designer to insure a Telecommunication ground system is installed per J-STD-607-A Commercial Building Grounding and Bonding Requirements for Telecommunications. This Telecommunications Ground System shall be installed to support the Information Technology Rooms and Infrastructure.

11.2.2. A permanent infrastructure for telecommunications grounding and bonding is required.
11.2.3. All metallic structures (racks, cabinets, cable runway, etc.) shall be attached to the TGB using grounding straps. Use minimum of #6 AWG, green jacket, stranded grounding wire between all equipment racks and the telecommunications grounding busbars. All metallic structures will be stripped of the paint coating at the point of grounding connection to ensure that the metallic straps and ground wires mate to the metal structure with sufficient contact.

11.2.4. A Telecommunications Main Grounding Busbar is directly bonded to the electrical service ground in the Main Distribution Facility. Each Telecommunications Closet Grounding Busbar shall be connected to the Main Grounding Busbar.

11.2.5. If a raised floor is present, the raised floor bonding shall consist of a #6 AWG, bare stranded copper ring around the floor perimeter. #6 AWG supplemental cables shall run within the perimeter in both directions to form a grid. All crossovers shall be bonded. The supplemental cables shall bond to each fourth (4th) pedestal and both ends will anchor on the perimeter #6 AWG ring. A bus bar shall be provided under the floor with a dedicated connection to the Telecommunications Main Grounding Busbar (TMGB) or the Telecommunications Grounding Busbar (TGB), depending on the endues room’s location. This bus bar shall be labeled “Raised Floor Bus”. Two diametrically opposed connections shall be made between the raised floor grounding bus bar and the perimeter #6 AWG ring.

11.2.6. The TMGB shall be a predrilled copper busbar provided with standard NEMA bolt hole sizing and spacing. The TMGB shall be electro-tin-plated for reduced contract resistance. The TMGB shall be a minimum size of 5 mm thick, 100 mm wide and 300 mm in length. The TMGB shall be insulated from IS support by a 50 mm separation.

11.2.7. The TMGB will be bonded to the electrical panel ground bus bar and to building steel or ground rod by conventional welds, exothermic welds clamp-and-braze method, or latest UL approved compression type connectors. Exothermic welds are the preferred
method. Because of the high temperatures involved, copper materials shall be bonded to iron or steel. The mold size shall match the cable or conductor cross section.

11.2.8. Sizing of the telecommunications bonding backbone per ANSI J-STD-607-A. Sizing of the building backbone ground conductor from MDFs to IDF shall be in accordance with latest technical guidelines and standards. Typical guidelines are as follows:

<table>
<thead>
<tr>
<th>Distance (feet)</th>
<th>Minimum Conductor Size (AWG)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 13</td>
<td>6</td>
</tr>
<tr>
<td>20-26</td>
<td>3</td>
</tr>
<tr>
<td>26-33</td>
<td>2</td>
</tr>
<tr>
<td>33-44</td>
<td>1</td>
</tr>
<tr>
<td>44-52</td>
<td>1/0</td>
</tr>
<tr>
<td>52-66</td>
<td>2/0</td>
</tr>
<tr>
<td>&gt; 66</td>
<td>3/0</td>
</tr>
</tbody>
</table>

11.2.9. Generally a continuous 6 AWG conductor is provided between each equipment in the Telecommunication Closet and its associated TGB.

11.2.10. Each Telecommunications Closet Grounding Bus bar is also directly bonded to building structural steel and other permanent metallic systems if accessible. A single ground point is recommended.

11.2.11. Contractor shall provide qualified personnel and test equipment to measure the resistance to ground of the grounding system before connecting equipment. Resistance to ground using the 3-point, fall-of-potential test method shall not exceed 5 ohms unless otherwise noted. The Contractor shall record resistance measurements, test point locations, ambient temperature, weather, conditions at time of test and provide testing results to the District.

12. HEATING, VENTILATION AND AIR CONDITIONING

The following information is the basic guidelines for the Mechanical Design Consultant. These design guidelines are to be considered to be minimum requirements. The HVAC engineer shall contact FHDA to determine if there are any other or special requirements.

12.1. GENERAL REQUIREMENTS

12.1.1. Mechanical Drawings shall carry a sheet note to the effect that installation of all ductwork shall be coordinated with the installation of the Communication Cable Tray and the final installation shall be such that the Communication Cable Tray has sufficient clearance to allow access to install and maintain the Information Technology cabling.

12.1.2. All Equipment and Intermediate Distribution Facilities require HVAC 24 hours per day and 365 days per year, separately controlled from adjacent rooms.

12.1.3. The HVAC unit will not be powered off the same electrical panel as the Main Distribution Facilities.

12.1.4. In critical installations, the air conditioning system shall have to be connected into a backup generator system. Provisions shall be made so the telecommunications or
network equipment will not be exposed to excessive operating temperatures due to a loss of power to the air conditioning system. This shall be coordinated with ETS.

12.1.5. The MDF and IDF’s shall have telecommunication racks with equipment that will generate approximately a range from 3,000 to 5,000 BTU per rack. The designer or engineer shall be responsible to calculate the thermal load which will be specified in the building specific bid package. Therefore it is imperative to consult with ETS.

12.1.6. A positive pressure differential with respect to the surrounding areas shall be provided.

12.1.7. The ambient temperature and humidity shall be measured at the distance of 5’ above the floor level. The normal temperature range is 64 to 74 degrees with a humidity range of 35% to 55% relative humidity. The units shall provide for the monitoring of temperature and humidity.

12.1.8. Coordinate the physical security of the equipment, the air pathway, and its electrical service with the architect and other design team members.

13. MULTIMEDIA SPACES

13.1. MULTI-MEDIA CABLE REQUIREMENTS – See Appendix A for Part Numbers

13.1.1. PART A - Multimedia Standard Station Data outlet requirements.

13.1.1.1. All cables homerun back to nearest Data Closet, Telecom room.

13.1.1.2. (1) 6 port face plate Angled, color White, recessed in the wall Flush mounted

13.1.1.3. (4) - Cat 6 (UTP Unshielded Twisted Pair) cables, color Blue

13.1.1.4. (4) - Cat 6 RJ45 Female Data jacks with different colors Position 1 = Blue, Position 2 = Orange, Position 3 = Green, Position 4 = Ivory

13.1.1.5. (1) Cat 6 or Augmented (UTP Unshielded Twisted Pair) cable, color Blue

13.1.1.6. (1) Cat 6 or Augmented RJ45 Red color Female Data jack , Position 5 = Red

13.1.2. PART B - Multimedia Standard Station outlet Coax requirements,

13.1.2.1. All cables homerun back to the nearest Telecom room

13.1.2.2. (1) RG6 Coax cable terminated with standard F connector

13.1.3. Multimedia Standard Station outlet Fiber requirements,

13.1.3.1. All cables homerun back to nearest Data Closet, Telecom room

13.1.3.2. (1) 2 Port face plate Angled, color White, recessed in the wall Flush mounted

13.1.3.3. (1) 2 Strand Fiber Multimode 50 Micron, Corning Performance code 80, SC connector Rated for 10 Gig Application

13.1.3.4. (1) Fiber optic adaptor module, SC connector insert for 2 port face plate

13.1.4. Standard Multimedia Projector/Flat Panel Cabling Requirements
13.1.4.1. Normally, the cables in 13.1.4.2 through 13.1.4.8 will be Owner Furnished. The length of the projector harness cables are to be determined by calculating the cable pathway from end to end than adding a 10 foot service loop at each end (pathway length + 20 feet).

13.1.4.2. If the projector harness cable exceeds 100 feet then the VGA, S-Video and composite cables shall be replaced by three (3) shielded 5 wire (RGBHV) cables. District preferred is Extron video cables.

13.1.4.3. (2) VGA Male to Male 15 Pin cables
13.1.4.4. (2) VGA Female to Male 15 Pin cables 6 foot extension cable
13.1.4.5. (1) Coax cable BNC on each end
13.1.4.6. (1) S-Video cable Male to Male
13.1.4.7. (1) S-Video cable Female to Male cables 6 foot extension cable
13.1.4.8. (1) Control Cable RS232 raw cable to terminate in the field
13.1.4.9. (4) UTP Cat 6 standard cables Plenum rated
13.1.4.10. (4) Cat 6 RJ45 Female Data jacks with different colors Position 1 = Blue, Position 2 = Orange, Position 3 = Green, Position 4 = Ivory
13.1.4.11. (1) 4 port surface mount type box, color White, surface mounted inside of 12x12x4 multimedia cable pull box
13.1.4.12. (1) 4 port face plate, color White, Mounted in the ceiling flush mounted on outside of the rear of ceiling mounted Projection plate.
13.1.4.13. (2) Wall mounted locations Speaker Wire locations 14 AWG Stranded

13.2. CONDUIT AND PATHWAY REQUIREMENTS

13.2.1. All conduits and their placement will require coordinating with the size and placement of each instructors console locations. Conduits shall be stub up to the open ceiling. In special hard lid situations conduits shall be installed end to end. All conduits shall have pull strings installed and have bushings at both ends. Any conduit over 110 feet shall have 3/16 size measuring tape installed; Preferred part number: WP12LC Bull-Line measuring tape.

13.2.2. Instructors console locations requirements

13.2.2.1. Electrical pull box MFG. Hoffman or Multimedia pull box is required at each location mounted in the wall.
13.2.2.2. Required quantity and conduits sizes for each Hoffman box or Multimedia pull box connection is:

   13.2.2.2.1. (2) - 1 ½ inch size Rigid conduits used for video cables.
   13.2.2.2.2. (1) - 1 inch size Rigid conduit.

