

SECTION 8500

TECHNOLOGY SYSTEMS

1.01 INTRODUCTION

- A. The Technology Systems Plans and Specifications shall be prepared in accordance with the latest edition of the BICSI Telecommunications Distribution Methods Manual (TDMM), the requirements of the OSDM as outlined herein, and shall be designed and approved by an RCDD or design professional with equivalent 3 years of experience. Refer to the OFCC Technology Phase Submission Form for *DD and CD phase* submittal requirements.
1. Audio-Visual Systems shall be designed and approved by a designer with a CTS, CTS-D or CTS-I or an equivalent minimum of 3-years experience.
 2. Security Systems shall be designed and approved by a designer with a CPP, PSP, ESS, or an equivalent minimum of 3-years experience.
- B. The Telecommunications Plans shall provide a minimum level of content as described herein. The guide below is intended to convey the basic information that is required to be included in Telecommunications Systems Plans. Additional information may be required based upon the scope and nature of the design. The guide below is not intended to set forth an exact organizational or numbering format for Telecommunications Plans.
1. T0 Site Plans - Projects where new telecommunications services are being provided shall be included with a site plan. The plan shall indicate proposed routing of incoming services including any required underground or aerial pathways. Site plan should also indicate approximate location within building outline of any exterior pathways' termination point as well as inter-building backbone cabling in a Campus setting. This information may be included on the Electrical Site Plan.
 2. T1 Composite Plans - Complete building composite floor plans for each floor at a scale no less than 1"=20'-0". The composite floor plans shall indicate locations of Telecommunications Rooms, cable assignment for each TR, major cable pathways including cable tray and conduit risers. Other information which may be included on the plans are security zones, wireless access points, and security camera locations.

3. T2 Floor Plans– Building floor plans at a scale of not less than 3/32"=1'-0", broken down with appropriate match lines for large buildings and key plan on each sheet to correspond to plan location within building. Floor plans shall include all technology outlets and equipment. Where loose equipment is presented in a table format, drawing symbols for these items may be omitted. Floor plans must include room numbers and names within the sheets for each space.
 4. T3 Telecommunications Spaces – Large scale plans of the Telecommunications Spaces at a scale of not less than 1/2"=1'-0". The large scale plans shall include a floor plan, rack elevations and wall elevations for each telecommunications space. Floor plans shall indicate all equipment including racks, cabinets, ladder rack, conduit sleeves, etc. In addition, electrical requirements such as outlet types and locations must be referenced to coordinate with electrical drawings. Rack elevations must be to scale and show actual equipment to be installed for each rack. Where equipment size varies based upon manufacturers used, the largest equipment shall be included in the elevations. Wall elevations must show, a **2012** dedicated spaces with approximate size for the various wall mounted items of equipment for the various systems.
 5. T4 Details - Technology details including symbol legends, system schematic wiring diagrams, system riser diagrams, specialty details for equipment mounting, etc. The technology details must provide a clear and accurate picture of each system and the interconnectivity associated with that system and the integration between systems.
 6. Miscellaneous Drawings. Additional drawings that can be used in conjunction with the above-listed drawings.
- C. The Technology Designer should endeavor to reduce the quantity of Telecommunications Rooms (TRs) by centralizing the TRs and/or using one TR to serve multiple floors. For example, in a 3-story building, place the TR on the second floor and serve the 1st, 2nd, and 3rd floors from the same closet. The Technology Designer should consider locating the Main Equipment Room (MER) in a central building location if feasible. Coordinate the location, quantity, and size of the MER and TRs required early in the design process with the Design Professional.
 - D. The Technology Designer shall endeavor to centralize as many Technology and Control Systems as possible for the District into one school building or Network Operations Center (NOC) and interconnect the buildings and systems via fiber-optic cables whenever economically feasible.
 - E. The Technology Designer should consider using the savings from the centralization of systems to offset the cost of inter-building, fiber-optic cabling. Capital costs for Inter-Building, Fiber-Optic Cables can be included in the project, provided the overall Project Technology Budget is not exceeded.

