Gavilan Joint Community College District

Gilroy, California

AV/IT/SECURITY STANDARDS

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Salter Project 20-0352

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INTRODUCTION

This document outlines technical standards for low-voltage technology (LVT) for the Gavilan Joint Community College District. This document is divided into the following sections: audiovisual, telecommunications, and security systems.

In its final form, this document is intended to provide:

- Architects, consultants, and design-build entities a common understanding of the District's technical requirements for the design and installation of audiovisual, telecommunications and security systems
- Relevant information that will help in better creating uniform and usable plans for deployment of technology throughout the District
- Create ease of use and consistent user interface for technology systems throughout the District
- Staff and faculty an understanding of the audiovisual capabilities planned for in the classroom and other spaces
- Provide budgetary guidelines to help control costs

This standards document is to be considered for all District projects. However, as the main campus in Gilroy comprises a majority of the student body and buildings within this District, much of the discussion will focus on this campus, with the intent that similar approaches will be used for the growing satellite campuses.

AUDIOVISUAL SYSTEMS

Audiovisual Standards & Guidelines

This document outlines a recommended application and implementation of audiovisual technology and infrastructure for the District. Audiovisual (AV) systems can provide an added dimension to learning and open up new avenues for teaching and learning. A thoughtful implementation of audiovisual systems can:

- Improve acceptance and use of AV technology in instruction
- Make the AV systems consistent, easier, and more reliable to operate
- More efficient procurement, and reduced installation costs
- Reduce maintenance costs
- Provide wider implementation of AV systems

Audiovisual is rapidly converging with computer networks and the Internet. The standards document considers these emerging technologies for potential new capabilities and cost benefits.

The following AVIXA[1] Standards should be considered for the District's audiovisual designs

- *Standard Guide for Audiovisual Systems Design and Coordination Processes*
- *Projected Image System Contrast Ratio*
- *Display Image Size for 2D Content in Audiovisual System*
- *Recommended Practices for Security in networked AV systems*
- *Cable Labeling for Audiovisual Systems*

Design Philosophy

Audiovisual systems that are simple to use tend to get used the most often. Systems should be designed to minimize complexity and provide accessibility while supporting the pedagogical approaches and features preferred by the faculty and staff.

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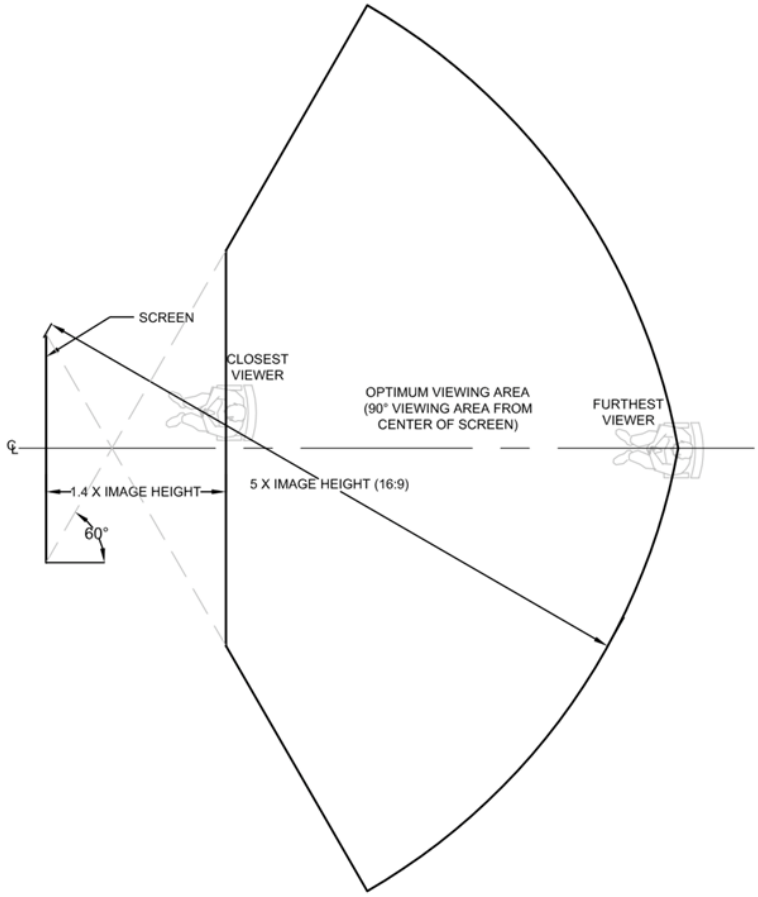
[1] **AVIXA** is the Audiovisual and Integrated Experience Association. AVIXA has more than 11,400 enterprise and individual members, including manufacturers, systems integrators, dealers and distributors, consultants, programmers, live events companies, technology managers, content producers, and multimedia professionals from more than 80 countries.

Display Standards

Displays systems, including projectors and flat panel display shall be designed to provide good legibility for all students in the classroom. Both projection screens and flat panel displays shall be 16:9 aspect ratio for high-definition and ultra-high-definition content, and appropriately sized based on AVIXA's display image size standards (AVIXA V202.01). Projectors, at minimum, shall have high-definition resolution (1080P), with 4K UHD (ultra-high definition) resolutions for consideration. Image brightness shall be based on AVIXA's Projected Image Systems Contrast Ratio standards (3M).

Standard Screen Sizes (diagonal inches)	Maximum Viewing Distance (feet)	Required Finish Ceiling Height (feet)
42	9	6
50	10	6
65	14	7
92	19	8
106	22	8
110	23	8
119	25	9
133	28	9
159	33	10
188	39	12
220	46	13
243	51	14
271	56	15



OPTIMUM DISPLAY VIEWING DIAGRAM

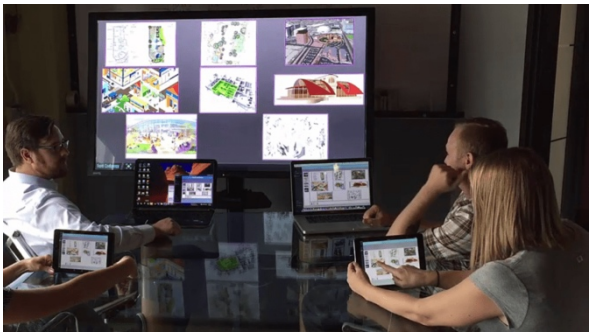
Flat panel displays shall be fully backlit LCD Displays and shall also be sized using AVIXA's V202.01 standard and be a minimum of 400 nits in spaces without outside windows or with shades. LCD displays in rooms with outside-facing windows and no shades shall be a non-reflective matte finish and be at least 700 nits to overcome ambient light conditions.

DISCUSSION AUDIOVISUAL TECHNOLOGIES

Wireless Collaboration

Wireless collaboration is a means of screen-sharing using Wi-Fi (IEEE 802.11) and offers a means of connecting to displays without cables. This technology should be provided in all classrooms, group study, and meeting/conference rooms. To achieve this capability, each space should be outfitted with its own

wireless audiovisual gateway device (e.g. Mersive Pod), often placed behind the display but can also be in the equipment rack.



Besides screen sharing, wireless audiovisual technology extends to applications such as active learning and videoconferencing (MS Teams, Zoom). Manufacturers/software developers such as Mersive, Barco and Wolfvision provide their own unique software feature sets allowing extended capabilities with their gateways.

Wireless audiovisual should be conducted on the same network that students use to access the Internet. Therefore, a campus Wi-Fi network should be planned to account for the additional bandwidth requirements to enable these capabilities.

Video Conferencing, Distance Learning and Lecture Capture

The emergence of software-based videoconferencing tools such as Microsoft Teams and Zoom, have created cost-effective options for distance learning and lecture capture. In higher education today, many general assignment classrooms are outfitted with professional-grade video conferencing cameras for use with these applications. As these “soft codecs” (software-based videoconferencing coder/decoder applications) can simultaneously record while they transmit, they can provide a cost-effective means of lecture capture.

Currently the District uses both Zoom and MS Teams, and has not yet standardized on a single platform. As the District will require communications with outside organizations, they should maintain compatibility with all commonly used videoconferencing applications (e.g. Go-to-Meeting). As such, audiovisual systems should be designed to provide agile compatibility with all applications.

Special “room based” applications such as Zoom Rooms and MS Teams are touted for their ease of use and minimal required setup time. However, as these room-based solutions are dedicated to a single application, their use can be limiting. This standards document proposes a wireless laptop-based solution that should provide seamless use with all commonly used applications.

Software-based videoconferencing capabilities will be required but not limited to the following spaces on campus:

- General Classrooms
- Classroom Labs
- Group Study Rooms (4-seat or greater)
- Conference and Meeting

The trend in classrooms and meeting spaces is to move away from installed PCs and to laptop computers that instructors bring. The use of shared computer keyboards will be frowned upon in a post-pandemic world.

In classrooms and other spaces, the goal is to create a touchless audiovisual experience, as much as possible. To minimize the cables needed for videoconferencing and lecture capture, each meeting or learning space will be served by its own *wireless audiovisual gateway* device having the following capabilities.

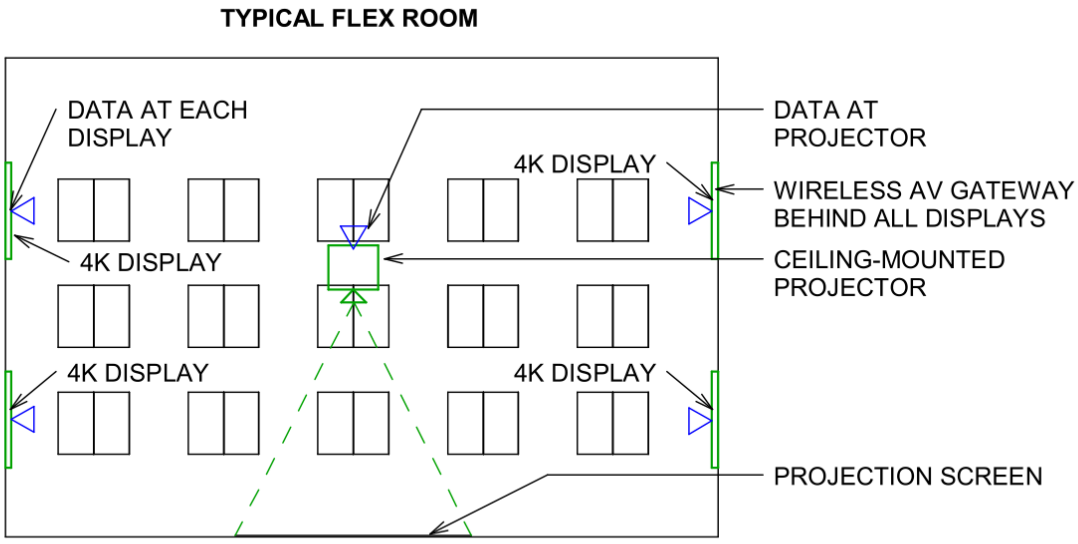
- Ability to wirelessly send and receive classroom audiovisual signals (installed cameras, microphones, loudspeakers) to and from the laptop
- Ability to store and display daily calendar with active URL links to the scheduled class sessions
- Touchless configuration for switching between the session's required soft-codec (e.g. Zoom)

Active Learning

Active learning is a pedagogical approach that often relies on audiovisual technology for its implementation. It is beyond the scope of this document to prescribe pedagogical approaches for learning space and where active learning may be appropriate. However, for planning of new academic buildings, it is common practice to provide at least infrastructure in a few spaces to allow for the eventuality of this type of learning. This document describes an audiovisual approach for introducing active learning to the District.