13.2.3. Required Quantity and Conduits sizes for each Projector/Flat Panel Display connection is:

   13.2.3.1. (2) - 1.5 inch size Rigid conduits used for video cables.
   13.2.3.2. (1) - 1 inch size Rigid conduit used for display data cables.

13.2.4. Required quantity and conduits sizes for each wall phone connection is:

   13.2.4.1. (1) - 1.25 inch size Rigid conduit.
13.2.5. Multimedia Standard Station outlets Part A and Part B requirements:

13.2.5.1. Part A Multimedia Standard Station outlet connection is (1) – 1.25 inch size conduits.

13.2.5.2. Part B Multimedia Standard Station outlet Fiber connection is: QTY. (1) -1 inch size conduits.

13.2.6. SPEAKER WIRE BACK BOXES AND CONDUIT.

13.2.6.1. Require 2 locations for flush mounted wall back boxes and conduits.

13.2.6.2. Locate on the wall 12 inches away from each side of the projection screen/flat panel display; Lined up with the top of the projection screen/flat panel display

13.2.7. Install (2) 3/4 inch size rigid conduits with bushings on all ends. Pull strings are required for any new installed conduit; Preferred part number: WP12LC Bull-Line measuring tape.

13.3. POWER REQUIREMENTS

Multimedia workstation Instructors console requires a dedicated power source that can be shared with the overhead ceiling mounted projector power/flat panel display source only. Field coordination with ETS is required prior to installation. Power shall be fed from a clean power panel source. All duplex outlets shall be supplied per project electrical specifications. Dedicated 20 Amp circuit can be shared with two (2) separate outlet locations listed below in order only.

13.3.1. Power Quad outlet located inside of the teaching station.

13.3.1.1. The exact placement of the Quad outlet installation will require an on site field coordination meeting with ETS for mutual agreement prior to the installation final location.

13.3.1.2. The console casework shall be onsite ready for rough in.

13.3.1.3. Type of outlets are (2) duplex receptacles side by side (Quad outlet) mounted in a double gang back box. This connection shall be hardwired with a flex type conduit whip with standard 3 conductor wires shall include Hot, Neutral and Ground connections.

13.3.1.4. Flex starts from the recessed flush mounted wall J-Box extended to the double gang back box or Quad outlet. Three feet length size whip minimum is preferred between wall and Quad outlet.

13.3.2. Power Duplex outlet located on the external far end area of teaching console station (on the opposite end of the Multimedia pull box).

13.3.2.1. The exact placement of the duplex outlet installation will require an on site field coordination meeting with ETS for mutual agreement prior to the installation final location.

13.3.2.2. The console casework shall be onsite ready for rough in.

13.3.2.3. Type of outlet is (1) single duplex receptacle mounted in a single gang back box. This connection shall be hardwired with a flex type conduit whip with standard 3 conductor wires shall include Hot, Neutral and Ground connections.
13.3.2.4. Flex starts from the recessed flush mounted wall J-box extended to the single gang back box or Duplex outlet. Eight feet length size whip minimum is preferred between wall and duplex outlet.

13.3.3. Power duplex outlet located in the ceiling for ceiling mounted Projector.

13.3.3.1. The exact placement of the Duplex outlet installation will require an on site field coordination meeting with ETS for mutual agreement prior to the installation final location.

13.3.3.2. Type of outlet is QTY. (1) single duplex receptacle mounted in a single gang back box located in the ceiling recessed flush mounted with the standard 3 conductor wires shall include Hot, Neutral and Ground connections.

13.3.3.3. Power outlet shall be located 12 inches from on the rear of the projection mounting pole (See Appendix E Detail 01).

13.3.4. Power outlet requirements for flat screen.

13.3.4.1. The exact placement of the Duplex outlet installation will require an on site field coordination meeting with ETS for mutual agreement prior to the installation final location.

13.3.4.2. Type of outlet is QTY. (1) single duplex receptacle mounted in a single gang back box recessed flush mounted with the standard 3 conductor wires shall include Hot, Neutral and Ground connections.

13.4. PROJECTION SCREENS

13.4.1. Knowledge of reflected ceiling drawings is critical to this design element.

13.4.2. Architects need to consider the “projection zone” prior to placement of any new projection screens configurations. The projection zone cannot have any type of obstructions conflicts in the way of the projection zone like light fixtures that will block the image projected. Projection zone is between the projector and the projection screen area. The projection zone distance ranges depending on the size of the room. The normal standard projector zone range distance to the screens is 13 to 19 feet.

13.4.3. Standard screen selection guidelines are available at the manufacture’s web site:


13.4.4. Screen size selection summary:

13.4.4.1. Screen height should be approximately equal to 1/6 the distance from the screen to the last row of seats, allowing text to be read and detail to be seen in the projected image. Ideally, the first row of seats should be approximately two screen heights away.

13.4.4.2. The bottom of the screen should be a minimum of 4 feet above the audience floor, allowing those seated toward the rear of the audience to see the screen. This may require additional screen "drop" for ceiling hung screens.

13.4.5. Standard manual screens smaller than 87”x116” shall have Da-Lite MFG - Model C, 1.78 aspect ratio with matte white finish.
13.4.6. Wall mount screens larger than 87”x116” shall have Da-Lite MFG – Cosmopolitan Electrol, 1.78 aspect ratio with matte white finish and electric controls.

13.4.7. Recessed electric screens shall have Da-Lite MFG – Advantage Electrol, 1.78 aspect ratio with matte white finish and low voltage control kits.

13.4.8. If an electric screen is specified, a cable pathway and 4 conductor control cable to the instructor console must be provided. (The nearby speaker conduit may be used, add additional conduit and back box if necessary for screen control cable).

13.4.9. Screens should NOT be mounted to dry wall. If necessary, a backing plate should be installed to support the weight of the screen and the recoil of the retraction spring.

13.4.10. Projection Screen Backing plates requirements

13.4.10.1. Each projection screen shall have an extra wall reinforcement support beneath the sheet rock using 3/16 inch aluminum backing plates. These backing plates shall cross the studs and span the length of the actual projection screen specified plus 12 inches.

13.4.10.2. All backing plate installations require a visual reference indication blue taped outline using painter’s non stick blue tape. Use blue painters tape to show the outline perimeter of where the actual support backing plate was installed.

13.4.10.3. Apply the blue tape on the finished painted wall. This will help in the actual screen installation team on where to anchor the wall support. Brackets for the projection screens.

13.5. CEILING PROJECTOR MOUNT REQUIREMENTS

13.5.1. Projector models change on a regular basis. The projector model should be specified at design time and the mount distance should be calculated based on the calculated screen size and specific projector model.

13.5.2. The projector mount shall consist of an approved Chief Manufacturing ceiling structural support specific to the ceiling type. The latest Chief Manufacturing adjustable extension column and Chief Manufacturing support bracket and cable assembly shall be specified.

13.5.3. Standard projector mount selection guide is available at the manufacture’s web site:


13.6. FLATPANEL REQUIREMENTS

13.6.1. Detail requirements are currently under design development. Design awareness is critical for the electrical and reflected ceiling plans. Architects need to consider the "visual zone" prior to placement of any new flat panel screen configurations. The Visual zone cannot have any type of obstructions that conflict with the viewer’s line-of-sight (i.e. light fixtures or other ceiling-mounted items that will block the visual view).

13.6.2. Flat Panel Screen requirements:

13.6.2.1. Backing plates are required for all flat panel screen mounting: Field coordination with ETS is required prior to installation. The exact placement of the flat panel backing plate installation will require an on site field
coordination meeting with ETS for mutual agreement prior to the installation final location. The backing plates shall be onsite ready for rough in.

13.6.2.2. Standard mounting height ranges guidelines for placement on the wall will be determined by the actual size of the flat panel screen purchased and the model mounting guidelines. Each flat panel screen shall have (2) extra wall reinforcement supports beneath the sheet rock using 3/16 inch aluminum backing plates. These backing plates shall cross at least 3 studs. Backing plate size is 12 inches High X 48 inches Wide. There shall be a 6 inch gap between the two plates for cable and power. (See Appendix E Detail 02)

13.6.2.3. All backing plate installations require a visual reference indication blue-taped outline using painter’s non-stick blue tape. Use blue painters tape to show the outline perimeter of where the actual support backing plate was installed. Apply the blue tape on the finished painted wall. This will help in the actual screen installation team on where to anchor the wall support brackets for the Flat Panel screens.

13.6.2.4. Sample Flat Panel mount - CHIEF MFG. mount part # PRO-2000

13.7. CASEWORK BASIC REQUIREMENTS

Casework design is under development at the District and ETS needs to approve all designs. Various configurations are available which are considered custom-made. American Disabilities Act (ADA) design considerations shall dictate clearances, configuration and overall placement in each room.

13.7.1. The current basic requirement is a square cut-out opening is required on one side of the casework. Location is in the side of casework that faces the wall area.

13.7.2. The main requirement is to have full accessibility to the recessed ASE12x12x4 Hoffman box, electrical outlets and flex whip, Part A Multimedia Standard Station outlet and Part B Multimedia Standard Station outlets for fiber. (See Appendix E detail 03).

13.7.3. Square size cut out opening area in the casework shall be determined based on the shelf support rails within the casework.

13.7.4. The open ended casework square cut out opening area side will slide over the existing ASE12x12x4 Hoffman box, Electrical, Part A and Part B standard outlets. Goal is to provide clear access within the inside of the Casework console for any connections and all Data and Multimedia Harness cables to pass through.

