Technology Design Criteria

Name: San Bernardino Community College District

Date: September, 29 2010

Spec Type: CSI Book Form

Technology Scope

The technology design documents shall include considerations for the following infrastructure components:

1. *Inter-building Pathways:* Four-inch Conduit backbone structure. Indicate if existing pathways are to be used or if new pathways are to be placed.

2. *Inter-building Media*: Copper and Air-Blown Fiber Backbone Cable Networks. Indicate existing and/or new media that is to be used.

3. *Intra-building Spaces:* BDF/IDF's

4. *Data Centers/MDF Spaces* Campus Data Center/MDF's

5. *Intra-building Pathways:* Cable tray, conduit, wire-mold, wire hanger systems. If the construction is a renovation project, indicate if any existing pathway is to be used.

5. *Intra-building Media:* Information Outlets (voice, data and video) and riser fiber and copper cables. If the construction is a renovation project, indicate if any existing outlets or riser cables are to remain in use.

6. Emergency Power: Various systems such as PA, PABX, Security, Computer Networking and Fire Alarm require emergency power.

7. *Audio-Visual:* Audio-visual room information and layouts, Electronic Image Display, Sources and Inputs, Sound Systems, Control Systems, Coordination Required by other trades.

Basis of Design:

The basis of design for technology is the San Bernardino Community College Technology Design Standards as revised in October, 2010 and known code requirements. A summary of the design criteria for each of the major components is listed below:

1. *Inter-building Pathways:*

Conduit systems:
Main Underground Conduits from Campus Data Center/MDF and Voice MDF/MPOE to the building serving manhole.
Size: 4" diameter.
Type: PVC Schedule 40 encased in concrete (Transition to GIP at building).
Cover: Minimum 24" dirt, minimum 6" concrete. Slurry around conduits with 2-sack mix concrete.
Minimum bend radius: 12.5 feet.
Maximum number of 90 degree bends between manholes: 2.
Design: Allocate conduits for the ultimate copper cable network. Home-run all other conduits from serving manholes to MDF. Provide spare conduits for future buildings in vacant land areas and additional growth requirements for future building renovation projects. Provide ultimate number of conduits (existing plus new) to serve entire campus.

Underground conduits transition from PVC conduits into main building entrance room.
Size: 4" diameter.
Type: Galvanized Iron Pipe (GIP)
Minimum bend radius: 36 inches.

Determining Number of Conduits for standard copper and fiber cable designs:

Building Entrance Conduits (Main telecommunications entrance rooms and BDF to serving manholes): Varies depending on building size and occupant requirements. Guideline:

ASF < 50,000 Sq. Ft.: (3) – 4" or equivalent for average size building
(1 for copper, 1 for Air-Blown Fiber Tube Cables, 1 for special requirements such as EMS/Security/Clock that require dedicated cables, and 1 spare for emergencies, cutovers, etc.)

ASF < 100,000 Sq. Ft.: (4) – 4"
ASF < 200,000 Sq. Ft.: (6) – 4"
ASF < 300,000 Sq. Ft.: (8) – 4"
ASF < 500,000 Sq. Ft.: (12) – 4"

1) Manholes

(a) Sizes: Manhole sizes will be based on the maximum number of conduits entering from one end per the following table:

# of Conduits	Manhole size
Less than 3	4' x 4' x 4' (Pull box)
3 to 5	5' wide x 7' long x 7' deep
6 to 9	6' x 12' x 7'
10 to 18	8' x 14' x 7'
19 to 24	8' x 16' x 7'

(b) Spacing – within 200 feet of building entrance room. Optimal manhole spacing is 350 to 400 feet between manholes.
(c) Conduit terminations: Conduit must enter and leave a manhole at the ends of the manhole.
(d) Equipment: manholes must be fully equipped including ground rods, rack hardware, sumps, ladder, and H-20 rated manhole cover.

2) Tube cables for standard fiber strands:
(a) Sizes: 19-cell, 7-cell and 4-cell.
(b) Number of tube cables: Buildings larger than 100,000 square feet shall be served with a minimum 7-cell tube cable. Smaller buildings shall have a 4-cell tube cable serving it.
(c) The 4- and 7-cell cables serving individual buildings shall be spliced into 19-cell tube cables at appropriate manholes and the 19-cell cables run

directly to the Data MDF. A minimum of two and a maximum of three 19-cell cables shall be placed in a 4" conduit.

2. Inter-building Copper Cable

A. Underground cable in conduit and tunnels.

1) Type:
   (a) Gel-filled, PIC, color-coded cable.

2) Gauge:
   (a) 24 AWG for loop lengths equal to or less than 2500ft.
   (b) 22 AWG for loop lengths greater than 2500 ft. and less than 3500 ft.
   (c) Special design for loop lengths greater than 3500ft.