An active learning classroom often has several small tables distributed throughout the room, each having its own audiovisual display to facilitate group collaboration. Often the classroom will also have a main projection screen that can be used by the instructor to bring the entire class's attention to the front of the room.

Traditionally, expensive video matrix switchers were used to transport and share screen images between the many displays. Fortunately, emerging wireless audiovisual technologies discussed above, can leverage existing campus networks, to provide screen image sharing at a fraction of the cost. As this technology is entirely network based, the need for expensive audiovisual conduit and signal cabling is no longer required. These emerging technologies should be considered where screen sharing is desired, such as a Library Flex Room. Additionally, this technology can be used to send screen images to rooms used to handle occupancy overflow.



Network-Based Audiovisual

As networks become increasingly faster and more robust, the trend is to use them to transport audiovisual signals that have traditionally traveled on their own cables.

The prime advantage of a network-based system is the flexibility it affords in where signals can be routed.

In practice, with networked audiovisual system any AV input device (e.g. Blu-ray player) can be viewed on any display on campus. This capability can be quite useful for assigning spaces with audiovisual systems to handle overflow conditions from other spaces hosting classes and events.

Additionally, the network-based AV system can be readily housed in the telecom equipment room, affording the benefits of an environmentally conditioned space. Service technicians no longer have to enter the classroom itself to services this equipment.

For the purposes of this standard, network-based systems should be considered for projects of new construction having eight or more classrooms.

Digital Signage

Digital signage displays can inform students, staff, faculty, and the public of District and community events, provide wayfinding and other content. Displays can reside at to-be-determined locations throughout student and public circulation areas. Displays can mount in either landscape or portrait orientations. Manufactured Kiosks can be used if there are no wall surfaces available for mounting.

Each digital signage display will require a small media player mounted behind it. The signage player will be connected to a cloud-based server for content management and deployment. Scheduling of content will be managed through this server.

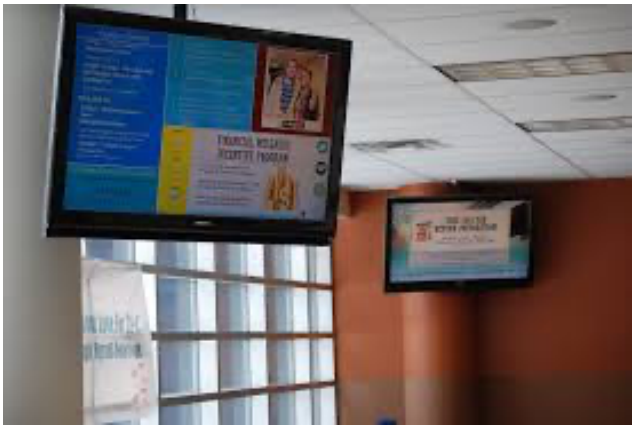
Digital signage should be considered at the following locations:

- Student Services
- Student Center
- Library
- Bookstores

Signage throughout the District is to show "pushed" content as scheduled from a server, rather than having users select content from an interactive touch screen. Therefore, screens will be mounted high, and out of reach.

Digital signage should conform to the following:

- 55" Backlit LCD Display
  - Indoors: Minimum 400 nits
  - Indoor environments with high levels of ambient light: 700 nits
  - Outdoor signage: LED preferred
  - 4K UHD resolution
  - Provide structural backing
- Display orientation
  - Landscape as default
  - Portrait for special applications
- Signage Player
  - PoE capable
  - HTML5
  - H.265
  - HDMI input for showing broadcast content in window
- Cloud-based content management deployment and scheduling
- Publish unique content to individual or groups of displays
- Bluetooth beacon capability



Assistive Listening Systems (ALS) with Induction Loop

Per ADA requirements, each space with audio systems shall provide an assistive listening system (ALS) for the hearing-impaired. For new construction, assistive listening shall be made available via an induction loop system in each room that has audio amplification system.

Induction systems use electrical cables concealed within the building structure to induce audio-modulated radio frequency signals into a hearing aids outfitted with T-coils. Since many people with hearing impairments already wear hearing aids, they merely need to turn on their T-coils to receive a direct signal from the room's audio amplification system. People without hearing aids should be able to request and check-out neck-worn loop receivers with earphone attachments. Each room with an installed amplified sound system, should be outfitted with a quantity of receivers based on its occupancy as dictated by the ADA and/or local/regional/state codes.

Acceptable manufacturer: Amptronics

Cloud-based Audiovisual Asset Management

Cloud-based services such as Crestron XiO, can be used for monitoring, managing, scheduling of the District's audiovisual systems and should be considered by the District.

Cloud-based services offer:

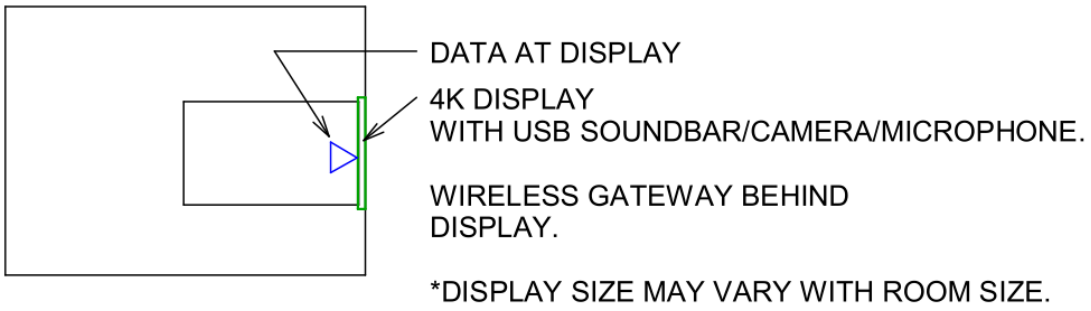
- Automated firmware updates
- Scheduling system power downs saving money and energy
- Monitoring hours of usage for projectors, displays and other devices
- Real-time email alerts for system failures or thermal over runs
- Environmental monitoring spaces
- System and room usage data for analytics
- Support digital signage deployment including scheduling off-hour downloads of large media playback files to digital signage players

AV Description by Room Type

Group Study Rooms (2, 4, 8-person)

A single wall-mounted 4K LCD display for group collaboration. Size to be determined by room size

- Wireless audiovisual gateway device behind display
- Table to abut display wall to minimize need for floor boxes and conduit to display
- Wireless capabilities for Zoom, MS Teams, and other “soft codecs” via laptop. No HDMI inputs required
- USB sound bar with integral USB camera and beam forming microphone (USB and HDMI to connect to wireless audiovisual gateway



Conference and Meeting Rooms

Conference and Meeting Rooms should have similar AV setups as Study Rooms but with consideration for equipment that is capable of capturing a larger space with more occupants.

Conf. Rm. w USB capable sound bar/cam/beam-forming microphone

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General Classroom Audiovisual Systems

All classrooms should be outfitted for lecture capture and online learning.

Audiovisual equipment may reside in either the instructor's desk – a more traditional approach – or centralized in a telecom equipment, an approach that leverages the benefits of modern network technology. A traditional approach for classroom technology may still want to be considered in audiovisual retrofit projects within older buildings involving only a few classrooms. A network-based approach for audiovisual technology should be considered for new building projects having eight or more classrooms. This report considers both approaches as viable options. Please see the Appendix for conceptually single-line diagrams and cost analysis of each approach.

Regardless of the system topology, the classroom should have the following features:

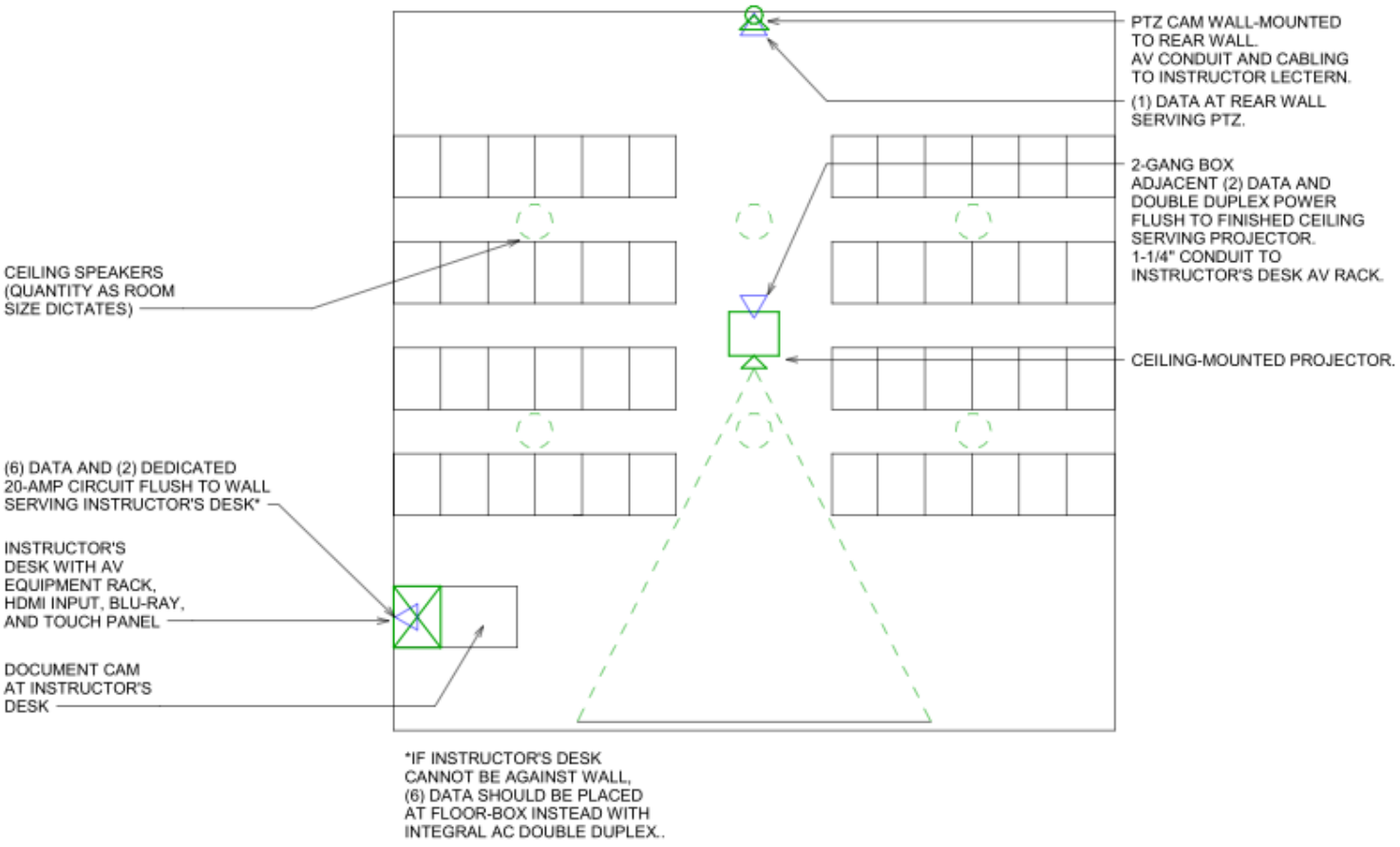
- Touch screen controller (Crestron, Extron, QSC) on desktop
- HDMI cable and AC power duplex
- Document camera on desktop
- Blu-ray Player
- Work surface for instructor's laptop

The Classroom display systems will comprise of:

- Ceiling-mounted projector (minimum 5000 Lumens)
- Motorized retractable projection screen. Size of the screen should be based on the furthest viewer being no more than six screen height dimensions away from the screen.