13.7.5. Keys are to be provided and keyed alike: Console to be keyed on classroom side only. See parts list

13.7.6. Air Ventilation is a major concern for the equipment locked up and located inside of each casework console. To increase air circulation to prevent overheating conditions various holes are required with screen mesh covers, black color.

13.7.6.1. Standard Console - Instructor side, where equipment will be installed, requires two 2-inch size hole vents low area. The classroom side requires two 2-inch size hole vents high area.

13.7.6.2. In other casework configurations, the front side gets two 2-inch size hole vents low area in the compartment where equipment will get installed, with vents on top section Ventilation for these “other” casework configurations require coordination with ETS prior to design and installation.
13.8. LIGHTING CONSIDERATIONS

13.8.1. Classroom lighting shall be divided into two or more zones. The zone covering the front of the classroom will be dimmed or off during presentations. Other zones may be on or dimmed for taking notes.

13.8.2. The projection zone cannot have any type of obstructions conflicts in the way of the projection zone like light fixtures that will block the image projected. The projection zone is basically a pyramid shape with the projection screen as the base and the projector at the top.

13.8.3. A duplicate set of light controls shall be located at the instructor console.

13.8.4. Light Switches Placement Requirements:

13.8.4.1. (2) Wall switch Recessed in the wall Flush mounted + 48 inch AFF. Located on Instructor side of the console.
13.8.4.2. (2) Switch shall be dual switched sharing the same circuit of entryway switches near the main door entry.
13.8.4.3. (1) 1 inch size Rigid conduits.
13.8.4.4. Field coordination will be required with ETS for all installs.

13.8.4.4.1. (2) Quad receptacle with 3 feet Flex whip extended from J-box in wall.
13.8.4.4.2. (2) Duplex receptacle with 8 feet Flex whip extended from J-box in wall.
13.8.4.4.3. (1) 3/4 inch size rigid conduits.

13.8.5. Electrical power screen switch location requirements

13.8.5.1. (2) Switches will be located near the instructor side of teacher console area, on the same wall of the projecting screen. + 48 AFF.
13.8.5.2. (1) 3/4 inch size rigid conduits.

13.9. GENERAL INSTRUCTOR SPACE CONSIDERATIONS

13.9.1. Placement of the phone, light controls and screen controls and electrical outlets shall be placed in a manner that allows easy access yet does not interfere with the equipment on the instructor’s console. (See Appendix E Detail 04).

13.10. BUILDING (RF) MATV / CATV DISTRIBUTION SYSTEM

13.10.1. RF System General Requirements; FHDA District will decide type of service to be required at time of programming of project.

13.10.1.1. The Contractor shall construct a Bi-directional (RF) MATV System capable of two-way transmission of audio, and video signals. The reverse transmission component of the system shall utilize frequencies between 5 and 50 MHz. The forward transmission component of the system shall utilize frequencies between 54 and 1GB.
13.10.1.2. The Contractor shall provide, install, place into operation, adjust, test, debug, document, warrant and provide operational instructions as described, hereinafter “provide” coaxial cables, active and passive equipment as specified herein and indicted on the Drawings for the Bi-directional (RF) MATV System,
13.10.1.3. The Contractor shall provide and install one (1) optical transmitter, in the MATV System headend. This optical transmitter will be the source of the programming, for the Bi-directional (RF) MATV System. The Contractor shall, in order to provide a complete working system, provide and install jumper cables to connect the in-building systems to the outside plant distribution backbone or the MATV provider point of presence in the Building.

13.10.1.4. Prior to installation of any equipment, the Contractor’s broadband communications engineer shall review the proposed Bi-directional (RF) MATV System schematic and shall submit to the District a red lined copy reflecting any changes based upon client requests, Contractor observations, field conditions, and/or product related issues.

13.10.1.5. The Contractor shall install the plenum rated coaxial backbone cables on the outboard side of the distribution pathways (cable trays) in the ground support clamp specified.

13.10.1.6. After placement and measurement of the coaxial cables, the Contractor shall submit a schematic reflecting actual cable lengths, projected gain, projected loss, attenuator values, equalizer values, directional coupler values, eight port tap values, and any other pertinent Bi-directional (RF) MATV System design information.

13.10.1.7. The Contractor shall provide and install one (1) Building Information Channel modulator in the Building Main Distribution Facility (MDF) of the building. The frequency used by this modulator will be determined by the District.

13.10.1.8. The Contractor shall provide and install one (1) signal processor in the Building Main Distribution Facility (MDF) of the building. The frequency used by this signal processor will be determined by the District.

13.10.1.9. The Contractor shall provide one (1) Return Feed modulator. The frequency used by this modulator will be determined by the District.

13.10.2. Installation Requirements

13.10.2.1. All Bi-directional (RF) MATV System installation work shall be performed according to published industry guidelines, rules, and regulations. If disputes occur, local, state, and national codes have precedence; then District polices and procedures; then standards such as the National Cable Television Association (NCTA); then guidelines from firms such as Building Industry Consulting Services International (BICSI), then finally, manufacturer recommendations.

13.10.2.2. The Contractor shall provide sufficient trained staff to monitor all work undertaken and to ensure the terms of the contract documents are met. The Contractor shall, at all times, make every effort to conduct all Bi-directional (RF) MATV System installation work in a manner so as to minimize the impact on the District students, staff, and facility.

13.10.2.3. The Contractor is required to provide and install all pathway and cable support hardware necessary to successfully complete the installation of the Bi-directional (RF) MATV System.

13.10.3. Basic System Components

13.10.3.1. System amplifiers shall meet or exceed the following specifications - frequency range: 5 to 1GB, channel loading: 110 channels, output level: 45dBmV at 1GB.

13.10.3.2. Directional couplers shall meet or exceed the following specifications - frequency range: 5 to 1000 MHz, housing and faceplate to be constructed
13.10.3.3. Line splitters shall meet or exceed the following specifications - Frequency range: 5 to 1000 MHz, housing and faceplate to be constructed of die cast aluminum, minimum isolation - 18 dB, and capable of bi-directional operation.

13.10.3.4. Eight port taps shall meet or exceed the following specifications - frequency range: 5 to 1000 MHz, housing and faceplate to be constructed of die cast aluminum, each tap labeled with the tap value and capable of bi-directional operation.

13.10.3.5. Male connectors shall be the "F" style connectors for the plenum rated RG-6 quad shield drop cable shall be equipped with an integral ribbed crimp ring.

13.10.3.6. Female to female connectors shall be F-81 connectors shall be installed with wall plates at all drop locations.

13.10.3.7. Hard line connectors (.500 inch) shall be the pin type connectors for the riser and/or plenum rated coaxial cable shall be designed to mate with the various active and passive components on the riser and plenum portion of the distribution system.

13.10.3.8. Line terminators shall meet or exceed the following specifications, having a characteristic impedance of 75 Ohms and designed for installation in an eight-port tap housing.

13.10.4. Activation And Balancing

13.10.4.1. The Contractor shall activate and balance both the forward and reverse components of the Bi-directional (RF) MATV System.

13.10.4.2. The Bi-directional (RF) MATV System “end of line” is defined as an MATV outlet fed from the last eight port tap on each terminated coaxial cable leg.

13.10.4.3. The activation and balancing process shall achieve the following forward performance parameters for each Bi-directional (RF) MATV System “end of line”:

13.10.4.4. Minimum and maximum video signal level shall be 3 dBmV and 10 dBmV, respectively.

13.10.4.5. Carrier to noise ratio shall be 43 dB.

13.10.4.6. Hum limited to 1%.

13.10.5. Proof Of Performance Testing Procedures

13.10.5.1. The Contractor shall conduct witnessed proof of performance testing procedures on the Bi-directional (RF) MATV System including all cables, passive and active devices. Details of the methods that shall be followed for conducting the proof of performance testing will be found in the current edition of the NCTA (National Cable Television Association) Recommended Practices for Measurements on Cable Television Systems.

13.10.5.2. The Contractor shall provide a fully operational broadband communications systems test equipment capable of providing complete, clear and legible representations of the proof of performance test results.

13.10.5.3. All Bi-directional (RF) MATV System proof of performance testing shall be conducted using broadband communications system test equipment that has been calibrated within six months of the required proof of performance tests.

13.10.5.4. The Contractor shall prepare and submit three signed copies of the broadband communications system test equipment calibration record and certification, prior to beginning the proof of performance testing procedures.
13.10.5.5. The Contractor shall provide and combine a 860 MHz. carrier with television signals from LOCAL SERVICE PROVIDER and THE FHDA DISTRICT. These combined television signals shall be supplied to the input at the point of supply to the District, for testing the forward components of the Bi-directional (RF) MATV System.

13.10.5.6. If the signals mentioned above are not available, the Contractor shall provide multiple radio frequency signals from a matrix type signal generator. These generated signals shall be supplied to the input of the optical transmitter, for testing the forward component of the Bi-directional (RF) MATV System.

13.10.5.7. The signals at the Bi-directional (RF) MATV System “end of lines” shall be free of additional noise and distortion. The Contractor will demonstrate that the signals at the Bi-directional (RF) MATV System “end of lines” conforms to the quality standard established by the DISTRICT. If excessive noise or any other picture impairments are present, the Contractor will be required to either resolve the problem or demonstrate the problem is not a result of work undertaken as part of this contract.

13.10.5.8. All proof of performance testing shall be conducted following NCTA published guidelines and all final measurements shall fall within NCTA standards. The Bi-directional (RF) MATV System shall be inspected, diagnosed, analyzed, repaired, adjusted, balanced, and/or reconfigured until the system meets or exceeds the NCTA standards. The proof of performance testing procedures is to ensure that the Bi-directional (RF) MATV System is complete and fully operational when turned over to the District for use.