- F. E-Rate grant opportunities for “Internal Connections” shall be considered for all OFCC projects. The Technology Designer shall coordinate all Technology Designs and Schedules with the Construction Manager, the School District, and the eTech Ohio E-Rate Coordinator.
- G. Since many of the Technology Systems could be operational for life-safety purposes and building evacuation purposes, the Technology Designer is to connect these systems and their associated UPS units to the Building’s Emergency Generator System when available. Coordinate the electrical loads, outlet types, and circuit locations with the Electrical Design Engineer. These systems include:
 - 1. Security Systems (CCTV, Access Control, and Intrusion)
 - 2. Telecommunication rooms UPS circuits
 - 3. Telephone System
 - 4. Paging and Central Sound System
- H. *The Technology Designer shall coordinate all MER and TRs equipment BTU loads, cooling and hours of operation requirements with the HVAC Design Engineer.*
- I. The Technology Designer shall assure all specifications require Contractors to submit shop drawings detailing the specific equipment provided for the project as well as O&M manuals containing project specific data. Generic equipment or system information is not acceptable. Additionally, requirements for “as-built” drawings from the Contractors for wiring diagrams, final system configurations, etc. are to be part of the specifications. The School District is to receive record documentation of the final actual installation of all technology systems.
- J. The specification of Technology Equipment (computers, A/V displays, etc.) that have the Energy Star label is preferred, when applicable.
- K. The Technology Designer shall coordinate specific wireless system design parameters and the possibility for greater reductions in hard wired outlet locations.
- L. The Technology Designer shall verify with the School District during the Programming Phase if they will be implementing any special technology applications or interfacing with third party entities (i.e. hosting or cloud computing solutions) that would affect the Technology or Facility Design.
- M. The Technology Designer shall submit required technical data validating the WLAN design to achieve *ubiquitous high-density coverage throughout the building* with the technology phase submissions. Refer to Section 27 21 33 for requirements.
- N. *The Technology Designer shall coordinate with the District regarding their on-line testing assessment procedures and policies. This is to ensure that the technology design and infrastructure will meet the District requirements.*

- O. *The Technology Designer shall coordinate with the District regarding the bandwidth needs of the District. The increase of wireless devices and increased bandwidth requirements , may necessitate an increase of bandwidth coming into the District building(s). Review should also consider ongoing maintenance cost for increased bandwidth.*
- P. *Note that an OSDM Technology and Security Checklist is located on the OFCC website. It is intended as a reference tool for use by the Technology Designer.*

1.02 TECHNOLOGY SYSTEMS

- A. Each OFCC Construction Project for new and remodeled facilities shall provide the baseline Technology systems. Additional non-baseline (optional) systems shall be added based on budget limitations.
- B. The Technology Designer shall design the following required Technology Systems for all new and remodeled buildings. Refer to the OSDM sections listed below for additional information:
 - 1. COMMUNICATIONS – DIVISION 27
 - a. Section 27 05 26 -- Grounding and Bonding for Communications Systems.
 - b. Section 27 11 00 -- Communications Equipment Room Fittings.
 - c. Section 27 13 13 -- Communications Copper Backbone Cabling.
 - d. Section 27 13 23 -- Communications Optical Fiber Backbone Cabling.
 - e. Section 27 15 13 -- Communications Copper Horizontal Cabling.
 - f. Section 27 15 43 -- Audio-Video Communications Horizontal Transport System.
 - g. Section 27 21 00 -- Data Communications Network Equipment.
 - h. Section 27 21 33 -- Data Communications Wireless Access Points.
 - i. Section 27 31 13 -- IP-Enabled PABX System (expansion of existing system only)
 - j. Section 27 31 23 -- IP Only PABX System.
 - k. Section 27 41 19 -- Video Display Equipment.
 - l. Section 27 41 25 -- Digital Media Management System.
 - m. Section 27 51 21 -- Student Dining / Auditoria Sound Reinforcement System – High School.

- n. Section 27 51 22 -- Student Dining / Cafeteria Sound Reinforcement System.
 - o. Section 27 51 23 – Central Sound and Paging System
 - p. Section 27 51 24 -- Gymnasium Sound Reinforcement System.
 - q. Section 27 51 25 -- Music Room Audio Program Playback System - Middle School.
 - r. Section 27 51 26 -- Music Room Audio Recording/Playback System - High School
 - s. Section 27 51 27 -- Classroom Sound Reinforcement System.
 - t. Section 27 53 13 -- Clock Systems.
2. ELECTRONIC SAFETY AND SECURITY – DIVISION 28
- a. Section 28 13 00 -- Access Control System
 - b. Section 28 16 00 -- Intrusion Detection System.
 - c. Section 28 23 00 -- Video Surveillance System.
 - d. Section 28 26 00 – Area of Refuge Intercommunication System
 - e. Section 28 32 13 – Emergency Responder Radio Coverage

1.03 BASE LINE SYSTEM

- A. The following items summarize the Technology Systems provided.
- B. TECHNOLOGY ELECTRICAL WORK
 - 1. These items are generally bid out as the Technology Electrical Package and are usually included in the Project's Electrical Bid Package.
 - 2. Back Boxes.
 - a. Includes back boxes and floor boxes that are part of the Technology system
 - 3. Cable Tray
 - a. Includes an OSDM Compliant, wire mesh, Cable Tray system.
 - 4. Conduits
 - a. Includes Technology conduit sleeves and conduit stubs to above accessible ceilings as per OSDM.
 - 5. Entrance Conduits – typical
 - a. Includes an allowance for a typical Service Provider UG Conduit System - if you have an unusually long Entrance (greater than 400 feet) adjust as required.
 - 6. Telecom Grounding