Other features of the classroom audiovisual system will include:

- Ceiling loudspeakers for audio playback and voice reinforcement
- Assistive listening per ADA requirements (induction loop required for each room)
- Lecture capture and distance learning shall utilize a single camera at back of room focused on the instructor having the following
    - Pan/tilt/zoom
    - 20x optical zoom
    - 4K resolution
    - Auto-tracking
    - Acceptable Manufacturers: Vaddio, Panasonic
- Two channels of wireless microphones for instructor (lavalier and handheld)
    - Acceptable Manufacturers: Shure, Audio Technica



TYPICAL LOCALIZED CLASSROOM

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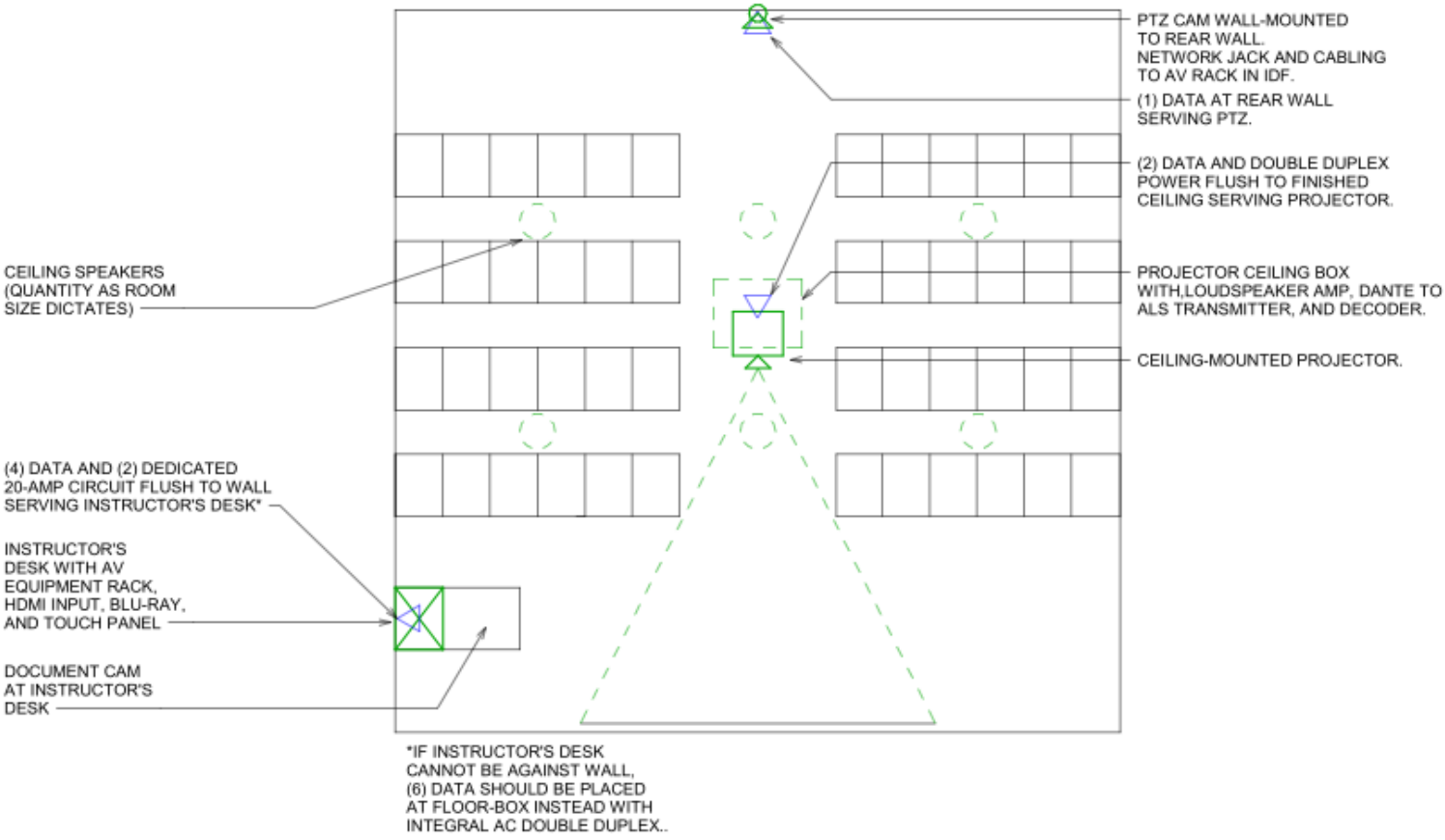

TYPICAL NETWORKED CLASSROOM

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One-Button Studio

The concept of a "One-Button Studio" is a room with the ability to simultaneously record a user's computer content (e.g. PowerPoint presentation) and a video of themselves in an environment having excellent lighting and acoustics. As the name suggests, the space should be designed to operate with a single touch of a button. In addition to the recording functions, the room will also have streaming, and video conferencing capabilities.

A One-Button Studio should have the following:

- Wall-mounted pan/tilt/zoom camera
- Presenter confidence video monitor
- Ceiling projector to project on wall behind presenter (for presenter laptop)
- Beam-forming ceiling microphone
- Studio lighting with mounting points
- Control System with touch panel
- Acoustics
    - Sound absorbing wall treatments
    - Sound-rated walls and door
    - NC 25 or quieter background noise
- Streaming/Recording device

Flexible Computer Labs

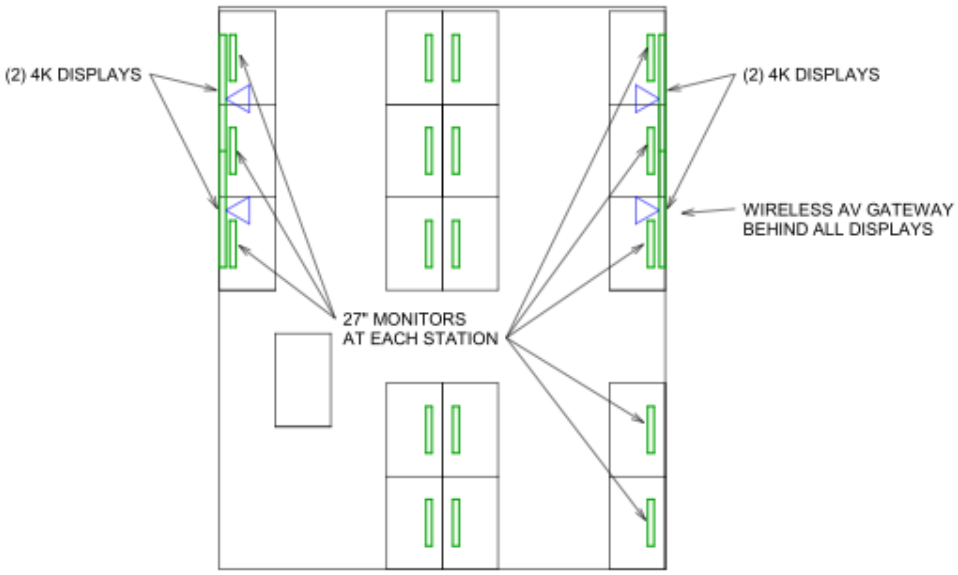
Traditionally, computer labs have been found to have rows of stationary tables with fixed desktop PCs. Today, computer labs need to be more flexible with movable furniture that can be configured in both traditional strip table rows and reconfigured for group learning. To achieve this flexibility, assume a room of Wi-Fi connected laptops.

To facilitate active group-learning, computer labs will feature large wall-mounted AV displays, distributed around the room to facilitate huddle-type furniture configurations. A wireless audiovisual gateway behind

each AV display will allow any one of the room's laptops to share its screen to any one of the room's six displays.

In summary, Computer Labs will feature the following technology:

- Six wall-mounted 4K LCD displays for active learning and group collaboration. Size to be determined by room size.
- Wireless audiovisual gateway device behind each wall-mounted display.
- Flexible furniture workstations with each seat having a dock-able 27-inch 4K computer monitor to extend each laptop's workspace screen (optional by IT).



TYPICAL FLEX COMPUTER LAB

Open Collaboration

The District should consider that learning can occur in not only in classrooms, but also anywhere on campus. As such, projects should consider audiovisual collaboration technology in open areas. Assume 55"-65" 4K displays with wireless AV gateways at locations where students can gather.

SECURITY SYSTEMS

Security System Overview

The goal of the security systems is to provide a safe and secure environment for the students, staff, employees, visitors, and guests.

An access control system (ACS) will use specified high-security encrypted RFID credentials at to-be-determined locations.

A video surveillance system will record high-definition video from cameras in the Public Employment Relations Board (PERB) approved locations for later review. If criminal or problematic activity occurs, the system can readily provide the administration, police, and prosecutors with actionable evidence. In addition, live video will allow the operations staff and the campus safety office to observe what is happening throughout the facility in real time.

Campus Security Officers

Currently the campus security staff is limited to patrol officers. There are no central dispatch capabilities. Emergency calls are routed to a phone carried by the officers. The access control and video surveillance system will become a force multiplier by bringing alarms and video feeds directly to the officers' tablet. The tablet will be carried with either a shoulder or belt holster. The tablet will connect to the campus security network VLAN via cellular service and Wi-Fi connectivity.