13.10.6. RF System Testing Documentation

13.10.6.1. The Contractor shall provide complete system testing documentation including, but not limited to the following items:

13.10.6.2. Description of all methods, results, and records of the proof of performance testing procedures.

13.10.6.3. Test equipment calibration record and certification - Test results, including signal levels, for the input to the system amplifiers.

13.10.6.4. Test results, including signal levels, at the output of the system amplifiers.

13.10.6.5. Verification of dB strength at connection location.

13.10.6.6. Test results, including signal levels, for each of the system “end of lines”

13.10.6.7. Signal leakage measurement test results, and records for each floor of the building
14. TESTING

14.1. FIBER OPTIC CABLE

14.1.1. Attenuation

Attenuation is optical power loss measured in decibels (dB). It is the primary limiting factor in most systems. The physical properties of fiber splices, connectors, and adapters all contribute to total system attenuation. Additional loss shall also be induced by tight bends or cable damage during installation. Acceptable loss values shall be determined in advance of the installation and tested for compliance after installation is completed.

14.1.2. Inter-building Backbone

14.1.2.1. Test for attenuation on all connectorized fiber strands at 850nm wavelength for multimode cables and 1310nm for single-mode cables with an approved power meter and light source.
14.1.2.2. Test bi-directional for attenuation on all fiber strands.
14.1.2.3. OTDR (Optical Time Domain Reflectometer) Test all connectorized (all fibers) in both directions and document distance and signal loss (attenuation).
14.1.2.4. OTDR graphic representation of power loss (A-to-B loss range) shall reflect the link loss from the patch panel connector to the far end connector. Test results shall be provided in hardcopy and softcopy forms, and information is to be downloaded to an MS Excel format. The following format or one containing similar information is required to facilitate District review.
<table>
<thead>
<tr>
<th>Start/End (RU/TH or EUI/MPO)</th>
<th>End (Outlet Number)</th>
<th>Fiber Number</th>
<th>Panel Number</th>
<th>Fiber Distance (Feet)</th>
<th>Number of Connections</th>
<th>Number of Splices (Fusion)</th>
<th>SM OSP Optical Budget</th>
<th>SM ISP Optical Budget</th>
<th>MM Optical Budget</th>
<th>SM Results (populate)</th>
<th>MM Results (populate)</th>
<th>Variance (margin dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>38</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>39</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>41</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>42</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>43</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>44</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>46</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>47</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
14.1.3. Intra-building Backbone

14.1.3.1. Test for attenuation on all connectorized fiber strands at 850nm wavelength for multimode cables and 1310nm for single-mode cables with an approved power meter and light source.
14.1.3.2. Test bi-directional for attenuation on all fiber strands.
14.1.3.3. OTDR (Optical Time Domain Reflectometer) Test all fibers in both directions and document distance and signal loss (attenuation). Hardcopy and Softcopy results are required.

14.1.4. Horizontal Cabling

14.1.4.1. Requires end-to-end attenuation testing at 850 wavelength for multi-mode fiber cables.
14.1.4.2. Test bi-directional for attenuation on all fiber strands.

14.1.5. Existing Fiber

14.1.5.1. All existing fiber is to be documented and accounted for prior to construction.
14.1.5.2. All existing fiber and fiber enclosures shall be covered, and protected from all construction debris and dust prior to onset of construction.
14.1.5.3. Any existing fiber needing to be re-located during the course of construction is to be tested by the Contractor prior to re-location, as well as after re-location to assure fiber was handled properly during re-location. This applies to any fiber that for any reason needs to be re-terminated during the project.

14.1.6. OTDR Graphic Representation

14.1.6.1. Power loss (A-to-B loss range) shall reflect the link loss from the patch panel connector to the far end connector. Test results shall be provided in hardcopy and softcopy forms, and information is to be provided in an MS Excel format.

14.2. COPPER CABLE

14.2.1. Inter-building Backbone

14.2.1.1. All pairs shall be tested for DC continuity, reversals, shorts, opens, overall loop resistance/cable length, attenuation, Splits, Transpositions, Grounds, Presence of AC voltage. These results shall be provided in an MS Excel format. The following format or one containing similar information is required to facilitate District review.
14.2.1.2. TDR for length or document actual length by cable markings.

14.2.2. Intra-building Backbone

14.2.2.1. All pairs terminated on 110 blocks on the wall shall be tested for opens, shorts, and reversals.
14.2.2.2. TDR for length or document actual length by cable markings.
14.2.2.3. All cable terminated on patch panels shall be tested with an approved test unit that provides hard- and soft-copy results to pursue an Extended Manufacturers Warranty for the District.

14.2.3. Horizontal Cabling

14.2.3.1. All cable terminated on patch panels shall be tested with a Category 6 TSB67 UL certified level III accuracy test unit that provides hard- and soft-copy results. Telecommunications Standards (TIA/EIA568A) Bulletin (TSB) number 67 defines the electrical characteristics, test methods, and minimum transmission requirements for UTP cabling links. Current levels for 100mhz field test sets Pass / Fail criteria is now defined at level III accuracy verified by UL laboratories.

14.2.3.2. Cables shall be tested after As-Built completion of the installation and prior to occupancy, also to pursue an Extended Manufactures Warranty for the District.
Near end Crosstalk (NEXT)
Equal level Far end Crosstalk (ELFEXT)
Attenuation
Return Loss
Ambient Noise
Impulse Noise
Splits
Wiremap
Cable Length
Propagation Delay
Loop Resistance
Power Sum Attenuation to Crosstalk Ratio (PS-ACR)
Power Sum Near end Crosstalk (PS-NEXT)
Alien Crosstalk for Augmented Cat 6 in 10 Gig Applications

14.2.3.3. Testing shall be conducted by Certified Technicians. Test all cabling to meet specifications or Category 6 or Category 6 Augmented as required. Test equipment shall perform individual tests as required by TSB67 Channel standards including but not limited to the following. Test results shall be provided in softcopy, along with software needed to read the files and in a MS excel format with the following data as column heading and cable number and room in the vertical column to the left.

14.2.4. Proof-of-Performance Testing - After the Contractor has provided complete testing documentation and the documentation has been reviewed by the District and the Architect's telecommunications designer, the Contractor shall conduct “proof of performance” testing on selected components at the direction and discretion and in the presence of the District inspector or his representative(s). These tests will a witnessed re-test of approximately 10% of the system-installed capacity. Such testing will utilize the same equipment and procedures used to conduct and document the initial tests but will be applied on a random basis to verify the testing documentation. If in the judgment of the District, the proof-of-performance test results vary from the Contractor's initial acceptance test results, the Contractor shall continue with testing beyond the 10%, at the discretion of the District, until discrepancies are cleared to the satisfaction of the District.

14.2.5. Existing Cable Situations for Renovations

14.2.5.1. All existing cable adjacent to or passing through the “Construction Zone” to remain in service after the project is installed is to be tested, documented and accounted for prior to construction. Preliminary As-Built and cable inventory required.
14.2.5.2. All existing cable and cable enclosures / patch panels shall be covered, and protected from all construction debris and dust prior to onset of construction.
14.2.5.3. All existing cable documented prior to the start of construction or that needs to be re-located or re-terminated during the course of construction is to be tested prior to re-location, as well as after re-location to assure cable was handled properly during re-location / re-termination.
15. DOCUMENTATION

New construction of Foothill - De Anza College District facilities, expansions of existing office space, renovations of leased space, and upgrades of existing sites all require documentation to the level where anyone other the original installers can reasonably understand the current infrastructure, the proposed modifications, and the as-built specifications prior to testing of the job.

Documentation requirements shall be detailed prior to the start of any project. The following list shall include the following.

15.1. AS-BUILT DRAWINGS. - Preliminary as-built drawings are required prior to testing of any cables. Interim documentation shall be required for longer-term projects. Building by building is an important example, which requires it to be done one at a time. Final drawings are requirement to be submitted based on the bid specifications, usually with the closeout documents, which includes the warranty information.

15.2. CABLE AND FIBER TEST RESULTS – Hard and Soft copies are required 5 days after completion of testing

15.3. AUTOCAD ARCHITECTURAL DRAWINGS - Foothill - De Anza Community College District owned buildings shall have floor by floor detail including the following

15.3.1. All Workstation locations
15.3.2. All Workstation Numbering Plan
15.3.3. All Cable numbering (If different from Workstation numbering)
15.3.4. All Cable Paths
15.3.5. All Firewall penetration locations
15.3.6. All Cable tray routing and locations
15.3.7. All Conduit pathways
15.3.8. All Conduit Sizing

15.4. FACILITY PRINT - Shall include service entrance points for all providers to including electrical, CATV, local telephone, data (Internet), and others.

15.5. BACKBONE AND RISER CABLE LAYOUT - Conduits used and inner-ducts.

15.6. MAIN DISTRIBUTION FACILITY AND INTERMEDIATE DISTRIBUTION FACILITY CLOSET DETAILS -. including detailed rack elevations showing all equipment, patch panels, Wall fields etc.