3) Design:
   (a) Star topology from MDF/MPOE to each building BDF.
   (b) Non-multipled, dedicated cable pairs from MDF/MPOE to each building BDF.
   (c) No bridged tap in design.

4) Building Entrance Cable:
   (a) Protected terminals on both ends of cable (BDF and MDF/MPOE)
   (b) Building Cable Pair Requirements:
   Process:
   Copper cable is to be used for analog service such as alarms, elevator phones, and emergency lines in a Voice over IP environment. Design minimum 50-pair copper cable to buildings after discussion with IT Group.
5) Protector panels demarc for inter-building at both ends

1. Inter-building Air-Blown Fiber Cable

A. Underground fiber cable in tube cable.

1) Type:
   (a) Sumitomo FutureFLEX- Air Blown Fiber is the Campus Standard.

2) Design:
   (a) Star topology from Campus MDF's to building BDF's.
   (b) Underground fiber cables installed in tube cables that, in turn, are in conduits.
   (c) Tube cable backbone size shall be 19-cell with 4- or 7-cell tubes to individual buildings.
   (d) Fiber cables shall be home run from Campus MDF's to optical patch panels in building BDF.
   (d) Building Entrance Cable: Since the air-blown fiber comes in one continuous length from the MDF, there is no "entrance cable" as traditionally known.
   (e) Building Fiber Requirements:
   Multi-mode, 50 micron 12-strand bundle installed in one cell and single-mode, 24-strand bundle installed in another cell shall be planned for buildings over 100,000 square feet. If large buildings require more fiber in the future, the vacant cells will be available for more ABF.
   Provide additional optics to a particular building if it is definitely known that usage such as data, video, energy management, fire alarm, security, etc. will surpass the standard amount listed above.
   (The San Bernardino Community College District Master Plan is being developed to add a second tube and fiber cable system from a new Network Operating Center/Data Center to allow for redundancy. Coordinate any new designs with this new plan.)

3) Bulkheads de-marc for inter-building cable. (Equipment rack and patch panel included in inter-building)

2. Intra-building Spaces (Determine Telecom Room Spaces in the initial design of the building.)

A. Service Entrance Room

1) Minimum size 5' x 7' and located on the lower level within 50 feet of the outside wall. The Service entrance Room is not necessary if the BDF is within 50 feet of the entrance of the cable and is at least 9' x 12' as mentioned below.

B. Equipment Room or BDF room.

1) Minimum size 10' x 15' for standard requirements.
   (Room may also serve as Service Entrance Room)
2) Open ceiling to deck above.
3) Void or a minimum presence of water pipes, A/C ducts, or other facilities.
4) Void of overhead water or drainage pipes.
5) Equipped with pre-action fire sprinkler system for coverage of this space.
   (Verify Campus desires at time of design.)
6) Floor loading minimum of 200 lbs per square foot (distributed loading).
7) Dedicated rooms for only technology equipment.
8) Lead-acid batteries not to be stored in these rooms. They require separate and adjacent rooms.
9) Accessible from hallway.
10) 24 hour/7 days per week air conditioning for Main Switch rooms, Data Hubs, and building BDF/IDF's.
11) Optimum location; center of building and no farther than 295 feet from the furthest information outlet, rooms stacked between floors.

C. Distribution Room or IDF room

1. Minimum size 10' x 10' and preferably one room per floor.
2. Open ceiling to deck above.
3. Void or minimum presence of water pipes, A/C ducts, or other facilities.
4. Void of overhead water or drainage pipes.
5. Equipped with pre-action fire sprinkler system for coverage of this space.
   (Verify Campus desires at time of design.)
6. Floor loading minimum of 200 lbs per square foot (distributed loading).
7. Dedicated rooms for only technology equipment.
8. Lead-acid batteries not to be stored in these rooms. They require separate and adjacent rooms.
9) Optimum location; center of building and no farther than 295 feet from the furthest information outlet, rooms stacked between floors.
10) Environment equal to or better than a normal office (positive air flow cooling, lighting at 50 foot candles, sealed concrete or tiled floor.)

D. Technology Requirements:

1) Backboards: Size 4′ x 8′ x ¾″ backboards on all walls to accommodate ultimate requirements.
2) Equipment Racks: Each telecom room should have minimum of three 2-post racks. More will be added depending on the floor plan needs. (Wall mounted swing racks for special applications.)
3) Ladder racks: 12″ wide to distribute wire and cables within rooms.
4) Each BDF/MDF/IDF must contain an appropriate number of Cisco network switches. The number of switch ports in each room must equal at least 75% of the number of patch panel ports in the respective room. All copper switch ports must be capable of 10/100/1000 MB speeds, and provide Power over Ethernet. Switches should have multiple10GB fiber optic ports, redundant power supplies and must be stackable with other Cisco switches.

E. Architectural Basis of Design

1) Architectural Space Requirements
   a. Open ceilings to deck above. (No dropped ceilings)
   b. 36″ wide x 7′ high door.
   c. Sealed concrete floor.
   d. No water sources, such as, sinks, water heaters, etc. in rooms.
2) All BDF and IDF Rooms shall be equipped with card reader access control.