COVID Considerations

As this standard is published, the COVID Pandemic is an ongoing concern. In the post-COVID era, consideration should be given to reduce the impact of future virus mass infections using mitigation strategies such as:

- Providing areas for screening people entering a facility - screening areas would direct people to a choke point where staff could do a manual temperature check or use a fever detection camera. The screening area should include a secondary screening area for people with abnormal skin temperatures. This area is to let people's skin temperature stabilize to better reflect their body temperature and be rescanned by a staff member.
- Reducing common touch points such as door levers and push bars - common touch point reduction can be done using door operators triggered by touchless access control readers and touchless sensors.

Security Principles

Security for a campus is much like a puzzle with interlinking pieces that work together to achieve a welcoming but safe and secure campus. The scope of this document focuses on electronic security. However, for electronic security to be effective it must be built on a foundation that includes:

- Policies and Procedures

Environmental / Architectural Considerations:

  - Natural Surveillance - Improving visibility makes a campus safer. Designing landscape and buildings for clear sight lines means less opportunities for wrongdoing. Adding windows, improving lighting, avoiding sharp corners and design elements that create blind spots improve natural surveillance. Plant landscaping that does not provide cover for potential offenders, such as tall bushes. Maintain landscapes by trimming plants preventing overgrowth, or low-hanging branches for trees and tall bushes.
  - Access Control - also known as natural access control or way finding. The purpose is to differentiates between public and restricted spaces. This is can be done with signage, obvious building entrances vs non-public doorways, gates, vehicle barriers and landscaping to control traffic to approved access points.
  - Border Definition – makes a distinction between public and areas that the District wants to discourage from public use. Borders can be fences, walls, landscaping, and sidewalks. Even signage such as private property, no trespassing, video recording, or security systems in place act as deterrents. These items make it clear to the public that they don't belong in the area and their presence will be obvious to security staff and others.

A comprehensive security plan integrates design, technology, and operations, including policies, procedures, and personnel. The most effective security plan is achieved when these three elements are coordinated during early project phases.

- Design: architectural elements and engineering systems, including space planning, adjacencies, user group zoning, passive physical protection; doors, locks, site perimeter barriers; exterior lighting, egress, and circulation system; and all building systems relating to building evacuation.
- Technology: electronic security systems and equipment, including access controls, alarm monitoring, remote door and gate controls, video surveillance.
- Operations: policies and procedures, including, security staffing, and employee training

Security Systems

The systems described below will focus on providing a high level of security, making students and staff feel safe, and conveying a level of sophistication compatible with this project.

The security system will consist of the following subsystems:

- Electronic access control
- Video surveillance
- Intrusion detection
- Video security intercoms
- Emergency exit alarms and door management alarms

- Elevator landing communication system
- Emergency lockdown

Access Control System (ACS)

Staff and students will be enrolled into the ACS. Their enrollment will include their access rights to specific doors. The access rights may include time of day, day of week and holiday restrictions.

The ACS will be designed in conjunction with the building architecture to assist the Owner in establishing layered control zones of access. Card readers will be placed at the following locations:

- Building entry doors
- Telecom and electrical rooms
- Back of house mechanical rooms

Manufacturers:

- Genetec
- S2
- Brivo
- Kerri

ACS Alarm Notification

The integrator will coordinate with campus safety staff on the alarm message format, graphic display, and message content of ACS alarms, prior to system commissioning. Alarms will be delivered to tablets carried by the security officers.

ACS Server And Field Panels

The future ACS system server and field panels will reside on the Gavilan College Ethernet Infrastructure (GCEI) on a dedicated security VLAN. The field panels will be in telecom rooms mounted on fire-retardant plywood wall fields.

The ACS will use standards-based field panels. Proprietary field panels are not acceptable.

Manufacturer: Mercury Security

Wireless Integrated Locksets

Wireless locks are battery operated locks with integrated card readers and door position sensors. These locksets can be easily added to existing doors without engaging an electrical contractor to install conduit or cabling. There are two types:

1. Radio enabled – these types communicate to the access control system via Wi-Fi or a proprietary radio system. These devices communicate to the ACS in the same way as wired card readers, although the communications can be delayed. They are not recommended for doors used for lockdowns.
2. Network-on-Card – Also known as No-Tour. These devices offer the same capabilities as the above locksets, except real-time alarm reporting and lockdown controls. These locks don't require any wireless communication to the ACS. Instead, the smart cards contain a list of readers they can access, along with the time-of-day access schedules. When a card is presented to these locksets, the reader queries the card if it has permission to enter. If the permission is there, the door unlocks. The lock also writes to the card the time and lock number. If the battery is low, it will also write that information to the card. When a card is next presented to a "hotspot" card reader, it uploads all the information it has gathered from network-on-card locksets. All communication and data are encrypted on the card. These locks are easy to install and a good choice for remote locations where it is expensive to provide wired or wireless communications to the ACS. To learn more about Schlage's no-tour locks and capabilities visit: https://us.allegion.com/en/home/products/categories/electronic-locks/ENGAGE-web-mobile-apps.html

Manufacturer: Schlage

Card Readers and Credentials

- RFID - The card readers use encrypted RFID MIFARE format contactless communication. The RFID cards will be used as staff and possibly student ID cards, so must support dye sublimation printing.
- Mobile Credentials - The readers will support mobile credentials. This feature allows personal devices such as phones and tablets to have a credential downloaded to the device. Once enabled, the device can act as a credential in the ACS. The credential is encrypted and can be disabled if the device is lost or stolen. To learn more about Schlage's mobile access credentials see: https://us.allegion.com/en/home/products/categories/credentials/schlage-mobile-credentials.html

Manufacturer: Schlage

Card Printer

Provide a color ID badge printer.

- Capable of double-sided printing
- High capacity and throughput
- Laminator with security seal
- Card encoding

Manufacturer: Fargo

Campus Lockdown

During emergency events such as an active shooter or an agitated / aggressive offender, it is important to provide a way to keep these individuals out of campus buildings until the situation is defused. Best practices advise that all buildings' doors must always remain locked except for the main entry door. The main entry doors should be fitted with electrified locks that can be controlled by the ACS. The doors can be unlocked during normal business hours using a schedule in the ACS configured for the time of day, day of week and holidays. After business hours, an authorized person would present their access control credential to enter the building.

Lockdowns can be done by individual building or by all campus buildings. Initiating a building lockdown can be done with emergency lockdown switches located in appropriate areas within the building. Activating the switch will lock the entry doors, and raise the treat level in the ACS, so that only authorized emergency personnel and admistration people would be able to access a locked down building. Activating the switch would also alert campus security, and admistration officals.

A campus-wide lockdown would be initated by authorized adminstration staff or authorized campus security officers. When ititated all campus building connected to the ACS will be lockeddown, and an emergency signal sent to law enforcement.

Initating a campus lockdown can be done from a lockdown switch in the administraion office or from a roving patrol officer's tablet.

Durring a lockdown, free egress will always be permitted, as required by building safety codes. Lockdowns would remain engaged until an authorized person declares the emgerncy over.

Classroom Locksets (Columbine Locks)

Although not part of the electronic security design, all classroom doors must have mechanical classroom locksets (also known as Columbine locks). These locks lock the exterior lever (lock trim) so that entry to the room requires a key. The lockset is locked from the inside of the room so that people are not exposed to danger outside of the room. These locksets comply with building safety codes that require free egress.

The campus is primarily using Allegion products. Classroom locks are a mix of cylindrical, mortise and exit devices. Classroom locksets must:

- Lock from the interior side and have an indicator showing the outside trim is locked
- Interior locking must use pushbutton, or thumb-turn trim. Interior trim with key cylinders is not acceptable, as many instructors do not carry keys
- For existing classroom locks with interior key cylinders, Allegion makes conversion kits that convert interior trim to pushbutton or thumb-turn trim.

The Allegion sales representative for the campus is Andy Baur at: Andy.Baur@allegion.com>

ACS installation

The integrator will provide and install the field panels, ACS devices and software licenses. The devices will reside on the campus supplied IP network, with infrastructure by Division 27. The integrator will coordinate with campus safety on the alarm notification messages, graphic displays and controls, prior to system commissioning.

Intrusion Detection System (IDS)

Intrusion detection included exterior door position switches, motion detectors in lobby and corridors, and glass break sensors. These sensors will be monitored by the ACS panels.

Arming/disarming IDS

Arming/disarming of the IDS will be on a schedule from the ACS and can be overridden by authorized staff at the ACS workstation. Stations will be located at the doors where staff members enter/exit the building, so that authorized staff can override the ACS schedule.

Duress alarms

The ACS will monitor covert duress alarms. A duress alarm will notify the law enforcement via a central station monitoring the system. Duress buttons are typically located at public facing information or registration desks.

Emergency Communications System

An emergency communication system that can be expanded campus wide will be included in the project. The emergency communications system will:

- Comply with NFPA 72 National Fire Alarm and Signaling Code Chapter 24 requirements
- Perform Risk Analysis for Mass Notification
- In Building Emergency Communication System
- Ensure speech intelligibility throughout the buildings
- Separate from building fire alarm system

Video Surveillance System (VSS)

The IP-based high-definition video surveillance system will be designed to communicate on the campus IT network using a dedicated security VLAN.

The cameras can be viewed on existing and personal devices that have the VSS viewing rights.

Software Manufacturers:

- Genetec
- Milestone

Video Storage

The main VSS server will be in a secured room on campus, typically a telecommunications room. The camera recording for this project will be done on-premise. Recording equipment will be in a telecom room equipment rack dedicated for security use. Video storage for the cameras will be sufficient to provide 30 days of storage of motion-based recording, at full-camera resolution, and at 15 frames per second. The local video recorder will have the following minimum specifications:

- Multiple hot-swappable hard drives
- Redundant and hot-swappable storage controllers, disk drives, power supplies and fans
- Dual active controller with failover.
- Dynamic disk arrays using RAID 6
- Drive health monitoring

Sever Manufacturers:

- BCD Video
- Rasilient

Camera coverage

For the following spaces (pending approval):

- Building entries
- Lobby areas
- Building exterior, all sides
- Elevator cabs
- Elevator lobbies
- Stairwell entry/exit

- All technology rooms

Camera requirements

Multi-imager 360/270-degree camera

- Minimum fixed camera resolution will be 1080p; higher resolution or multi-imager cameras are needed for cameras with wide field of views or long-distance views.
- Exterior fixed cameras will have built-in IR illuminators to improve low-light level camera performance.
- At the points of pedestrian entry, the camera resolution, positioning, and technology will be selected to recognize facial details of at least 80 pixels per foot (PPF).
- Building perimieter will use multi-imager 270 degree cameras on the building corners to for a permiter view of all sides of the facility. Multi-imager cameras will have a minium resolution of 15MP.
- Where required, exterior cameras on the building will be 270 degree multi-imager cameras with an integrated pan-tilt-zoom (PTZ) camera. These combination cameras will have a minium resolution of 20MP with a 2MP PTZ camera with a 30X zoom.