15.7. "STRUCTURED CABLE SYSTEM" WARRANTIES FOR ALL FIBER AND COPPER INFRASTRUCTURE - installations are required. Manufacturing companies offer Warranties on all Telecommunications and audio-visual cables installed. The longest possible Warranty shall be provided for all Structured Cabling Systems. Structured Cabling Systems (SCS) wiring is defined as all required equipment and cabling including building entry protection, hardware, termination blocks, cross connect wire or cordage, patch panels, patch cords, telecommunication outlets, UTP and fiber optic cable installed and configured to provide computer data, voice and video connectivity from each data, voice or video outlet to the
termination equipment and hardware providing connection to network file servers or voice network/switch designated as the service point of the campus wide network.
APPENDIX A

Vendors and Materials List

The following list is a sample of the products currently approved for use by ETS. Designer shall be responsible to verify and update product part numbers. In a situation where an Or-Equal is requested by the cable installer, the designated Telecommunications Design firm will analyze the submission and provide a written response as to the authentication of the Or Equal submission. ETS and its representative will have the final approval of the submitted Or Equal.

Suggested Product Vendors
Corning
Panduit
ADC
Belden
Commscope
Extron Cables
Liberty Cables
Quicktron
Superior Essex
STI
Maxcell
Ciricia
CPI
B-Line
Flextray
Fiber Guide
Fiber Runway
Guiest
APC
General
Carlon

• Warranty Cable Plant: 25 years by the selected manufacturer; End to end 25 years. Refer to Sections 14.2.3.2 and 15.7 above.
  Preferred/Match Existing:
  Fiber: EWP Warranty - Corning Exended Warranty Plan; Network preferred Installers
  Copper: PCI Warranty - Panduit Certified Installer Warranty

Intra-Building Cabling System:

Fire Stop sealing is required for wall, ceiling and floor penetrations and meets applicable codes; ability to add cabling without having to remove the fire stop material; ability to add/remove cable without damaging the fire stop material; allows for easy organization of cables by type; color code pathways by type.
Preferred mfg: EZ-PATH

4-Pair Plenum and Nonplenum Category 6 and 6A: Minimum performance specification:
Meet or exceed TIA/EIA Category 6 and 6A standards, color Dark Blue match existing cable plant; refer to Section 5.2 above.
Category 6 UTP Plenum and Nonplenum:
  Conductors will be 23 AWG UTP solid bare annealed copper
  Insulation:
APPENDIX A continued

Plenum FLUOROPOLYMER, low-smoke, flame-retardant PVC jacket
Separator cross-web
Rip cord - applied longitudinally under jacket
Color code - pair #1 blue-white/blue; pair #2 orange-white/orange; pair #3 green-white/green; pair #4 brown-white/brown
Nominal Cable Diameter (inches):
Non Plenum: 0.260
Plenum: 0.250
Footage markings
Performance guaranteed to 350 MHz
Plenum:
Preferred mfg: General GenSPEED 6500
CAT6: 7131970.2R
Nonplenum:
Preferred mfg: General GenSPEED 6500
CAT6: 7133970.2R

Category 6A UTP Plenum and Nonplenum:
Conductors will be 23 AWG UTP solid bare annealed copper
Insulation:
Non Plenum POLYOLEFIN, flame-retardant PVC jacket
Plenum FLUOROPOLYMER, low-smoke, flame-retardant PVC jacket
Separator cross-web
Color code - pair #1 blue-white; pair #2 orange-white; pair #3 green-white; pair #4 brown-white
Nominal Cable Diameter (inches):
Non Plenum: 0.305
Plenum: 0.305
Footage markings
Performance guaranteed to 500 MHz
Plenum:
Preferred Mfg: General GenSPEED 10MTP
CAT6A: 7131849
Nonplenum:
Preferred Mfg: General GenSPEED 10MTP
CAT6A: 7133849

Station Patch Panels: Minimum Specification:
Mount to standard TIA/EIA 19 inch rack; all metal shielded modular patch panels. High Density modular style 24/48/72 Port, angled patch panels with 12 UTP RJ45 female 8 position 8 wire universal jack module, meets ANSI/TIA/EIA-568-B.2-1 Category 6, modular UTP RJ45 female 8 position 8 wire universal jack module, meets ANSI/TIA/EIA-568-B.2-1 Category 6 jacks in required colors: blue, orange, green, ivory, slate, white, red. Color sequence details provided in project specification documents.
Preferred mfg: Panduit

Unpopulated Patch Panel Positions:
Shall be filled with port blank modules, color black.
Preferred mfg: Panduit, part number CMBBL-X
**APPENDIX A continued**

**Strain Relief Bar:** With clips for 19 inch racks; supports 24 cables with hinged dual clips and provides bend radius protection.
  Preferred mfg: Panduit part #SRBWCY

**Wire Management H/V:** Minimum Specification:
- **Vertical:** Vertical rack mounted wire managers for seven (7) foot racks, double sided, ten (10) inch wide vertical, include internal mounted molded plastic slack spools; Dual hinged metal doors front and back required for double sided vertical wire managers, rugged full length, doors open 180 degrees for complete access to pathway, color black; Large finger openings accommodating up to 48 category 6 cables.
  Preferred mfg: Panduit
  - Double sided wire manager: part # PRV10
  - Dual hinged metal doors: part # PRD10
  - Patch Runner End Panel 7': part #PREP
  - Plastic Slack Spool: part #PRSP5

  **Horizontal:** High capacity horizontal cable manager front and rear, size #2RU, including plastic hinged cover, color black.
  Preferred mfg: Panduit: Part # NM2
  NOTE: Renovations are usually match existing: Consult with ETS for final approval.

**Station (Relay) Racks**
- 7” x 19” Standard Rack Color Black with top rack trough for wire management support.
  Preferred mfg: Panduit or Chatsworth
  Panduit Netrunner rack top trough part #WMPV45ERTW in support of wire management

**Cable Tray Color Black**
- **Seismic support required**
  Under Raised Floor: Preferred mfgs: Panduit GridRunner, EZTray
  Overhead: Preferred mfgs: Panduit GridRunner, Chatsworth, B-Line, EZTray
  Design of cable tray needs to be incorporated into the Bid specification document
  Minimum is 12" wide cable tray; depends on the design
  Bend radius control required
  Waterfalls for strain relief are required; type depends on the application

**Jack Modules for Patch panel and Faceplate:** Minimum Specification:
- **Modular Patch Panel:** RJ45 female 8 position 8 wire universal jack module, meets ANSI/TIA/EIA-568-B.2-1 Category 6 jacks, RJ45 eight(8) position eight(8) wire universal module, category 6 or 6A, jacks in required colors: blue, orange, green, ivory, slate, white, red. Color sequence details provided in project specification documents. Terminate four pair #22-26 AWG, 100ohm, solid twisted pair cable.
  Preferred mfg: Panduit, part # for CAT6: CJ688TGxx - where xx = color, for CAT6A part # CJ6X88TGRD.
APPENDIX A continued

Modular Face Plate: Flush mount, RJ45 eight(8) position eight(8) wire universal module, category 6 or 6A, jacks in required colors: blue, orange, green, ivory, slate, white, red. Color sequence details provided in project specification documents. Preferred mfg: Panduit, part # for CAT6: CJ688TGxx - where xx = color, for CAT6A part # CJ6X88TGRD.

Patch Cords Category 6 and 6A (stranded 8 wire): Minimum performance specification:
Meet or exceed TIA/EIA Category 6 and 6A standards; Specified by manufacturer to meet the 25 year warranty.
4-Pair Nonplenum Category 6 Color Dark Blue and 6A Color Red.
Quantity and length of each size of patch cord depends on the project scope:
Typical:
Minimum 7 feet for office and IDF racks
10 feet for IDF racks
Preferred Mfg Panduit:
Category 6: UTPSP7Y (7 feet)
Category 6A: UTP6X7BUY (7 feet)

Faceplates minimum specification:
-Modular RJ45 female 8 position 8 wire universal jack module, meets ANSI/TIA/EIA-568-B.2-1 Category 6 angled single gang faceplates, color: off white, standard six (6) port, two blanking modules. Unpopulated port positions shall be filled with blank modules (color off white).
  Preferred mfg: Panduit
  Six (6) Port (typical office and Multimedia) Part #CFPSL6WHY
  Four (4) Port (Multimedia Projector Data) Part #CFPSL4WHY
  Two (2) Port (Wireless and Security) Part #CFPSL2WHY
  Blanking modules: Part number CMBIW-X

-Modular Furniture
  As required – coordinate with owner and furniture provider

-Hardwall Flush Mount single and/or double gang, RJ45 female 8 position 8 wire universal jack module, meets ANSI/TIA/EIA-568-B.2-1 Category 6, standard six (6) port, two blanking modules. Unpopulated port positions shall be filled with blank modules (color off white).
  Preferred mfg: Panduit
  Color to be coordinated with owner

-Surface Mount Box
  Modular RJ45 female 8 position 8 wire universal jack module, meets ANSI/TIA/EIA-568-B.2-1 Category 6, single and/or double gang, standard six (6) port, two blanking modules. Unpopulated port positions shall be filled with blank modules (color off white).
  Preferred mfg: Panduit
  Color to be coordinated with owner

-Flush-Mount Poke and floor boxes
  Coordinate with Owner, specific to each project
  Color to be coordinated with owner

-Wall Mount Telephone Faceplates minimum specification:
  Wall phone faceplate one (1) port, flush mounted, single gang, stainless steel keystone CAT6 module.
  Preferred mfg: Panduit, part # KWP6EY
APPENDIX A continued

Copper Riser

110 Patch Panel System Terminal Blocks: Minimum performance specification:

Rack mounted panel for a standard 19" rack, 110 patch panel system: includes 5 position connector kit, labeling system, jumper trough, etc.
Preferred Mfg: Panduit

Rack mounted panel for a standard 19" rack: Part number changes frequently and depends on the specific application. Want consistency to maintain warranty.