F. Electrical Basis of Design

1) Electrical Space Requirements:

   a. A separate electrical service panel, sized to support 225 amps (150 amps for IDF's) shall be placed in each BDF. If the building is to have an emergency generator, the panel shall be connected to the Automatic Transfer Switch for the generator.
   Power outlets: 20 amp, 120 volt quad, dedicated circuits plus 30 amp, 208 volt dedicated circuits.
   Number and Location:
   BDF's – 3, (20 amp, 120 volt: 1 located at 72″ on backboard behind equipment rack, 2 at 15″ AFF on backboard near data terminal blocks).
   Two 208 volt, 30 amp circuits for data switch equipment.

IDF's – 2, (20 amp, 120 volt: 1 located at 72" on backboard behind equipment rack, 1 at 15" AFF on backboard near data terminal blocks). One 208 volt, 30 amp circuit for data switch equipment.

b. Grounding per EIA/TIA 607: Ground Bus Bars mounted at 15" AFF on the plywood backboard.
Sizes: BDF's – ¼" x 4" x 20"
IDF's – ¼" x 4" x 12"
Conductors: All IDF's shall be connected back to the BDF with a green insulated, 3/0 stranded copper cable. From the BDF Bus Bar, connect to the Building Main Ground with a 3/0 conductor. All items being bonded to the bus bars shall be connected with # 6 AWG copper insulated wire.

c. Lighting: 50 foot candles illumination measured 3 feet above the finished floor.

2) Emergency Power

a. If a building is to have an emergency generator, the service panel in each telecom room shall be on the emergency power transfer switch as noted above.

b. The PA/Intercom/PABX system shall be equipped with an uninterruptible power supply (UPS) capable of providing a minimum of 1 hour continued emergency operation. The computer networking system shall be provided with a UPS with a minimum of 1 hour of emergency operation and automatic shutdown capabilities. This means that every BDF/MDF/IDF must have enough power for 1 hour of runtime. Each UPS must be expandable, networkable and able to integrate with the existing campus UPS management system.

c. The security system shall be furnished with an emergency power supply capable of supporting 4 hours of continuous operation. The fire alarm system shall contain an emergency power supply capable of supporting 4 hours continuous operation.

G. Mechanical Basis of Design

1) HVAC Space Requirements:

a. Main Switch rooms and special technology rooms (for example large Server Rooms): These rooms must be equipped with a separately

controlled HVAC capable of maintaining an office environment temperature on a 24/7 basis. This separate system is a secondary system. Both the primary (building) system and the secondary system must be capable of maintaining the prescribed environmental conditions for these types of rooms.

b. BDF's: These rooms require a separate controlled HVAC the same as noted above. A minimum heat load of 18,000 BTU, for communications equipment only, can be assumed for the BDF's. Sufficient heating, ventilating, and air conditioning (HVAC) sensors and equipment must be installed to provide a constant environment for this space. Unless specific requirements otherwise dictate, the room environment should approximate an office. The maximum change in temperature must not vary more than 5 degrees (F), and humidity must not vary more than 10 percent. The design target is a continuous operating temperature between 64 and 75 degrees with 30 to 50 percent relative humidity. Both the primary and secondary system thermostats are to be placed adjacent to each other within this room.

c. IDF's: Same requirements as BDF's listed above except for the heat load. Assume a minimum heat load of 12,000 BTU for the IDF's.

d. HVAC systems for the telecom rooms shall be wired to the service panel in the respective telecom room or to some other source of emergency power. This allows the system to be included in the emergency power connection.

3. Campus Data Centers/MDF Spaces

A. Physical Aspects of Data Center/MDF

The same considerations for BDF spaces shall be used for Data Centers/MDF's except that the space must be larger. A 24" raised floor is another exception to the space requirements of a BDF. In designing the size of a Data Room consideration must be given to the fact that the server racks are 24" wide, 7 feet high and 42"to 48" deep. This means that rows are wider than normal telecom rooms. Aisle space in front and back of the racks needs to be a minimum of 36". Discussion with the Campus IT people regarding their expected number of racks is a critical item in order to plan the proper sized Data Center/MDF. Consideration for expected growth has to be considered too.

The Data Center/MDF door(s) shall be equipped with card reader access.

B. Mechanical System (HVAC) Requirements for Data Center and MDF

Provide HVAC that will maintain continuous and dedicated environmental control (24 hours per day, 365 days per year). Maintain positive pressure with a minimum of one air change per hour. Provide:

1) Temperature 70 degrees F +/- 10 degrees
2) Relative humidity 50% +/- 20%
Estimated Heat Loads: 5,000 to 7,500 BTU per equipment cabinet or rack.