Multi-imager camera with integrated PTZ

Acceptable camera manufacturers:

Axis

- Single imager Dome cameras – P32 series
- Single-imager 360-degree 12MP cameras – M3058
- Multi-imager cameras – P37 series
- Multi-imager cameras with integrated PTZ camera – Q6010-E series

- Hanwha
  - Multi-imager camera with integrated PTZ – PNM-9320VQP

VSS Installation

The integrator will provide and install the cameras, video recorders and software licenses. The devices will reside on the campus supplied IP network. The integrator will coordinate with campus safety on the camera views and graphic display, prior to system commissioning.

Emergency Exit and Door Prop Monitoring

Emergency exits are vulnerable to criminal activity. To deal with these threats, all emergency exits will have a door management unit with a local audible alarm to discourage non-emergency use of the door. These alarms will be monitored by the ACS.

Door Management Unit

Entry doors are also vulnerable, even when they are unlocked by a schedule in the ACS. During a lockdown, a door propped open cannot be locked, defeating the protection of the lockdown. A door management unit, located near the door, will provide an audible alarm when the door is propped open for a programable amount of time. The alarm will be reset when the door is closed. If a door is not closed when the alarm sounds, a second programable timer will start, when that time elapses, a signal will be sent to the ACS. This feature encourages people in the area to close a propped door. Only if the alarm is not responded to, will campus safety be notified. The device can be bypassed with a key switch during move-in or for maintenance activities.

Acceptable manufacturers include: DSI models ES4200

Elevator Landing - Area-of-Refuge Intercoms

California Building Code requires an area-of-refuge intercom system at all elevator landings above and below the level of discharge. These intercoms will call campus safety, and if no answer, roll over to a 24-hour answering service. Appropriate signage will be located near each area-of-refuge calling station. The system installation must meet the requirements of NFPA code 72 including Circuit Integrity with two-hour rated cabling.

Acceptable manufacturers include:

- Rath
- Cornell

Electronic Communications

The electronic security systems will require structured cabling and static IP addresses for the following:

- IP cameras
- Access control panels
- Servers

TELECOMMUNICATIONS SYSTEMS

Introduction

This section will discuss the minimum Telecommunications infrastructure requirements for future projects on Gavilan District campuses. All recommendations in this report should be viewed as minimum requirements. The design professional selected on the project should research new and emerging technologies to incorporate in the project which are unknown at the time of writing this report.

The overall goal of the telecommunications systems is to provide a flexible and expandable communications network for the Gavilan College district. New construction projects containing telecommunications should be designed with the next 20 to 30 years in mind and should be flexible enough to support current and future technologies which may reside on the communications network.

New communications infrastructure within the District should be designed to accommodate a minimum 20% increase in communications cabling infrastructure through the life of the project. Successful projects will include early and regular communication with District IT Staff beginning with the basis-of-design / Schematic Design phase of the project. District IT Staff will provide feedback at regular intervals of the design and retain the right of final review and approval for all construction documents and submittals.

This standard includes components and installation methods for the design of a generic communications cabling infrastructure that will support multiple manufacturers to foster a competitive bidding environment.

The telecommunications systems infrastructure will support the following systems:

1. Voice and data networking
2. IP-based security systems
3. Wireless (Wi-Fi) in common areas, including outdoor areas
4. To support the above systems, the design will include the following infrastructure:

Telecommunications spaces, including the following:

- Building Distribution Facility (BDF) the location where cables enter building
- EF (entrance facility): the location for service provider equipment
- ER (equipment room): the location for servers, routers, TV receivers, audiovisual, and other centralized technology equipment
- TR (telecommunications room, formerly known as IDF rooms): the location on each floor for network switchers, patch bays, and other equipment
- There will be one joint BDF/EF/ER space on Level 1 that needs to be a minimum of 300 sq. ft.
- There will be a TR on every floor
- Intra-building network cabling (copper, optical fiber, and coaxial cabling)
- Telecommunications pathways to support the telecommunications cabling
- Horizontal cabling distribution to support voice and data
- Grounding and bonding of the telecommunications system

Telecommunications Standards

Develop a Telecommunications Cabling Design based upon the current, published TIA Standards, the latest BICSI Manuals and other Standards produced by the District. The Design Documents shall include, at a minimum:

- Drawings consisting of:
  - General notes & Symbols Legend
  - Site Plan showing OSP conduits and boxes, etc. (can also be part of the electrical site plan)
  - Floor plans showing the type and number of communication cable(s) to be installed at each outlet.
  - Cable Infrastructure (cable pathway, outlet boxes locations, conduit, cable tray or J-Hook routing (can be part of the electrical drawings)
  - Telecommunication Room enlarged plans and rcp's
  - Single Line conduit risers for backbones
  - Unique construction details
- Division 27- Specifications or Scope of Work (SOW) documentation (for design-build projects).

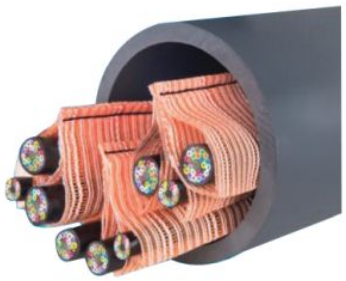
Outside-Plant (OSP) Communications Infrastructure

An outside plant conduit system will provide a cable pathway allowing future expansion to the Campus Data Center to the new building's entrance facility (EF).

- Conduit pathways should extend from maintenance holes to the EF/BDF where the building equipment racks are located.
- Entrance conduits in the EF must be above the maintenance hole level to avoid flooding. Provide a minimum of four (4) 4-inch conduits, the conduits would run from their manholes into the building.
- Maintenance holes will be sized appropriately according to how many conduits and OSP cabling will pass through the maintenance hole.
- Provide one (1) 4-inch conduit dedicated for fire alarm cabling; the conduit would run from their manholes into the building. Coordinate the location of the fire-alarm panels with the Fire Consultant to determine the fire alarm conduit routing.

For the flexibility of adding satellite TV, provide one 3-inch conduit capped with a weatherhead from the roof to the topmost telecommunications room.

OSP backbone cabling will be composed of 200-pair copper and 48-strand single-mode optical fiber (OS2) cable in new building from the Campus Data Center.



OSP CONDUIT w/ FABRIC INNERDUCT

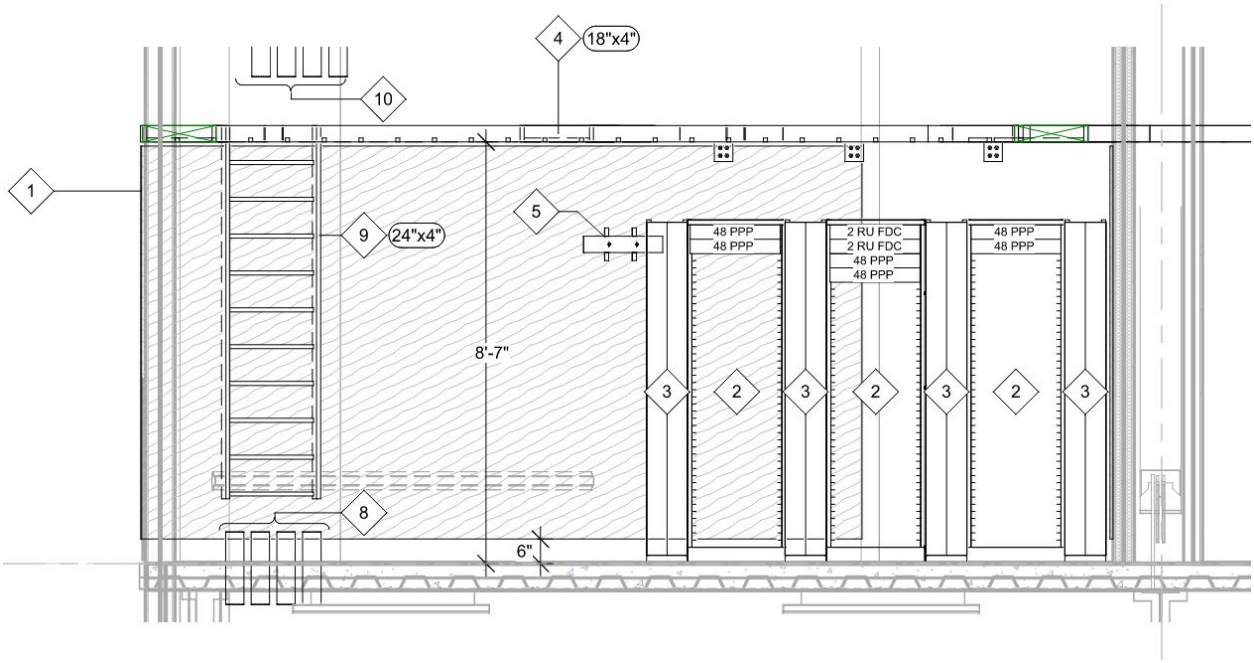
Communications Backbone Cabling Pathways

In buildings with multiple floors, a riser pathway will extend from the MPOE to each telecommunications room (TR) via a series of slots from the lower TR to the one above. Initial slot sizing for the TRs can be 36 inches by 12 inches in the lower portion of the floors and may be reduced to as little as 18 inches by 6 inches in the upper floors, based on the amount of backbone cabling required. Place a 3" X3" curb around the slots to prevent water from migrating from floor to floor in the event of a flood from a unit or burst pipe. If slots are not possible due to structural implications or other coordination issues, a bank of minimum (4) 4-inch conduits can be placed between telecommunications rooms. A minimum of 40% expansion should be planned into calculation of the required number of conduits between floors. Insert one 3-cell fabric innerduct within each (4) OSP conduit entering the building.

For Emergency Responder Radio Communication System (ERRCS), the pathway from head-end equipment on an upper floor TR will be in a two-hour rated enclosure. All walls within telecommunications spaces should be 2-hour fire-rated including the door.

If more than one TR is required on a floor, the TRs on the same floor will be connected with cable tray or conduit. Use conduit conveyance systems where ceiling conditions are not accessible.

Two 1-1/4-inch pathways should be provided between the MPOE and all elevator machine rooms to support voice and video systems.



EXAMPLE TELECOM ROOM ELEVATION / RISER

Emergency Responder Radio Communications Systems (ERRCS)

An ERRCS system may be required to augment the reception of cellular and public safety systems throughout the building.

If the AHJ determines that an ERRCS is required as a part of this project, it will feature the following components:

1. Donor antenna on the roof; the antenna is approximately 36 inches by 8 inches by 2 inches on a 6-foot mast
2. Bi-directional amplifier with a fiber distribution system located on topmost level telecom room
3. Locate a 19-inch equipment rack for the building distribution amplifier, fiber gear, and the UPS (the equipment in a NEMA 4 enclosure with a load of less than 400W)
4. Fiber remotes located on various levels

All riser cable and pathways will be two-hour rated. All fiber remotes will share NEMA 4 enclosures with a dedicated UPS.