General Outside Plant:
- Expandable Duct plugs for OSP applications shall be required
- Measuring Tape: Traceable bull line, with footage markers, minimum 1800lb pulling tension
- Maxcell INNERDUCT product shall be used. Place (3) Three cells for each 4-inch size conduit.

Outside Plant - Copper:
- 24 gauge PE-89 copper, gopher resistant cable
- Required Fuse protection and grounding; 5-pin protector modules; Preferred mfg: Circa
- Splice case; Preferred mfg 3M
- Splice case module 710; Preferred mfg 3M

Below the part #s mfg: Corning

Fiber Optic Housings & Hardware; Located in the 19" rack fiber patch panels

Description: Pretium Connector Housing, 2 Panel Capacity, 1 Unit High, 4 Type 2R or 2 Type 4R tray capacity (with splice tray holder PC1-SPLC-04R)
Part Number: PCH-01U

Description: Pretium Connector Housing, 4 Panel Capacity, 2 Unit High, 6 Type 2R or 3 Type 4R tray capacity (with splice tray holder PC2-SPLC-6SR)
Part Number: PCH-02U

Description: Pretium Connector Housing, 12 Panel Capacity, 4 Units High, 12 Type 2S/2R or 7 Type 4S/4R tray capacity (with splice tray holder PC4-SPLC-12SR)
Part Number: PCH-04U

Description: Connector Panel CCH, with 6 SC, SM duplex adapters, ceramic insert, composite housing.
Part Number: CCH-CP112-59

Description: Connector Panel CCH, with 6 SC, MM 50 UM laser optimized, duplex adapters, ceramic insert, composite housing.
PART NUMBER: CCH-CP12-E7

Description: Connector Panel CCH, with 6 SC, MM 62.5 UM, duplex adapters, composite insert, composite housing.
PART NUMBER: CCH-CP12-91
APPENDIX A continued

Fiber Optic Pretium UniCam Installation Kit

Description: Premium Installation Kit; with high-performance cleaver; includes single- and two-fiber handlers, visual fault locator and connector cleaning cassette; recommended for single-mode applications; does not include cleaver
PART NUMBER: TKT-UNICAM-PFC

Fiber Optic Connectors

Description: SC UniCam Connector 50um Laser Optimized MM Ceramic Ferrule
PART NUMBER: 95-050-41-X

Description: SC UniCam Connector SM Ceramic Ferrule Ultra Physical Contact Polish
PART NUMBER: 95-200-42

Description: SC Multimode, 62.5 UM Ceramic Ferrule
PART NUMBER: 95-000-41

Fiber Optic Fan-Out Kits

Description: Fan-Out Kit Assembly, 12 fiber, 25 INCHES
PART NUMBER: FAN-BT25-12

Description: Fan-Out Kit Assembly, 6 fiber, 25 INCHES
PART NUMBER: FAN-BT25-06

Fiber Optic Hybrid OSP Outside Plant (non-armored) Cable Campus Distribution

Description: ALTOS, All-dielectric gel-free cable, Outside rated only, laser optimized, 72 strand 36/36 Hybrid cable, 36 singlemode/36 multimode 50 UM pretium 550 performance code 90, rated for 10 gig for 550 meters (1804 feet), Non-armored
Serialized PART NUMBER: 072XU4-CJ664D20
Generic PART NUMBER: 072TU4-T4190D20

Fiber Optic Hybrid Indoor and Outdoor rise rated (non-armored) Cable Campus Distribution

Description: FREEDM, Loose tube gel-free cable, rated indoor/outdoor riser rated, laser optimized, 72 strand 36/36 Hybrid cable, 36 singlemode/36 multimode 50 UM pretium 550 performance code 90, rated for 10 gig for 550 meters (1804 feet), Non-armored
Serialized PART NUMBER: 072XWF-T41XXD20
Generic PART NUMBER: 072WUF-T4190D20

Fiber Optic Hybrid OSP Outside Plant (armored) Cable Campus Distribution

Description: ALTOS, Lite, gel-free cable, single-jacket, single armored cable, outside rated only, laser optimized, 72 strand 36/36 Hybrid cable, 36 singlemode/36 multimode 50 UM pretium 550 performance code 90, rated for 10 gig for 550 meters (1804 feet), Armored
Generic PART NUMBER: 072XUC-T41XXD20
APPENDIX A continued

**Fiber Optic Hybrid Indoor and Outdoor rise rated (armored) Cable Campus Distribution**

Description: FREEDM, Loose tube gel-free interlocking armored cable, rated indoor/outdoor riser rated, laser optimized, 72 strand 36/36 Hybrid cable, 36 singlemode/36 multimode 50 UM pretium 550 performance code 90, rated for 10 gig for 550 meters (1804 feet), Armored
Generic PART NUMBER: 072XWF-T41XXDA1

**Fiber Optic Intra-Building Cable (non-armored) Distribution**

Description: 6-Fiber MIC Cable Riser Rated 50um laser optimized Pretium 550 10GbE up to 550 meters (Performance Code 90)
PART NUMBER: 006T81-31190-24

Description: 12-Fiber MIC Cable Riser Rated 50um laser optimized Pretium 550 10GbE up to 550 meters (Performance Code 90)
PART NUMBER: 012T81-33190-24

Description: 24-Fiber MIC Cable Riser Rated 50um laser optimized Pretium 550 10GbE up to 550 meters (Performance Code 90)
PART NUMBER: 024T81-33190-24

**Fiber Optic Intra-Building Cable (armored) Distribution**

Description: 6-Fiber Interlocking armored MIC Cable Riser Rated 50um laser optimized Pretium 550 10GbE up to 550 meters (Performance Code 90)
PART NUMBER: 006Q88-33190-A9

Description: 12-Fiber Interlocking armored MIC Cable Riser Rated 50um laser optimized Pretium 550 10GbE up to 550 meters (Performance Code 90)
PART NUMBER: 012Q88-33190-A9

Description: 24-Fiber Interlocking armored MIC Cable Riser Rated 50um laser optimized Pretium 550 10GbE up to 550 meters (Performance Code 90)
PART NUMBER: 024Q88-33190-A9

**Fiber Optic Station or Multimedia (non-armored) Distribution Cable**

Description: 2 strand Fiber MIC Cable Plenum Rated 50um laser optimized Pretium 550 10GbE up to 550 meters (Performance Code 90)
PART NUMBER: 002T88-31190-29

Description: 2 strand Fiber MIC Cable Riser Rated 50um laser optimized Pretium 550 10GbE up to 550 meters (Performance Code 90)
PART NUMBER: 002T81-31190-24
APPENDIX A continued

Fiber Optic Cable Assemblies (fiber patch cords):

Description: SC Duplex 2 strand fiber zipcord single-mode jumper, riser rated, 2-meter length
PART NUMBER: 727202R5131002M

Description: SC Duplex 2 strand fiber zipcord jumper with laser optimized pretium-550 50 UM fiber, riser rated, 2-meter length
Part Number: 575702Q5190002M

Description: SC Duplex 2 strand fiber zipcord multimode 62.5 jumper, riser rated, 2-meter length
Part Number: 575702K5141002M

Outdoor Rated Housings:

Description: Environmental distribution center accepts 2 CCH panels and 2 R or 1 Type 4R, reduced-length splice trays
PART NUMBER: EDC-02P-NH

Description: Wall Mount Connector Housing, 2 Panel capacity, (2) 2R or (1) 4R splice tray capacity with WCH-SPLC-2P splice tray holder.
PART NUMBER: WCH-02P

Description: Single Panel wall mount housing, 1 Panel capacity, 12F splice capacity.
PART NUMBER: SPH-01P
APPENDIX A continued

BROADCAST COAXIAL PARTS LIST

Broadband Indoor Distribution Amplifier, Blonder-Tongue BIDA 100A-30 or equal, two-way broadband indoor distribution amplifiers, Frequency Range (MHz): 49-1000, Channel Loading: 150, Flatness (dB): +/-0.75, Hybrid Technology: Pull-Pull, Gain (dB): 30, Noise Figure (dB): 8.5, Output Level (dBmV): 32/40.

Broadband Passive Directional Couplers and Taps Indoor Applications, Blonder-Tongue SRT Series or equal, 50 to 1000 MHz bandwidth in the forward path, 5 to 45 MHz reverse, Electromagnetic interference shielding effectiveness greater than minus 120 dB. Tap values from 35 dB to 4 dB in 3 dB increments.

Broadband Passive Directional Couplers and Taps Outdoor Applications, Blonder-Tongue TLS or DMT Series or equal, 1 GHz Passive, 2, 4 and 8 Port Models with F Connectors, 120 dB RFI Shielding, Diecast Housing, Grounding Block, Pico Macom GRB Series or equal, Comply with NEC 820-7, Bandwidth to at least 1000 MHz, Ground-Block, Ground-Lug

RF Attenuator, Blonder-Tongue FAF Series or equal, Fixed Attenuator Type F Female - Female (FAF), Frequency Range (MHz): 5 to 890 5 to 1000, Attenuation Values (dB): 3, 1, 2, 3, 4, 5, 6, 7, 10, 20, Impedance - All Ports (Ω): 75

Splitter/Combiners, 2 to 8 way, Indoor Applications, Blonder-Tongue SRT Series or equal, indoor 1GHz taps, directional couplers, available with 2, 4, and 8 tap ports and have tap values from 35 dB to 4 dB in 3 dB increments, Die-cast housings, RFI shielding of 120 dB.