The Data Center HVAC system(s) needs to be designed with Computer Room Air Conditioners (CRAC) units. The initial cooling capacity will be 10 Tons with a final build out capacity of 40 Tons. Ten Ton IN-ROW DX CRAC units will be added incrementally as the power load in the Data Center increases. The initial CRAC units, one chilled water unit and one DX unit, will be conventional downflow type units discharging cold air into 24" raised floor plenum space. The 10 Tons chilled water CRAC unit will be served with chilled water from the campus central plant and the redundant 10 Tons DX CRAC unit will have air-cooled condenser on the roof.

Server racks will be arranged to create hot and cold aisles. The cold aisle is the front of the racks and should have some form of containment to maximize the cooling effectiveness of the cold air that is being supplied to the cold aisle.

C. Mechanical System (Fire Suppressant) Requirements in Data Center

The Data Center shall have an FM-200 Fire Suppressant System furnished for it. A certified design-build fire suppressant company shall be engaged to provide the system for the Data Center. All necessary ties to the fire alarm system shall be provided by the design.

D. Electrical System Requirements for Data Center and MDF

1. Lighting
   Provide a minimum equivalent of 500 lux (50 foot-candles) measured 1 m (3 ft) above the finished floor. Locate light fixtures a minimum of 2.6 m (8.5 ft) above the finished floor. Emergency lighting systems which operate on trickle-charge storage batteries are desirable as a safety precaution in the event of an inadvertent power outage.

2. Power

   Separate service panels are recommended for these rooms. A minimum capacity for the MDF is two 225 amp panels.

For every equipment rack/cabinet, provide (1) dedicated non-switched 3-wire, 30A, 208 volt (V) alternating current (ac) with locking electrical outlets (NEMA L6-30R) for equipment power, each on separate branch circuits.

Provide separate duplex 120 V AC convenience outlets (NEMA 5-20R) for tools, test sets, etc., located at least 18 in. above the finished floor, placed at approximately 6 ft. intervals around perimeter walls and identified and marked as such. All outlets must be on non switched circuits.

All power panels in the Data Center shall be on the transfer switch for the generator.

Because of the "mission critical" nature of the Data Center, backup power shall be provided, allowing a controlled shutdown of the equipment in the event of a power failure: A single module UPS with parallel (maintenance) bypass, 100% isolation from raw utility power and 60 minute (expandable to 120 minute) battery capacity at full load.

There shall be an emergency generator designed for the Data Center. An outside area shall be designed to house the generator and the condensate units for the HVAC systems.

E. Bonding and Grounding

Provide a minimum 12" copper signal ground bus bar mounted on the Data Center/MDF wall, under the raised floor. The ground lead shall be a 3/0 copper cable with green insulation, cad-welded to the Ufer Ground or building steel.

Provide Signal Reference Grid (SRG), comprised of the Data Center raised floor bolted metal stringers, with bonded perimeter copper wire (#8 AWG minimum) grid on 2 foot centers, covering the entire space. The SRG shall be bonded with #2/0 AWG copper wire to the Data Center ground buss, PDU ground bus, structural steel penetrations, metal pipe or duct penetrations, and cable tray. The SRG shall be bonded with # 6 AWG copper wire to Data Center computer equipment racks and HVAC equipment.

F. Category 6A Copper

All Copper Terminations in the Data Center shall be Category 6A 10gig rated system.

4. *Intra-building Pathways (Determination of telecom pathways should be done simultaneously with determination of mechanical and electrical pathways.)*

A. Cable Trays: Use when station outlets exceed 25 in number and installation is possible by removing tiles in dropped ceilings or ceilings can be removed. Standard sizes 18" wide or 12" wide by 3" high. Increase sizes as necessary. Flextray-type cable tray (equipped with solid bottom when used in exposed areas) to be used. If these conditions don't exist, use wire hangers supported from the deck above.

Conduits between BDF and IDF's (Riser Pathways): (3) – 4" conduits or sleeves minimum and add one additional conduit for each 40,000 square feet of space served above that point.

C. Air Blown Fiber (ABF) 4-cell Tube Cable (indoor-rated) shall be placed between the BDF and each IDF. The continuity of the tube cable must be continuous from the BDF to the IDF.

D. Conduit and conduit sleeves for station wire:

Conduit size	1"	1 ¼"	1 ½"	2"	4"
*Max. No. of cables	5	9	12	20	77

*Reflects the use of four-pair Category 6A station cable and does not include any allowance for coaxial or fiber optic cable.

Two four-inch conduits should be dedicated between a distribution room and each (raised floor) computer lab or video facility it serves.

E. Information outlet receptacles: The standard wall outlet should be a 5 inch square (quad), 2-7/8" deep outlet box served by a 1 ¼ inch conduit (with no more than a total of 180 degrees of bend) covered with a duplex mud ring. Use in new wall construction and surface mount outlets. In existing hollow wall, fish wall and use Caddy-type receptacle bracket. Surface Raceway: Use for standard pathway distribution systems in areas where walls are inaccessible to fish walls. Do not use surface raceway in areas of heavy pedestrian traffic areas such as major corridors in buildings.