Acceptable UPS Manufacturer:

1. American Power Company (APC)
2. Equal Alternate

Telecommunications Spaces

Main Distribution Frame (MDF)

In buildings where main telecommunications service equipment will be located within the building and not routed to the campus server room, provide an MDF to establish communications service within the building. The Main Distribution Frame (MDF) and Telecommunications Rooms (TR's) will be the common service access points for communications backbone cabling, horizontal cabling, grounding systems, and building pathways throughout the project. The rooms will contain telecommunications, audiovisual, CATV, and DAS equipment; security-related network cabling; cable terminations; and associated cross-connect and/or patch cable wiring.

The MDF and TR will be dedicated to telecommunications, security, and audiovisual functions and related support facilities. Dedicated telecommunications spaces will not be shared with electrical installations other than those that directly support those functions. Equipment not related to the support of these rooms (e.g., piping, ductwork, conduit) will not be installed in, pass through, or enter the rooms

New MDF locations will initially serve as the main equipment room on the new campus and will be a minimum of 400 square feet. The MDF could include equipment and connectivity to support all building services, such as a local area network (LAN)/wide area network (WAN), private branch exchange (PBX)/voice server, security, and other low-voltage services. Equipment may be located within the MDF to support horizontal cabling to work area outlets located adjacent to the MDF.

The entrance facility (EF) and equipment room (ER) will be located within the MDF. The EF requires about 4 feet by 8 feet of floor space for conduits and 4 feet by 6 feet of wall space.

TYPICAL TELECOMMUNICATIONS ROOM CRITERIA	
Facilities	**Design Criteria**
Size	As indicated
Construction	2-hour rated walls slab-to-slab construction with fire rated plywood mounted at 6" to 8'-6" AFF. on all walls, paint white
Lighting	Pendant mounted Caged fluorescent fixtures to provide 50 foot-candles measured at 3-feet AFF on work surface of equipment rack (vertical)
Ceiling	No finished ceiling. Ceiling slab sealant-finished to reduce dust.
Flooring	Anti-Static Sealed concrete

TYPICAL TELECOMMUNICATIONS ROOM CRITERIA	
Facilities	**Design Criteria**
Door	42” X 84” outward opening, lockable, w/ card reader.
HVAC	64-80ºF on a 24/7 basis
Humidity (Relative)	30-55% RH on a 24/7 basis
Equipment Power	Average 100-120 Watts/ft2
Convenience Power	120VAC duplex outlets at 6-foot spacing along walls
Fire Suppression	Wet sprinklers, ceiling mounted with caged heads
Equipment Supports	Equipment racks and cabinets for equipment
Support Hardware	Wall mounted cable splice racking and overhead cable runway
Grounding	Telecom copper ground bar on insulated standoffs, wall mounted in the MPOE

Telecommunications Rooms (TR)

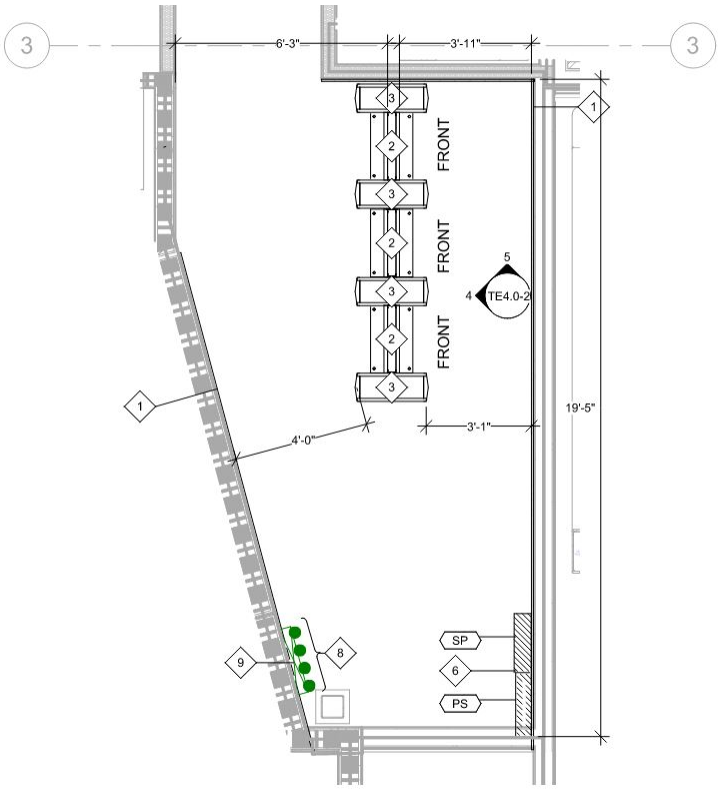
Telecom rooms in new projects will be located at the core of the building but separate from electrical rooms. Preferred size for the TR is 140 sq. ft. although can be as small as 120sq. ft.

The equipment requirements withing each room may vary from floor-to-floor; however, each will contain infrastructure for voice, and data services.

The TR will be located such that no horizontal cable exceeds 250-feet in total length. This means that the TR will not be greater than 220-feet from the farthest data or voice connections, as measured along the path of travel. Telecommunications rooms should be centrally located in the project to minimize cabling travel distances.

Below are the recommended sizes for telecommunications rooms, based on the anticipated number of category cables on the project. Each project should be evaluated throughout the design process to determine the proper sizing of the telecommunications spaces.

- Basic – 10’ long x 11’deep, for up to five 48-port station patch panels and backbone cabling installed on up to one equipment rack.
- Standard – 14’ long x 11’ deep, for up to ten 48-port station patch panels and backbone cabling, terminated on up to three equipment racks.
- Large – 20’ long x 11’deep, for up to twenty 48-port station patch panels and backbone cabling, terminated on up to five equipment racks

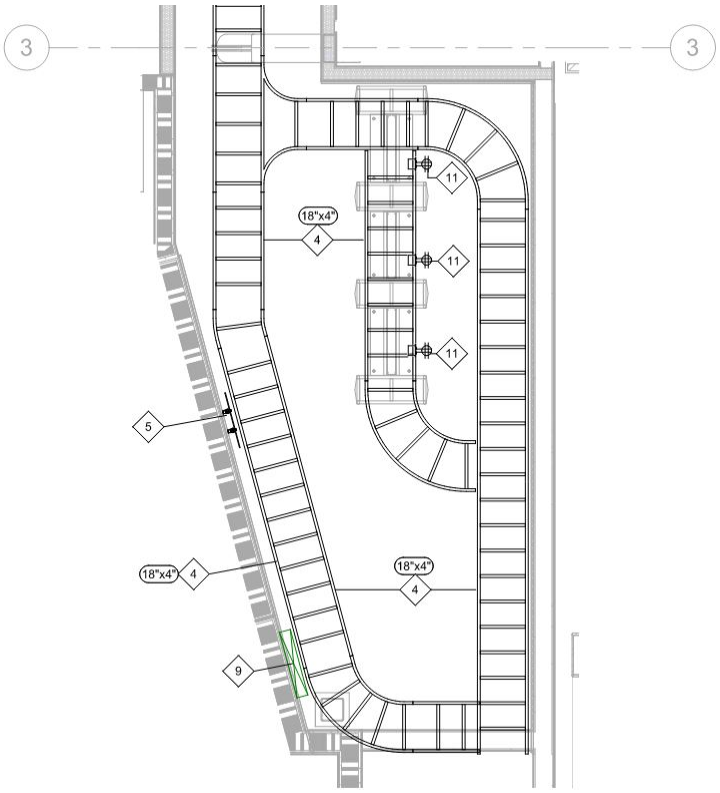


EXAMPLE TELECOM ROOM PLAN

Salter

130 Sutter Street, Floor 5
San Francisco, CA 94104

tel 415.397.0442
salter-inc.com



EXAMPLE TELECOM ROOM RCP

Communications System Requirements

Horizontal Cabling

The District standard for cabling infrastructure is a Category 6A UTP cabling for copper station cabling and single-mode fiber (OS2) cabling for fiber backbones. Future telecommunications UTP cabling types should be evaluated for viability at the start of each project.

Buildings will be provided with a dedicated telecommunications cable tray horizontal cabling conveyance system. Cable trays are required for cable bundles that exceed 100 cables. Minimum cable tray sizing will be 12”x4” and placed in accessible ceilings.

Cable tray routing will be determined in coordination with other above-ceiling systems and routed through accessible portions of major building circulation such as hallways and corridors. Special care should be taken when designing cable tray systems to allow access for future moves, adds and changes to the telecommunications system. Maintain a minimum of 6” clear space above cable trays for access to communications cabling.

Telecommunications outlets will be provisioned with 5” square Randl Telecommunications backboxes and single-gang faceplates. Each telecommunications outlet will have one (1) 1-1/4-inch conduit for every four cables that extends from the backbox to the nearest accessible ceiling space.

Acceptable Communications Cabling and Infrastructure Solutions:

1. Leviton
2. Chatsworth
3. Corning
4. Equal Alternate

Communications cabling test results:

All station cabling will be tested and certified to meet Category 6A standards when all pairs are terminated on a patch panel port and at an outlet port. The tests shall include:

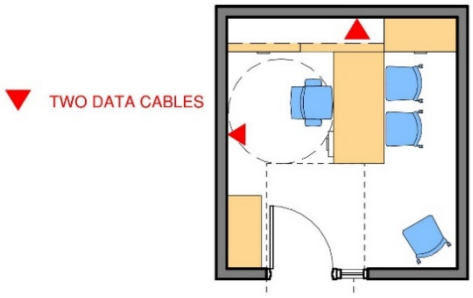
- Testing shall conform to ANSI/TIA/EIA-568-C.
- Testing shall be accomplished using a UL certified Level III tester.
- Any cable failing the prescribed certification testing should be removed and replaced.

EXAMPLE TELECOMMUNICATIONS ROOM

Typical Communications Configurations for Common Spaces

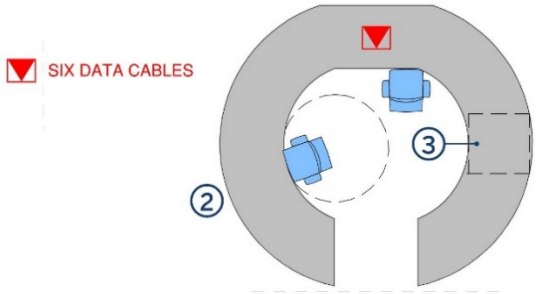
OFFICES

For offices, place two unshielded twisted-pair (UTP) Category 6A (Cat6A) cables for Data at two opposing or adjacent walls within the office.