- a. Includes Telecom Grounding System, Ground Bars, and Cable Tray Grounding.
- 7. Backboards
 - a. Includes Painted Plywood backboards in Telecom Closets.
- 8. Power
 - a. Includes Rack and Cabinet Power Conduits, Stubs and pigtails to Junction Box only.
 - b. Does NOT include Technology Power wiring -- part of Electrical Package.
- C. TECHNOLOGY CABLING
 - 1. Refer to section 271100, 27131, 271323, 271513, 271543
 - 2. This Section includes the Technology Data Cabling and is based on an OSDM Compliant minimum Category 6 system. Use of shielded cable and Category 6A is optional.
- D. NETWORK ELECTRONICS
 - 1. Refer to Sections 272100, 272133
 - 2. This Section includes the Network Electronics as based on an OSDM Compliant Network.
 - 3. Network edge and core switches
 - 4. Wireless Access Points (APs).
 - 5. Wireless Controller/Switches
 - 6. Radius Authentication Server.
 - 7. UPS Units
 - 8. Fiber Patch Cords.
 - 9. Copper Patch Cords.
- E. IP-ONLY PABX SYSTEM – *Refer to section 273123*
 - 1. This section includes an IP-Only phone system based on OSDM requirements.
 - a. The typical system shall include Voice Mail and carrier circuits interfaces – these are based on whether the District has a central, redundant, IP-Only phone system that links all buildings together. If a central, redundant, IP-Only phone system exists, then Call Processing, carrier circuits, and Voice Mail are provided at the central location and the remote buildings are interconnected over the fiber-optic WAN. The remote buildings shall have Survivable Remote Units for call processing in the event of a fiber WAN failure.

- a. The system is based on a micro-processor based two-way intercom, paging and program distribution system connected to the PBX System via a multi-zone paging adapter as per OSDM.
 - b. The Central Office CD/*Digital Player*/FM Tuner is connected to the Paging System as per OSDM.
 - c. The Central Office Emergency Evacuation Switch and Tone Generator are connected to the Paging System as per OSDM.
 - d. An FM Antenna system is provided for feeding the various FM tuners located in the building.
 - e. The Central Bell/Clock system is connected to the paging system.
- J. WIRELESS CLOCK SYSTEM – Section 275135
- 1. This Section includes the Building Wireless Clock System based on OSDM Requirements.
- K. CLASSROOM A/V SYSTEMS – Sections 274116, and 274119
- 1. This Section includes the Classroom and Misc. A/V Systems based on OSDM Requirements.
 - 2. Technology Designer shall coordinate with other Design Professionals for an integrated classroom design to accommodate features such as daylighting.
 - 3. The Design is based on Classroom interactive projectors integrated with the *Classroom Sound Reinforcement* system and Digital Media Delivery and Scheduling.
 - 4. The Central Media Server and Scheduling system is NOT included and is assumed to be centrally located at the District's NOC.
- L. SPECIALIZED AUDIO SYSTEMS – Sections 275122, 275124, 275125, 275126, and 275127
- 1. This Section includes the Specialized Audio Systems based on OSDM Requirements:
 - a. Note that not all systems are required in every building type.
- M. REQUIRED SYSTEMS -- IF NO NOC EXISTS
- 1. This Section includes Systems that must be added to the Estimate if there is NO centralized NOC Location for the District.
 - 2. These systems are generally located at one building in the District and used to serve all District Facilities over a fiber-optic WAN.
 - 3. The following systems are Base Line required systems if no NOC exists
 - a. Voice Mail if no Central IP-Enabled or IP-Only PBX Exists.

- b. PBX PRI Interface if No Central IP-Enabled or IP-Only PBX Exists.
- c. Access Control Software & Console if no Central Unit Exists.
- d. Digital Media Management System if no Central System exists.
- e. Legacy only - CATV Head End and Coax System. Optional if extending an existing system.
- f. If the District has NO Digital Headend for Broadcast Media, then provide a Digital Broadcast Media District Head End – 6 or 12 Channels, as required.
- g. Redundant Central IP Call Processing Units if no Central IP-Only PBX Exists.