5. *Intrabuilding Media (Design can be made after pathways are determined, but coordination between pathway designer and media designer is crucial. It is preferred by the Campus to have the same designer for telecom pathways and media.)*

A. Copper Riser Cable (BDF to IDF's):
Riser rated cables, all pairs dedicated, non-multipled from IDF's to BDF. Even though the campus is a Voice over IP system, copper shall still be placed from the BDF to each IDF. This is for any non-VoIP circuits that may be required. A minimum 50-pair cable shall be placed from the BDF to each IDF.

B. Air Blown Fiber Riser Cable (BDF to IDF's):

ABF fiber cable - 12 multi-mode (50 micron) in one cell and 24 single-mode fiber optic cables, riser rated installed in 4-cell tube cable. (In buildings with smaller floor sizes, a 6 mm/6 sm can be used.) All optics home-run from IDF to BDF. Increase the number of optics for special, heavy demand areas. Both ends of the fiber cable are to be terminated on a Sumitomo FutureFlex housing with AMP, Mfg#2, Mfg#3, or equal connectors and adapters.

C. Information Outlets:

1) Quantity and type for each room: Individual Offices- Two 3-data outlets, each on an opposite wall; Conference Rooms –3-Data outlet on each wall, 3-data Floor Mount Outlet and a video outlet on front wall. A three-data outlet ceiling mounted for projector and wireless access point; Classrooms – 3-data outlet and a video outlet at instructor's position. A 3-data outlet on the ceiling for projector and wireless access point, additional 3-data outlet at the front, a 3-data outlet on each of three walls and one wall voice outlet. Multiple-user offices: One 3-data outlet per anticipated work station and additional 2-data for dedicated equipment locations such as copiers. Hallways/foyers: Wall voice outlets for courtesy phones spread out at reasonable distances within the building. All cables shall be Category 6 4-pair UTP or equal.
(This is only a partial list of the criteria for outlets. To see all the possibilities for outlets, please refer to the *SBCCD Technology Design Standards*, Section 2.0.)

2) Standard three-data outlet: 3 Category 6 cables terminated on AMP, Mfg#2 or Mfg#3 rack mounted 110 modular jack 48-port patch panels in the BDF and on three AMP, Mfg#2 or Mfg#3 Category 6, eight pin modular jacks at the outlet. All termination equipment shall be rated for Category 6 gigabit speed usage.
3) Standard data only or voice only outlets: One Category 6 cable terminated on a AMP, Mfg#2 or Mfg#3 rack mounted 110 modular jack 48-port patch panels in the BDF and on one RJ-45, Category 6, eight pin modular jack. All termination equipment shall be rated for Category 6 gigabit speed usage.
4) All Category 6 jacks shall be blue for Data and White for Voice.
5) All Category 6 UTP Plenum Cable shall be blue for Data and White for Voice.
6) Wiring terminations shall be according to EIA/TIA T568B.

D. Structured Cabling System

1) Copper Structured Cabling System: Require that a minimum 20-year warranty from SBCCD approved manufacturers, AMP, Mfg#2 or Mfg#3 be provided. Structured Cabling System shall conform to and pass all EIA/TIA Category 6 performance specifications. Valid Certification to be provided in submittals.

2) Copper Structured Cabling System Data Center/MDF: Require that a minimum 20-year warranty from SBCCD approved manufacturers, AMP, Mfg#2 or Mfg#3 be provided. Shall conform to and pass all EIA/TIA Category 6A performance specifications for the Data Center/MDF. Valid Certification to be provided in submittals.

3) Fiber Structured Cabling System: Require Sumitomo FutureFlex Warranty from Certified Sumitomo FutureFlex Installers. Valid Certification to be provided in submittals.

E. Wireless Access Points

1) Included in the cabling of the building shall be two-port data outlets to allow for the connection to wireless access points throughout the building. The design of the access points shall be such that the signal strength exceeds the subjective rating of Good to Excellent (-67dB minimum) as measured on a standard PC laptop computer in each room of the building. Design overlap in coverage area into the deployment so that clients will be distributed as

efficiently as possible and to provide redundant coverage if there is a temporary disruption in service of an individual access point.

2) Design coverage for classrooms and other areas so that during peak usage (50% of occupancy are expected to have wireless devices) the maximum number of clients associating with any given access point will not exceed 30. Wireless bandwidth is shared by all clients associated to an access point, and for normal, casual network usage, no noticeable degradation in network response will usually be seen until approximately 30-40 clients associate to a single access point. Design the system to support all standard wireless protocols.
3) The College is using Cisco Aironet Access Points for their wireless system.
4) Emergency Phones – College standard is the Talk-A-Phone ETP-MT/R Phone Tower. Each is to be equipped with the VOIP-500D Phone capable for using a Voice over IP line. The color for the tower shall be blue and all components to be discussed with the College Facilities Staff before ordering.