Splitter/Combiners, 2 to 8 way, Outdoor Applications, Blonder-Tongue DMT Series or equal, outdoor multitaps with frequency coverage to 1000 MHz, available in two, four and eight port models, both stand and pedestal mounting, "F" connectors on the tap ports

Terminator, 75 ohm, "F" type, Indoor Applications, Blonder-Tongue 4670 or equal, Terminator Male, Type "F", 75 ohm

Terminator, 75 ohm, "F" type, Outdoor Applications, Blonder-Tongue DMT-TP or equal, Terminator Power blocked, DMT style, 75 ohm

Broadband Cable Drop Feeder, RG-6 RG-6M, RG6ML, Belden 9116, 9116P or equal, 18AWG solid bare copper covered steel, Duobond II plus 60% aluminum braid, 100% shield coverage. Polyethylene dielectric and PVC jacket. OD .270" nominal. Impedance 75ohm nominal.

Broadband Cable Riser Feeder, RG-11, RG-11M, Belden 1153A or equal, RG-11/U Tpe Plenum, 14 AWG Solid .064" BCCS Conductors • Duofoil® (100% Coverage) + TC Braid Shields (60% and 40% Coverage)

Broadband Cable Trunk Feeder, Commscope P3 500 JCASS or equal, Solid Aluminum Tube Swaged onto Dielectric Core, Fully Bonded Copper Clad Center Conductor, MIGRA-HEAL Flooding Compound, Corrugated Chrome Plated Steel Armor, Medium Density PE Jackets

Connectors Radio Frequency Broadband, RG-59, RG-6 and RG-11, "F" Type, Thomas &
Betts/LRC Snap-N-Seal F Connectors or equal, size to match cable, 360 degree radial compression, Pull-out strength not less than 40 pounds, weatherproof seal

**APPENDIX A continued**

**Connectors**

**Hardline Trunk Feeder Pin Connector**, Corning, GRS Series, GRS-500-CH-DU-03 or equal, meet SCTE interface specifications, Bandwidth: 5 MHz to 1 GHz, Operating Range: -40°F to +140°F, Nominal Impedance: 75 ohms, Shielding Effectiveness: > 130 dB, Return Loss: 30 dB minimum, Insertion Loss: < 0.15 dB (pin types)

**Connectors**

**Hardline Trunk Feeder Coax to F Connector**, Corning, GRS Series BAFF, PN GRS-500-BAFF-DU-03 or equal, meet SCTE interface specifications, Bandwidth: 5 MHz to 1 GHz, Operating Range: -40°F to +140°F, Nominal Impedance: 75 ohms, Shielding Effectiveness: > 130 dB, Return Loss: 30 dB minimum, Insertion Loss: < 0.15 dB (pin types)

**Connectors**

**Hardline Trunk Feeder Housing of Housing splice connector**, Corning, PN GRS-500-SPDU-03 or equal, meet SCTE interface specifications, Bandwidth: 5 MHz to 1 GHz, Operating Range: -40°F to +140°F, Nominal Impedance: 75 ohms, Shielding Effectiveness: > 130 dB, Return Loss: 30 dB minimum

**MULTIMEDIA PARTS LIST**

**Screens and Accessories:**

87"x116", Da-Lite MFG - Model C,
87"x116" Da-Lite MFG – Cosmopolitan Electrol,

Recessed Electric Screen - Da-Lite MFG – Advantage Electrol

(VGA Male to Male 15pin) - Plenum rated cable - 50ft but with backshell VGA connector - Part # 26-439-05 Extron

(VGA Male to Male 15pin) - 75ft - Part #26-439-06 Extron

(VGA Male to Male 15pin) - 100ft - Part #26-439-07 Extron

(VGAP M-M MD Series) - Male to Male VGA Molded Connectors Cables – Plenum rate cable = Part # 26-439-02 Extron

(Coax Cable RG6) - Single Conductor RG6 Super High Resolution Cable - Plenum rated 500ft - Part # 22-164-02 Extron

(MHR-2P SVM-M) - Male to Male 4-pin Mini DIN S-Video Cables - Plenum rated - MHR-2P SVM-M/50 - Part # 26-522-05 Extron

(MHR-2 SVM-F) - Male to Female 4-pin Mini DIN S-Video Cables- Plenum - MHR-2 SVM-F/6 - 6' (1.8 m) - Part # 26-542-02 Extron (Only available in Non-Plenum with Extron)

(RS232 cable 6 pin un-terminated raw cable) - Extron STP22-2 Cable - Serial Control/Audio Cable - STP22-2P/1000 - Plenum 1000' (300 m) spool - Part # 22-162-03
(Cat 6 UTP Enhanced bonded Plenum rated cable, Blue color jacket) - Belden MFG. part # 1874AD151000

(Speaker Wire 14 AWG Speaker Cable Plenum rated) - SPK 14P Plenum - 1000 feet - Part # 22-155-03

**APPENDIX A continued**

(5 wire for RGBHV) - MHR5 BULK CABLE - Plenum rated cable – PN 22-103-02 - 500ft MHR5 P

Wall Mounted Pull Box: Hoffman Multimedia Part # ASE12X12X4, gray in color

Console lock Key Hafele # 100T Part #210-04-311 on the Instructor side

Latch and cylinder casting Parts # 232-18-350 Left assembly – Parts # 232-04-035 Right assembly

**Pull Mount Support Systems:**

<table>
<thead>
<tr>
<th>Ceiling Type</th>
<th>Structural Support part #</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wood Joist</td>
<td>CMA390 or CMA391 Dual joist ceiling plate</td>
</tr>
<tr>
<td>Concrete</td>
<td>CMA330 Offset ceiling plate</td>
</tr>
<tr>
<td>I-Beam</td>
<td>CMA360 I-Beam Clamp</td>
</tr>
<tr>
<td>Hard Ceiling</td>
<td>CMA110 8” Ceiling plate</td>
</tr>
</tbody>
</table>
## APPENDIX B

### DIVISION 27 SPECIFICATIONS – TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>SECTION</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>271100</td>
<td>Main Distribution Facilities and Service Entrances</td>
</tr>
<tr>
<td>271113</td>
<td>Telecommunication Rooms</td>
</tr>
<tr>
<td>270528</td>
<td>Interior Communication Pathways</td>
</tr>
<tr>
<td>270543</td>
<td>Exterior Pathways</td>
</tr>
<tr>
<td>271300</td>
<td>Backbone Cabling</td>
</tr>
<tr>
<td>271500</td>
<td>Horizontal Cabling</td>
</tr>
<tr>
<td>270800</td>
<td>Testing, Identification and Administration</td>
</tr>
</tbody>
</table>
APPENDIX C

Request for Modification / Correction / Clarification

This template is used to request clarification, and to modify or correct the Telecommunications and MultiMedia document. Please complete the following questions and forward this form to WSC.US

Requester Information:

Name:
Phone:
Fax:

Type of Action: (please check one)

[ ] Request clarification of document.
[ ] Correct error in document or addition to document.
[ ] Request modification of document. (standards change)

Provide Details:

Page number of cable standards document in question:
Proposed changes, including rational:

Addendum Information:

Please copy any additional information as an E-mail attachment. For example:

Supplier information  New equipment  Availability of equipment
Network diagrams  New Standards  Modification of codes
Equipment diagrams  Floor layouts  Pricing information

EMAIL REQUEST TO:

Sharon Luciw: luciwcharon@fhda.edu

-AND-

Lisa Hocevar: hocevarlisa@fhda.edu

-OR-

FAX: 650-949-6137
APPENDIX D

Glossary

**A.C.** - Alternate Current;  
**A/C** - Air Conditioner  
**ANSI** - American National Standards Institute;  
A standards setting, non-government organization which develops and publishes standards for “Voluntary” use in the United States.  
**ATM** - ATM is the technology selected by the Consultative Committee on International Telephone & Telegraph (CCITT) International Standards organization in 1988 to realize a Broadband Integrated Services Digital Network (B-ISDN). It is a fast cell-switched technology based on fixed-length 53-byte cell. The most significant benefit of ATM is its uniform handling of services, allowing one network to meet the needs of many broadband services.  
**Amphenol Connector** - Amphenol is a manufacturer of connectors. They make many connectors, many of which are made by other companies. The most famous connector was the 25-pair connector used on 1A2 Key telephone systems, and for connecting cables to many electronic key systems and PBX’s. The telephone companies (LEC) call the 25-pair Amphenol connector the RJ-21X. The RJ-21X connector is made by other companies including 3M and TRW.  
**BEF** - Building Entrance Facility  
**BICS** - A telecommunications association founded in 1974 as a non-profit, professional association to serve the telephone company buildings industry consultants (BIC’s) who were responsible for the design and distribution of telecommunications wiring for commercial and multifamily dwellings.  
**BRI** - Basic Rate Interface  
**BTN** - Billed Telephone number; the primary telephone number used for billing, regardless of the number of circuits associated with the number.  
**CAM** - Call Applications Manager; The name of the Tandem software interface which provides the link between a call center switch telephone switch (either a PBX or an ACD) and all Tandem Non-Stop, fault tolerant computers. CAM supports most major PBX's and automatic call distributors.  
**CAT** - Category of Performance - The EIA/TIA Technical Systems Bulletin (TSB) 36 for unshielded twisted pair (UTP) wire and the impedance release of EIA/TIA TSB 40 for cross-connect hardware provide the performance benchmarks that the cabling industry shall meet in order to claim a particular category of performance. The table below highlights the different categories and their supported data rates:

<table>
<thead>
<tr>
<th>Category</th>
<th>Data Rate Supported</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,2</td>
<td>Voice</td>
</tr>
<tr>
<td>3</td>
<td>10 Mbps</td>
</tr>
<tr>
<td>4</td>
<td>20 Mbps</td>
</tr>
<tr>
<td>5</td>
<td>100 Mbps</td>
</tr>
<tr>
<td>6</td>
<td>1 gig</td>
</tr>
</tbody>
</table>