N. CURRICULUM TECHNOLOGY

1. This section includes various types of technology which specifically relates to use within the educational space by the instructor and students alike. The Technology Designer shall review the various technologies that are available with the School District to determine what combination of system(s) should be selected that will meet the needs of the District, within the allotted Baseline Budget. Note that some systems have minimum base line quantities suggested.
2. Baseline Systems:
 - a. Digital Media Management System
 - b. System shall consist of server portal that will enable web-based viewing, uploading, and downloading of digital content; management of title database operations; and logging of system parameters. System to allow for multicasting. System shall be sized according to number of users, number of titles, and network bandwidth. Baseline is 1 per District/School. Optional equipment in educational spaces may include: set-top boxes and digital encoders for video sources.
 - c. Hosted Solution – Technology Designer to coordinate with the School District if a hosted Digital Media Management System is the District’s preference. An OFCC variance shall be obtained if it is determined that a hosted Digital Media Management System is to be implemented. Specific items to review include:
 - 1) Method of incorporation into the designed technology system(s)
 - 2) Total Cost of Ownership / Annual Costs, etc
 - 3) Training requirements.

- 4) Cost for systems and equipment not located in the District and/or owned by the District is not OFCC funded.
- d. *Alternative Digital Media Content Solution - Technology Designer to coordinate with the School District if alternative methods to obtain digital media content is preferred versus local system equipment or a hosted solution. An OFCC variance shall be obtained if it is determined the District prefers to redirect digital media management system budget monies towards other technologies. Specific items to review in the variance submittal includes*
- 1) *District reason to not include a digital media management system via district owned equipment or hosted solution.*
 - 2) *Proposed method to obtain digital media content in District Technology Plan..*
 - 3) *Proposed use of re-directed technology budget monies associated with the baseline system, including Total Cost of Ownership/Annual Costs/Training Requirements, if applicable.*
 - 4) *Cost for systems and equipment not located in the District and/or owned by the District is not OFCC funded.*
 - 5) Interactive Projectors
 - 6) Interactive Projector – Baseline is 1 per educational space. Shall be mounted within room and provide interface with instructor’s workstation in the room and provide the ability to record, save and recall presentations. Includes equipment that can transform any writing surface into an interactive surface. Utilize either wired or wireless connections to the instructor’s workstation.
- O. Area of Refuge Assistance – Section 282600 – As required by code
1. The system shall be a multiplexed intercom system, designed specifically to meet the Area of Refuge Assistance communication requirements of the ADAAG and the OBC. During an emergency, building occupants can use the system to call for assistance from an Area of Refuge to either a local master station or to 911 services through the building telephone system
 2. The system shall consist of remote call-in stations in the areas of refuge (typically stairwells) and a master station. The system shall also provide telephone connections to the master station for access to 911

3. Note that this system is listed under optional systems category, as it typically would not be installed as a baseline system. It is listed here to advise the Technology Designer to verify building requirements with the Project Architect, to determine if it is a code required system and integrate with the telephone system accordingly.
- P. Emergency Responder Radio Coverage – As required by Code
1. The OBC requires approved radio coverage for emergency responders within the building.
 2. Note that this system is listed under optional systems category, as it may or may not be required based on several factors.
 3. The Technology Designer needs to determine compliance methodology with the Design Professional and AHJ during initial project phases

1.04 OPTIONAL SYSTEMS

- A. This Section includes Optional Systems that can be added to the Estimate based on Local Requirements if the budget permits.
- B. Interactive Tablets
1. *System shall be wireless*, utilizing RF, 802.11ac, or Bluetooth technology. System shall provide *wireless* interface with instructor's workstation *and display device(s)* in the room *including* the ability to record, save and recall presentations. System shall be of the integrated display type or non-display type tablet
- C. Classroom Digital STBs.
1. Includes Digital STB for delivery of IP Video into Classroom.
 2. Web-based Control via Projector IP Connection.
 3. Bracket included in Technology TE Package.
- D. Digital Signage
1. Single unit flat panel displays utilized for Visitor Information, General Way-Finding or Display Education Content.
 2. The quantity of Digital Signage shall be minimal and is an Optional System based on budget constraints.
 3. Digital Signage unit(s) utilized for video walls, sport or food services applications are not OFCC funded.
- E. High School Auditorium
1. The auditorium system is for Districts that construct a large formal auditorium and is only used for special situations.
- F. Enhanced Security Package

1. Based on local conditions, select this option to add additional camera coverage and security enclosures for classroom projectors – added cost and based on local conditions.
- G. AV Control Systems
1. Central control panels for classroom AV systems. Optional based on budget constraints.
- H. TV Studio
- I. *Interactive Flat Panel Displays (IFPDs)*
1. *IFPDs may be utilized instead of classroom interactive projectors. Refer to 27 41 19 for requirements.*
- J. *Optional method based on budget constraints.*

END OF SECTION