EXAMPLE OFFICE SPACE

BUILDING ENTRANCES



Provide one floor box at the building entrance / help desk with a minimum of six unshielded twisted-pair (UTP) Category 6A (Cat6A) cables for workstations, phones, and printers located at the desk. Cabling will route from the floor box, through the furniture to these various devices. Provide one six-data floor box for each (2) workstations.

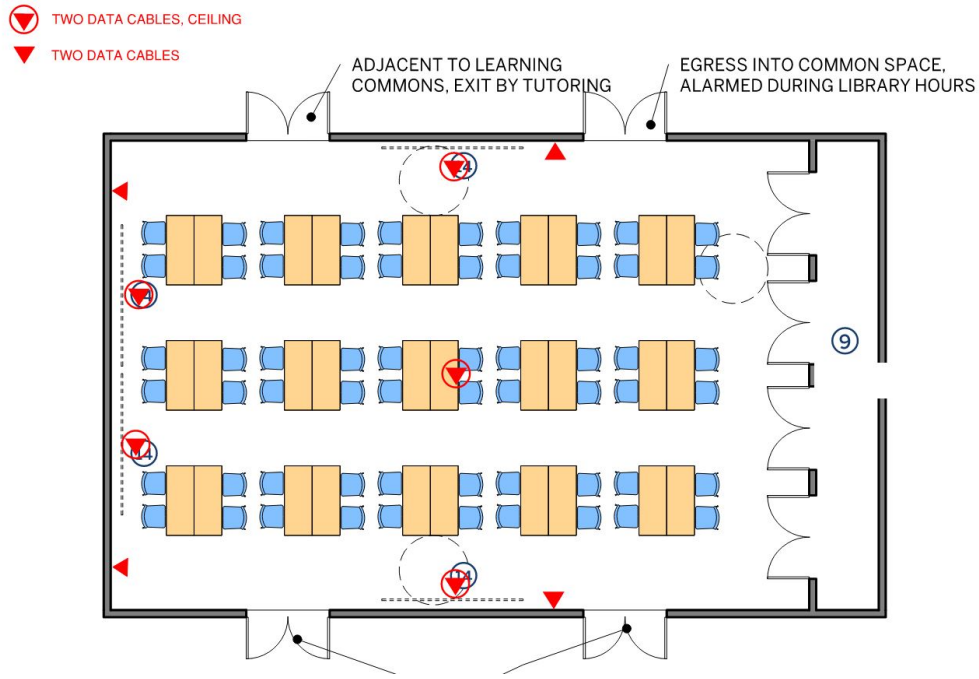
EXAMPLE HELP DESK

Salter

130 Sutter Street, Floor 5
San Francisco, CA 94104

tel 415.397.0442
salter-inc.com

FLEX SPACES

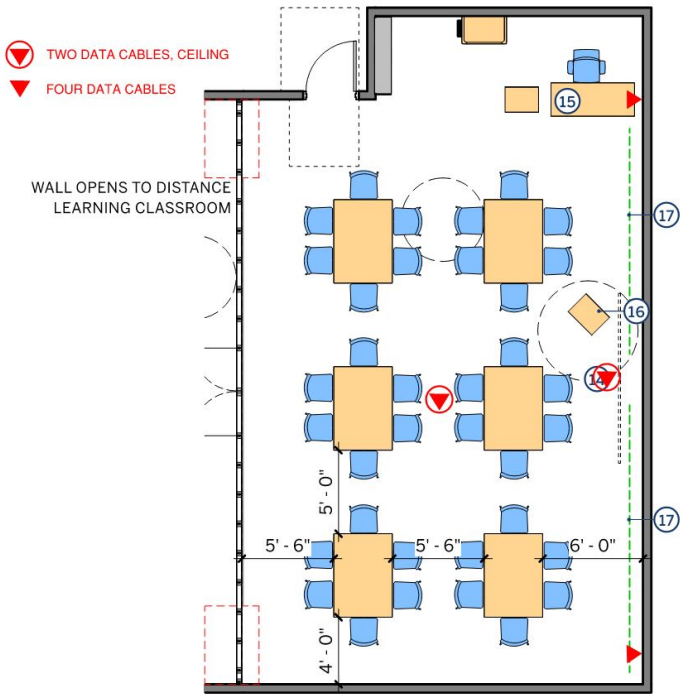


EXAMPLE FLEX SPACE

Because flex spaces will not have fixed furniture and the uses of the space can vary, the space will mainly be served via wireless access points. Provide at least two unshielded twisted-pair (UTP) Category 6A (Cat6A) cables for each planned wireless access point in each flex space.

Provide at least two unshielded twisted-pair (UTP) Category 6A (Cat6A) cables at convenience data outlet locations around the room. In addition, provide two unshielded twisted-pair (UTP) Category 6A (Cat6A) cables at each ceiling AV projector location, as outlined in the AV portion of this narrative.

CLASSROOMS (TYPICAL)



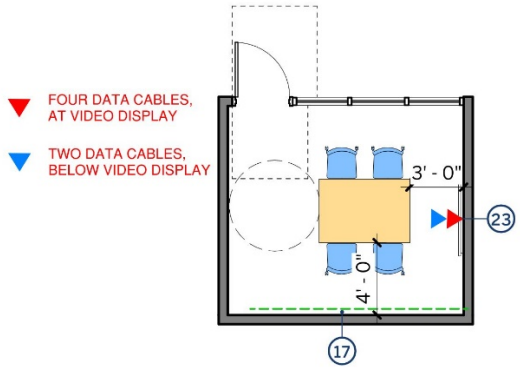
EXAMPLE CLASSROOM

Classrooms will also mainly be served via wireless access points. Provide at least two unshielded twisted-pair (UTP) Category 6A (Cat6A) cables for each planned wireless access point in classrooms.

Provide at least four unshielded twisted-pair (UTP) Category 6A (Cat6A) cables at a minimum of two data outlet locations around the room, one of these locations must be the instructor desk location. In addition, provide two unshielded twisted-pair (UTP) Category 6A (Cat6A) cables at each ceiling AV projector location, as outlined in the AV portion of this narrative.

SMALL STUDY / BREAKOUT ROOMS (VARYING SIZES)

Study rooms differ from quiet study in that they also contain equipment for local media sharing on video displays. Provide at least two unshielded twisted-pair (UTP) Category 6A (Cat6A) cables behind each planned video display at 60-inches above finish-floor and two unshielded twisted-pair (UTP) Category 6A (Cat6A) cables below the display at standard outlet height.



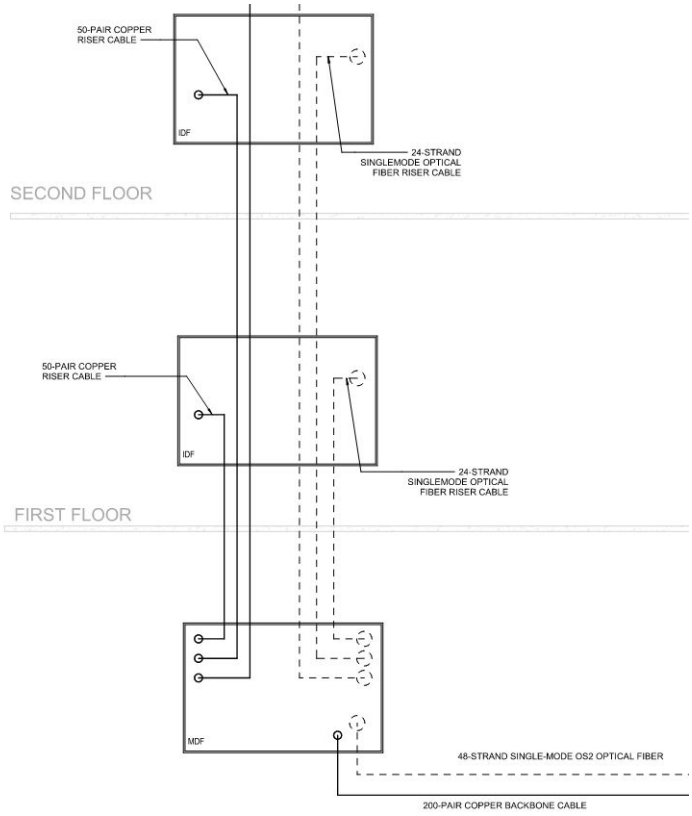
EXAMPLE SMALL COLLABORATION SPACE

PRINTER LOCATIONS

Printer/fax locations will receive a minimum of two (2) cat6A cable each. Depending on equipment density at any one location, cable quantities may be increased.

Telecommunications Backbone Cabling

Riser Cabling



Buildings that contain multiple Telecommunications Rooms will require fiber backbone cabling installed between the rooms and the BDF/MDF. All riser fiber backbones will minimally consist of 24-strand single-mode fiber and 24-strand multi-mode fiber. The type of riser cable will be UL listed OFNP rated. This type of cable can be placed in vertical shafts and plenum spaces without the use of conduit or fabric innerduct.

The copper riser pair count shall be equal to the number of voice stations served by the Telecommunications Room with a 20% growth/expansion factor. Round cable sizes to the next multiple of 25, 50 or 100 pairs. The cable shall be Category-3 UL listed CMP rated. A minimum of 50-pair copper backbone cabling should be brought to each telecom room.

Riser Cabling and Copper Backbone Terminations

Optical fiber patch panels shall meet or exceed the following:

- Rack mounted.
- Duplex SC style termination configuration.
- Must be available as a high-density 4U shelf for Main and Building Telecommunications Room installations, or 24-connector 2U trays for smaller Telecommunication room backbone terminations where fiber counts are less than 24 fibers

All new copper backbone cables will be terminated to building entrance protectors, and then extended to terminate on rack-mounted patch panels. Provide one pair copper per RJ-45 jack, facilitating moves and changes via patch cords from the station jack. Cross-connect wires should be avoided.

Supported Telecommunications Systems

- There will be a variety of networking and building-wide systems supported by the infrastructure outlined above. This section outlines the main systems that are currently being considered.
- In addition, for all telephony and specialty circuits, cabling will be provided to each TR and terminated on standard patch panels.

Wireless Access Points (WAP)

- Wireless will be provided via four Category 6A cables for 802.11 devices for common areas of the building. The WAP will be located such that the density will accommodate high-bandwidth users. For exterior locations, coverage will be provided by WAP that are built into the facade of the building or surrounding landscaping. Predictive modeling or “Heat maps” will be generated to identify potential locations for the WAPs.

Voice and Data Networking

- There will be computer-networking equipment to support voice and data communications relevant to the building’s needs. This equipment could include large network switches, desk and/or wall-mounted telephones, WAP, and network connections to various emergency, cellular, mechanical, electrical, or plumbing systems for building management. All new telephony systems will be VOIP-based. Existing PBX-based phone systems will be phased out.

Security Systems

- Because the planned security system for the new building will rely heavily on networked cameras and IP-based communication protocols, there will be a significant amount of telecommunications cable infrastructure to support it. Card readers and intercoms will also be IP-based. Therefore, space will need to be to be allocated in the MPOE and each TR for the equipment and any UPS that will be needed.