7. Closed Circuit TV (CCTV)

A. The College utilizes a (Mfg) CCTV IP System with (Mfg) Series cameras. The video storage is handled by a (Mfg) Physical Security Platform for Video Surveillance.
B. Future work must ensure that the prescribed (Mfg) cameras are used with the campus preferred Category 6 UTP cabling for the camera connections. The College CCTV System shall be discussed with the College prior to ordering any components.
C. When camera locations are determined, two areas in which cameras shall be planned are inside all elevators and in entries/exits of buildings.

8. Security Access

TBD

9. Audio-Visual Systems

The Audio-Visual Systems design intent is to create standardize equipment layouts and control methods that instructors and students are familiar with regardless of which

building and/or room they are assigned too. The focus should be on educating rather than learning how to operate disparate audio-visual systems on campus.

The objective of this document is to provide the following guidelines:

- To simplify the controls of the audio-visual systems for the users
- To provide a consistent design, layout, and operation of the audio-visual systems
- To provide the infrastructure requirements for the audio-visual components and future expandability
- To implement the Crestron Roomview Management Software for District wide management of audio-visual resources
- To help facilitate the support and maintenance of the audio-visual systems
- To provide performance standards and requirements of the audio-visual system components to be installed
- To provide performance standards and requirements of the audio-visual system integrators that are qualified to install and maintain the audio-visual systems.

A. Standard Room Types:

1. 40 Seat Classroom (Typical)

Instructional Classrooms will be considered also as "Smart Classrooms" where the space is designed for multi-media instruction via multiple audio-visual sources. These spaces will be provided with a lectern which will be the control center for the audio-visual systems. The lectern shall provide rack mounting space for audio-visual components such as: Crestron Digital Media components, Blu-ray player, power-strips, audio amplifiers, and DSP components. The lectern shall provide shelf space for a dedicated computer, laptop, document cameras, and Crestron audio visual input and control panels. An HD projector and projection screen would be appropriately sized for the instructional space. Program speakers would be provided on the right and left of the screens for stereo sound.

2. 40 Seat Computer Labs (Typical)

Computer Labs will require the space to be for designed for multi-media instruction that will enhance the viewing experience of presentations. A lectern and/or desk shall provide rack mounting space for audio-visual components such as: Crestron

Digital Media components, Blu-ray player, power-strips, audio amplifiers, and DSP components. The lectern/desk shall provide shelf space for a dedicated computer, laptop, document cameras, and Crestron audio visual input and control panels. An HD projector and projection screen would be appropriately sized for the instructional space. Program speakers would be provided on the right and left of the screens for stereo sound.

3. Conference Room (Type 1)

Type 1 Conference Rooms would be considered small meeting rooms with seating for up to 12 occupants. The audio-visual systems would provide the viewing of multi-media presentations, HD-video conferencing (if required), teleconferencing, and the capability to display campus CATV. The audio-visual systems would be located in a fixed space such as a multi-media credenza with an integrated equipment rack. Voice/Data/AV inputs would be provided in the middle of the room in a floorbox and/or poke-thru for the conference table. A flat panel display will be wall mounted with stereo loudspeakers attached on the right and left of the display.

4. Conference Room (Type 2)

Type 2 Conference Rooms would be considered medium size meeting rooms with seating for up to 18 occupants. The audio-visual systems would provide the viewing of multi-media presentations, HD-video conferencing (if required), teleconferencing, and the capability to display campus CATV. The audio-visual systems would be located in a fixed space such as a multi-media credenza with an integrated equipment rack. Voice/Data/AV inputs would be provided in the middle of the room in a floorbox and/or poke-thru for the conference table. A flat panel display will be wall mounted with stereo loudspeakers attached on the right and left of the display.

5. Lecture Hall (Typical)

Typical Lecture Hall will seat approximately 90 occupants. The audio visual systems would provide the viewing of multi-media presentations with dual projection screens with program audio and voice reinforcement ceiling speakers. The lectern and/or desk presentation station would be located in between the two screens. A

dedicated audio-visual equipment rack would be required to house the audio-visual system components.

B. Room Data and Layouts

1. 40 Seat Classroom (Typical)

Room Data

Room Area:	915 sqft
Ceiling Height:	10’
No. of Occupants:	<45
Seating:	Flexible seating at tables

Electronic Image Displays

Display Equipment:	Ceiling mounted Hitachi LCD projector, 16:9 aspect ratio, 1024x768 minimum native resolution, 3500 ANSI Lumens. BMS LCD LOC-II Projector Mount with BMS ceiling flange.
Projection Screen:	Shall be Da-lite Advantage Manual with CSR (Ceiling Recessed) Screens with Matte Finish minimum size 58”x104” for new construction. All screens HDTV Format. Shall be Da-lite Manual C with CSR Screens for wall mount installation with Matte Finish minimum size 58”x104” for renovations where a ceiling recessed screen is not applicable. All screens HDTV Format.