**CENTREX** - Centrex is a business telephone service offered by a local telephone company from a local central office. Centrex is basically single line telephone service delivered to individual desks with features such as: call forwarding, call transfer, toll restrict, least cost routing and hold.  
**CDR** - Call Detail Recording; A feature of a telephone system which allows the system to collect and record information on outgoing telephone calls - who made the call, where the call went, what time of day the call was placed, the duration of the call, etc. It is usually needed if you are to install a Call Accounting System.  
**COT** - Central Office Trunk; A trunk between central offices, major switches, minor switches and between public and private switches.  
**CSU/DSU** - Channel Service Unit/Data Service Unit  
**D.C.** - direct current  
**DCE** - Data Communications Equipment  
**DID** - Direct Inward Dialing; For dialing inside a company directly without going through the attendant. This feature used to be an exclusive feature of Centrex, but it can now be provided by all modern PBX’s and some modern hybrids.
APPENDIX D

DTE - Data Terminal Equipment
EIA/TIA - EIA/TIA 568, 568A and 568B Commercial Building Wiring Standards. This telecommunications standard in early 1991 was out for industry review under draft specification SP-1907B. Its purpose is to define a generic telecommunications wiring system for commercial buildings that will support a multi-product, multi-vender environment. It covers such topics such as: Recognized Media, Cable Lengths/Performance, Interface Standards, Wiring Practices, Hardware Practices, Administration
EMI - Electro-Magnetic Interference
Ethernet- 10Mbps data network. (Includes multiple 10- 100- and 1000-Mbps standards, over coax, UTP and fiber, with higher speeds on the way.)
FCC - Federal Communications Commission;
FDDI - Fiber Distributed Data Interface; FDDI is a 100 Mbps fiber optic LAN. It is an ANSI Standard. FDDI uses a counter rotating token ring topology. It is compatible with the standards for the physical layer of the OSI model. The theoretical limit of Ethernet, measured in 64 byte packets, is 14,800 packets per second (PPS). By comparison, Token Ring is 30,000 and FDDI is 170,000 pps.
FOIRL - Fiber Optic Inter-Repeater Link
GPS - Global Positioning System; a system which computes and calculates exact coordinates anywhere on the earth. The GPS will eventually consist of 21 satellites orbiting the earth at 10,900 miles - they circle the earth twice a day. The GPS system allows one to get precise positioning, latitude, longitude and altitude. GPS satellite complement is now complete.
GUI - Graphical User Interface; A generic name for any computer interface that substitutes graphics for characters. GUI's usually work with a mouse or a trackball.
HTTP - Hyper Text Transfer Protocol; Invisible to the user, HTTP is the actual protocol used by the WEB Server and the Client Browser to communicate over the "Wire."
IDF - Intermediate Distribution Facility - additional telecommunications rooms within a building to the MDF.
ISDN - Integrated Services Digital Network; ISDN comes in two basic options, BRI (Basic Rate Interface), which is 144,000 bits per second and designated for the desktop, and PRI (Primary Rate Interface) which is 1.544 Mbps. And designated for telephone switches, computer telephony and voice processing systems.
ISO - International Standards Organization
ITU - International Telecommunications Union, Telecommunication Standards Bureau
IXC - IntereXchange Carrier - These are the "Long Distance Toll" Carriers; AT&T, SPRINT, MCI, WorldCom etc.
LAN - Local Area Networking; A short distance high bandwidth data communications network, typically within a building or campus, under some form of standard control.
LCD - Liquid Crystal Display; A low power display that aligns material suspended in a liquid under the influence of a low voltage so it reflects ambient light and displays alphanumeric characters.
LEC - Local exchange Carrier; The local telephone company, the local loop. Companies such as Ameritech, Nynex, SouthWestern Bell, Pacific Bell, US West etc.
LED - Light Emitting Diode; A semiconductor diode which emits light when current is passed through it.
MDF - Main Distribution Facility
MERS - Most Economical Routing Selection, A term used by GTE and other PBX Manufacturers to mean Least Cost Routing.
MODEM - Modulator/DEModulator; Equipment which converts digital signals to analog signals and vice-versa. Modems are used to send data over inside and outside plant telephone cables, which is usually analog. The modem modulates the “1’s” and “0’s” into tones, which can be carried by the telephone network. At the other end, the demodulator part of the modem converts the tones back to digital “1’s” and “0’s.”
MUX - MUltipleXer; Electronic equipment which allows two or more signals to pass over one communications circuit. The “circuit” shall be a telephone line, a microwave circuit or a radiated television circuit.
NET REQ - Network Requisition; Oracle Corp. internal process by which network upgrades are requested, implemented and tracked.
APPENDIX D

NEXT - Near End CrossTalk - the ratio between the strength of the transmitted signal and that of the radiated noise on the adjacent pair.
OSI - Open System Interconnection; The only internationally accepted framework of standards of communication between different systems made by different vendors.
OTDR - Optical Time Domain Reflectometer; fiber optic cable test unit.
PBOX - Private Branch Exchange; privately owned (opposed to the LEC) telephone switch designed to emulate traditional feature phones provided by the Bell Operating Companies.
PCMIA - Personal Computer Memory Card International Association; Standardized credit card size packages for memory and I/O's (input/output devices) for computers, laptops, palmtops etc.
PMD - Physical Layer Medium Dependent;
PVC - Polyvinyl Chloride;
RUS - Rural Utilities Services (formerly REA)
RBOC - Regional Bell Operating Companies; Seven Bell Operating Companies fell out of the old AT&T/Bell System in the break up and divestiture of 1993.
RCDD - Registered Communication Distribution Designer; A title conferred on people who have acquired certain requisite education and experience by BICSI.
RJ - Registered Jacks; Telephone and Data plugs registered with the FCC, RJ-XX (where XX is a number) are probably the most common telephony plug in the world.
RJ-11 - Registered Jack # 11; Is a six conductor modular jack that is typically wired for four conductors. The RJ-11 is typically used to connect the telephone instrument, modems and fax machines to the female RJ-11 jack in the wall or floor. The jack is in turn connected to the twisted pair network to the PBX or other media.
RJ-21X - Registered Jack # 21; An amphenol connector attached to a typical 66M1/50 standard punch down block, wired and fanned out to have an electrical path for every 25 pairs of the connector. This is the device that the LEC uses as a demarcation point of systems.
RJ-45 - Registered Jack # 45; Is the 8-pin modular connector used for data transmission over standard telephone wire.
SC - Subscriber Connector; Optical Fiber Connector
SCSI - Small Computer System Interface - "Pronounced Scuzzie", The vehicle by which information is passed between the microprocessor of a PC system. USB and FireWire (IEEE 1394) are also now widely used.
SONET - Synchronous Optic Network. A family of fiber-optic transmission rates from 51.84 Mbps to 13.22 Gbps, created to provide the flexibility needed to transport many digital signals with different capacities, and to provide a standard for manufacturers to design from.
SQL - Structured Query Language; Invented by IBM and first commercialized by ORACLE in the early 1990's, SQL is a powerful database language used for creating, maintaining and viewing database data. It is becoming somewhat of a standard in the Mainframe and Minicomputer world.
T-1 - A digital transmission link with a capacity of 1.544 Mbps. A T-1 uses two pairs of normal twisted pair wires and can normally handle 24 simultaneous voice conversations, each one digitized at 64 kbps.
URL - Uniform Resource Locator; An Internet term. A URL is a glorified name for an address on the World-Wide-Web. A URL is a string expression that can represent any resource on the Internet.
UTP - Unshielded Twisted Pair; A cable medium with one or more pairs of twisted insulated copper conductors bound in a single plastic sheath. The most common medium to bring voice and data signals to the desktop. A strong belief exists that twisted pair cables carrying over 16Mbps shall definitely be carried on unshielded twisted pair - since at such speeds, such cables emit radiation which should be allowed to radiate unimpeded.
WAN - Wide Area Network; Uses common carrier-provided lines that cover an extended geographical area.
WWW - World Wide Web, a hypertext-based system for finding and accessing resources on the Internet network.
APPENDIX E

STANDARD FLAT SCREEN DISPLAY MOUNT

P2S
ENGINEERING
Long Beach, California • www.p2seng.com

DRAWN BY
RM
CHECKED BY
BL
SCALE
NONE
DATE
02/07/08

SKETCH NO.
02
APPENDIX E

TYPICAL INSTRUCTOR CONSOLE SPACE LAYOUT

P2S ENGINEERING
Long Beach, California  www.p2seng.com

DRAWN BY
CHECKED BY
SCALE
DATE
02/07/08

SKETCH NO.
03

Foothill-De Anza Community College District
Appendix E
Telecommunication Standards
APPENDIX F

VOICE / DATA SYSTEM LOGICAL RISER SCHEMATIC DIAGRAM – FOOTHILL AND DE ANZA CAMPUS

The following diagram represents the logical relationship between the individual building being addressed on a project and the campus MPOE for third-party service providers and the campus data center.
APPENDIX G

VIDEO SYSTEM LOGICAL SCHEMATIC RISER DIAGRAM - FOOTHILL CAMPUS

The following diagram represents the video system logical riser diagram for the Foothill Campus only.

Foothill-De Anza Community College District
Telecommunication Standards

Appendix G
APPENDIX G

VIDEO SYSTEM LOGICAL SCHEMATIC RISER DIAGRAM – DE ANZA CAMPUS

The following diagram represents the video system logical riser diagram for the De Anza Campus only.