Sources and Input Locations

Media Sources:	Dedicated computer with keyboard and Mouse Laptop Computer Blu-ray player and/or DVD/VHS Player

	Document Camera auxiliary input
Media Sources Equipment Location:	Media Sources will be located in integrated equipment rack inside lectern located at the front of the room.
Signal Routing Equipment Location:	Crestron Audio and Video signal matrix/routing equipment to be located in integrated equipment rack inside lectern located at the front of the room.
Input Locations:	Input locations at wall and lectern

Sound Systems

Program Audio:	Program audio from media will be produced through wall mount speakers placed at the left and right of the projection screen.
Voice Reinforcement:	A microphone will be provided at each lectern and/or instructor station for adequate speech coverage. Both the program audio and voice reinforcement will be provided through the program speakers.
Audio System Electronics:	Matrix/switching control equipment will provide DSP processing and volume controls. Crestron is the district wide standard. Independent DSP Processing Matrix shall be Biamp Nexia or Audia System. Amplifiers shall be Lab.Gruppen or District approved equal. Microphones shall be Shure or District approved equal.

Assistive Listening Systems:	The audio-visual system will support a fixed and/or portable assistive listening system as required. ALS is provided as part of Division 275126. Listen Technologies is the district wide standard.
Speakers:	Speakers are provided as part of Division 275123 "Distributed Audio Video Communication Systems". Speakers are designed around Tannoy Professional Series Speakers or District approved equal.

Control Systems

Control Panels:	Wall mounted push button control panel located at the front of the room and lectern.
Control Processing:	Control processing equipment is built into the matrix/routing equipment that is rack mounted inside the lectern.
A/V Racks and Cabinets:	Racks and Cabinets shall be Middle Atlantic Products.

Coordination Required by Other Trades

Data Network:	Data outlets required at wall input locations, lectern floor box/poke-thru, TV outlets and projector locations.
CATV:	RG6 outlet, where required. TV outlets comprise of one RG6 and one Category 6.
Electrical:	20 amp isolated ground receptacles for AV Equipment.

	Wiring for all audio-visual components shall be run in metal conduit from the equipment racks to the audio-visual equipment with bends kept to a minimum.
Lighting:	Shall provide zone lighting controls which allow individual dimming control of lights nearest the video projection display area, lectern/instructor station and table areas. Large rooms with high windows may require motorized window coverings that are integrated with Crestron Controls. Lighting shall integrate with Crestron Controls.
HVAC:	Diffusers/Vents shall not be placed near projection screens causing the screens to move. Selection of Diffusers/Vents shall not contribute significantly to the ambient noise level of the room.
Fire Alarm:	Provisions will be made to integrate the building fire alarm system into the audio-visual equipment to allow the muting of program audio for emergency notification.
Furniture:	All audio-visual lecterns and credenzas will be supplied by the integrator responsible for the installation of the audio-visual equipment. The audio-visual integrator shall be responsible for installation of audio-visual equipment within furniture and any coordination required mounting equipment within millwork and proper ventilation is provided.

2. Conference Rooms

Room Data

Room Area:	370 sqft
Ceiling Height:	10’
No. of Occupants:	<12
Seating:	Center conference room table

Electronic Image Displays

Display Equipment:	50” to 65” LCD wall mounted flat panel 1080P display. 16:9 aspect ratio with 1920x1080 minimum native resolution. Chief Manufacturing Mounts LTMU Series.

Sources and Input Locations

Media Sources:	Dedicated computer with keyboard and Mouse Laptop Computer Blu-ray player and/or DVD/VHS Player Document Camera auxiliary input
Media Sources Equipment Location:	Media Sources will be located in integrated equipment rack inside credenza located at the front of the room.
Signal Routing Equipment Location:	Crestron Audio and Video signal matrix/routing equipment to be located in integrated equipment rack inside credenza located at the front of the room.
Input Locations:	Input location at conference table via floor box and/or poke-thru at center of table.

Sound Systems

Program Audio:	Program audio from media will be produced through wall mount speakers placed at the left and right of the digital display.
Voice Reinforcement:	N/A
Audio System Electronics:	Matrix/switching control equipment will provide DSP processing and volume controls.
Assistive Listening Systems:	N/A
Speakers:	Speakers are provided as part of Division 275123 "Distributed Audio Video Communication Systems". Speakers are designed around Tannoy Professional Series Speakers.

Control Systems

Control Panels:	Push button control panel located at the conference table connected to floorbox/poke-thru.
Control Processing:	Control processing equipment is built into the matrix/routing equipment that is rack mounted inside the credenza.

Coordination Required by Other Trades

Data Network:	Data outlets required at floor box/poke-thru, and TV outlets.
CATV:	RG6 outlets, where required, for TV outlets
Electrical:	20 amp isolated ground receptacles for AV Equipment.

	Wiring for all audio-visual components shall be run in metal conduit from the equipment racks to the audio-visual equipment with bends kept to a minimum.
Lighting:	Shall provide zone lighting controls which allow individual dimming control of lights nearest the video display area and conference table areas. Large rooms with high windows may require motorized window coverings that are integrated with Crestron Controls. Lighting shall integrate with Crestron Controls.
HVAC:	Selection of Diffusers/Vents shall not contribute significantly to the ambient noise level of the room.
Fire Alarm:	Provisions will be made to integrate the building fire alarm system into the audio-visual equipment to allow the muting of program audio for emergency notification.
Furniture:	All audio-visual lecterns and credenzas will be supplied by the integrator responsible for the installation of the audio-visual equipment. The audio-visual integrator shall be responsible for installation of audio-visual equipment within furniture and any coordination required mounting equipment within millwork and proper ventilation is provided.

3. Lecture Hall (Typical)

<u>Room Data</u>

Room Area:	Varies
Ceiling Height:	Varies
No. of Occupants:	<90
Seating:	Fixed seating in stadium format

Electronic Image Displays

Display Equipment:	Dual Ceiling mounted LCD projectors, 16:9 aspect ratio, 1024x768 minimum native resolution, minimum 5000 ANSI Lumens
Projection Screen:	Shall be Da-lite Ceiling Recessed Tensioned Advantage Deluxe Electrol Screens with Matte Finish minimum size 58"x104" for new construction. All screens HDTV Format. Shall be Da-lite Tensioned Contour Electrol Screens for surface mount installation with Matte Finish minimum size 58"x104" for renovations where a ceiling recessed screen is not applicable. All screens HDTV Format.

Sources and Input Locations

Media Sources:	Dedicated computer with keyboard and Mouse Laptop Computer Blu-ray player and/or DVD/VHS Player Document Camera auxiliary input
Media Sources Equipment Location:	Media Sources will be located in a equipment rack inside dedicated conditioned audio-visual closet located at the front of the room.

Signal Routing Equipment Location:	Crestron Audio and Video signal matrix/routing equipment to be located in integrated equipment rack located at the front of the room.
Input Locations:	Input locations at lectern/instructor station

Sound Systems

Program Audio:	Program audio from media will be produced through wall mount speakers placed to the outer left and outer right of the projection screens and side walls.
Voice Reinforcement:	A microphone will be provided at each lectern and/or instructor station for adequate speech coverage. Voice reinforcement will be provided through ceiling speakers for adequate speech intelligibility.
Audio System Electronics:	Matrix/switching control equipment will provide DSP processing and volume controls.
Assistive Listening Systems:	The audio-visual system will support a fixed and/or portable assistive listening system as required. ALS is provided as part of Division 275126. Listen Technologies is the district wide standard.
Speakers:	Speakers are provided as part of Division 275123 "Distributed Audio Video Communication Systems". Speakers are designed around Tannoy Professional Series Speakers.

Control Systems

Control Panels:	Wall mounted push button control panel located at the front of the room and lectern.
Control Processing:	Control processing equipment is built into the matrix/routing equipment that is rack mounted at the equipment rack location.

<u>Coordination Required by Other Trades</u>

Data Network:	Data outlets required at wall input locations, lectern floor box/poke-thru, TV outlets at equipment rack and projector locations.
CATV:	RG6 outlets, where required, for TV outlets
Electrical:	Quad 20 amp isolated ground receptacles for AV Equipment. Wiring for all audio-visual components shall be run in metal conduit from the equipment racks to the audio-visual equipment with bends kept to a minimum.
Lighting:	Shall provide zone lighting controls which allow individual dimming control of lights nearest the video projection display area, lectern/instructor station and seating areas. Large rooms with high windows may require motorized window coverings that are integrated with Crestron Controls. Lighting shall integrate with Crestron Controls.
HVAC:	Diffusers/Vents shall not be placed near projection screens causing the screens to move. Selection of Diffusers/Vents shall not

contribute significantly to the ambient noise level of the room.

Fire Alarm: Provisions will be made to integrate the building fire alarm system into the audio-visual equipment to allow the muting of program audio for emergency notification.

Furniture: All audio-visual lecterns, desks and credenzas will be supplied by the integrator responsible for the installation of the audio-visual equipment.

The audio-visual integrator shall be responsible for installation of audio-visual equipment within furniture and any coordination required mounting equipment within millwork and proper ventilation is provided.

MORE DETAILED INFORMATION ABOUT THE COLLEGE'S TECHNOLOGY REQUIREMENTS, PLEASE REFER TO THE *SAN BERANRDINO COMMUNITY COLLEGE DISTRICT TECHNOLOGY DESIGN STANDARDS* DATED OCTOBER, 2010.


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