Audiovisual Systems

- Data outlets serving the District network, will be provided at AV device locations to allow for:
  - control and monitoring by campus AV technicians
  - cloud-based remote device configurations and updates
  - videoconferencing (MS Teams, Zoom)
  - IP-based TV/streaming, etc.
- Current ongoing discussions for the forthcoming District AV/IT Standards, may result in requirements for color-coded network cabling to transport IP-based audiovisual signals. Traditionally, audiovisual signals have been on run on proprietary cables, installed by the AV equipment vendor. Cables for an IP-based AV transport network should be installed by the same contractor who installs the building's structured cabling.
- An IP-based AV transport network can be an entirely separate network (on color-coded cable) or simply reside on a VLAN on the District network. Determination of network capabilities and responsibilities will be required to choose the best and appropriate approach.

Specific Telecommunications Requirements

The following are additional requirements for the telecommunications systems:

1. Electromagnetic interference: Locate telecommunications spaces away from sources of electromagnetic interference, such as electrical power supply transformers, motors, and generators
2. Water infiltration
   a. Telecommunications spaces will not be located below water level unless preventive measures against water infiltration are employed
   b. Water or drainpipes that are not directly required in support of the equipment will not be located within the spaces
   c. A floor drain and moisture sensors with alarms should be provided within spaces where there is risk of water infiltration
3. Doors will be a minimum of 40 inches wide and 80 inches high and have electronic access control door locks
4. Ceilings:
   a. The height between the finished floor and the lowest point of the ceiling in the BDF will be a minimum of 10 feet to accommodate tall frames and overhead pathways
   b. Walls will be continuous, full-height to the slab / structure above

Plywood Backboards: All walls will include 3/4-inch thick AC-grade plywood painted flat white over the gypsum wallboard

Other Provisions for Telecommunications

- In each TR, provide one non-switched dedicated 120V/20A quadra-plex electrical receptacle above each equipment rack location. The outlets will be placed at six-foot intervals around the room.
- Provide one 208V/30A outlet above each two-post equipment rack.
- The grounding and bonding should be as follows:
    - Provisionally, plan on one #4/0 copper cable from main ground bar in the MPOE to the electrical service entrance grounding electrode system
    - Provisionally, plan on one #4/0 copper cable from the main ground bar in the riser to the highest TR in the building. Each TR's ground bar will be bonded to this riser with exothermic welds.
- Provide electrical panels in the rooms that are dedicated to communications equipment only. No other loads – such as utility electrical, lighting, motor, or other devices – will be placed on these panels.
- Provide lighting with a minimum of 500 lx (50 foot-candles) measured three feet above the floor.
- HVAC will be provided on a 24/7/365 basis that can be called independently from surrounding spaces. The heat load in communication rooms will be at least one-half of the total wattage capacity supplied to each room.

Equipment loads for building services will be supplied by the building Owner's IT services staff in the next design phases. For the MPOE and DAS rooms, utilize 25 watts per square foot as a place holder until more clear information is available.

Table 1: Sizing of the TBB Cables

TBB Length (in Linear Feet)	TBB Size AWG
Less than 13	6
14 to 20	4
21 to 26	3
27 to 33	2
34 to 41	1
42 to 52	1/0
53 to 66	2/0
67 to 84	3/0
85 to 105	4/0
106 to 125	250 kcmil
126 to 150	300 kcmil
151 to 175	350 kcmil
176 to 250	500 kcmil
251 to 300	600 kcmil
Greater than 301	750 kcmil

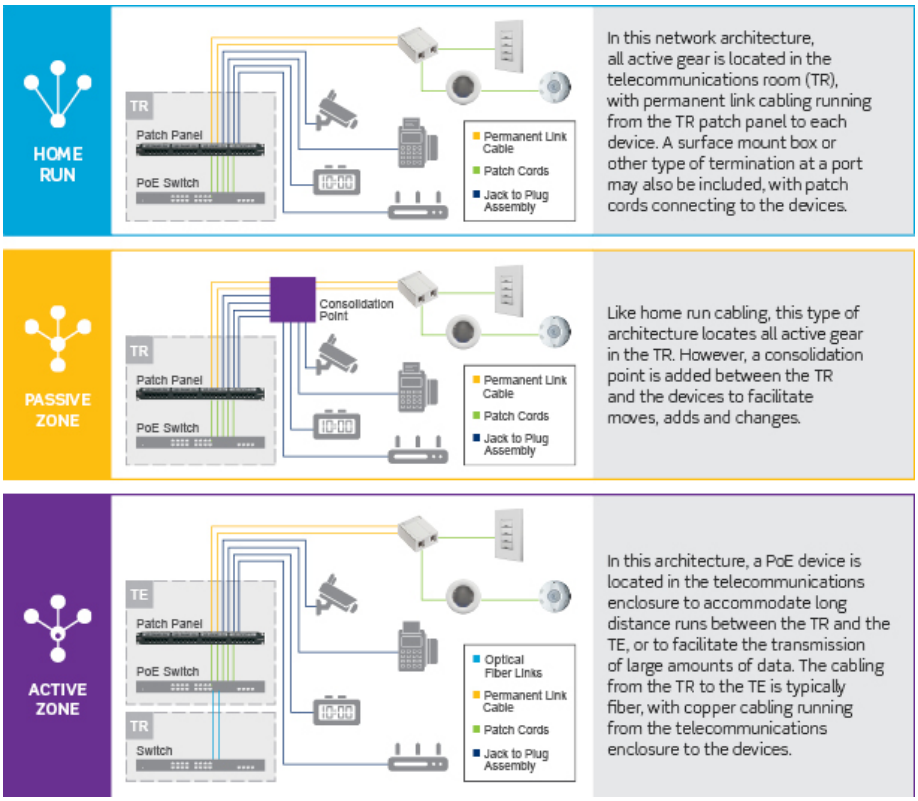
Future Planning & Smart-Building Infrastructure

With consideration for balancing overall project needs and budget, the design team should have discussions on how smart-building technology can improve the efficiency, wellness, comfort, and sustainability of the building. To prepare the building for emerging and future technology a zoned cabling system should be considered.

The latest trend towards smart buildings and increased requirements for health and safety should be considered when designing the building's structured cabling system. Towards that goal, a zoned-ceiling cabling system as describe in ANSI/TIA-862-B: Structured Cabling Infrastructure Standard for Intelligent Building System, should be considered to enable ready connection of PoE smart building devices, such as occupancy sensors, daylight sensors, security cameras, lighting, Wi-Fi, wayfinding beacons, distance learning microphones and cameras, and other Internet-of-Things (IoT) devices.

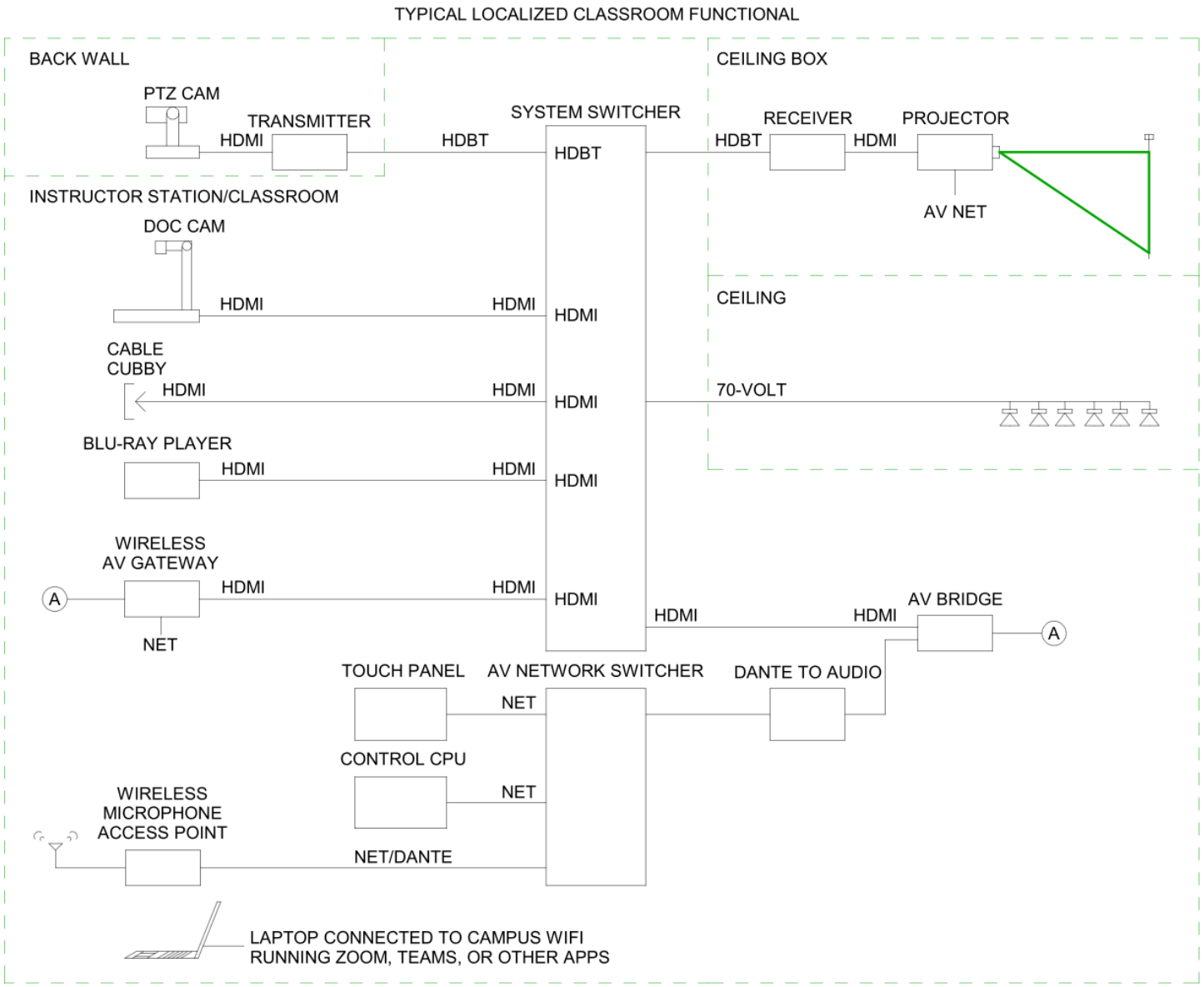
A zoned-structured cabling design consists of horizontal cables run from the telecommunications room to an intermediate connection point (zone enclosure), typically in the ceiling where most smart building devices reside. Cables are then patched from the zone enclosure to the smart devices located nearby. The benefits of a zoned cabling approach include ease of deploying new technologies and improved pathway utilization.

Manufacturer-accepted solutions to the zoned cabling approach include Leviton, or equal.



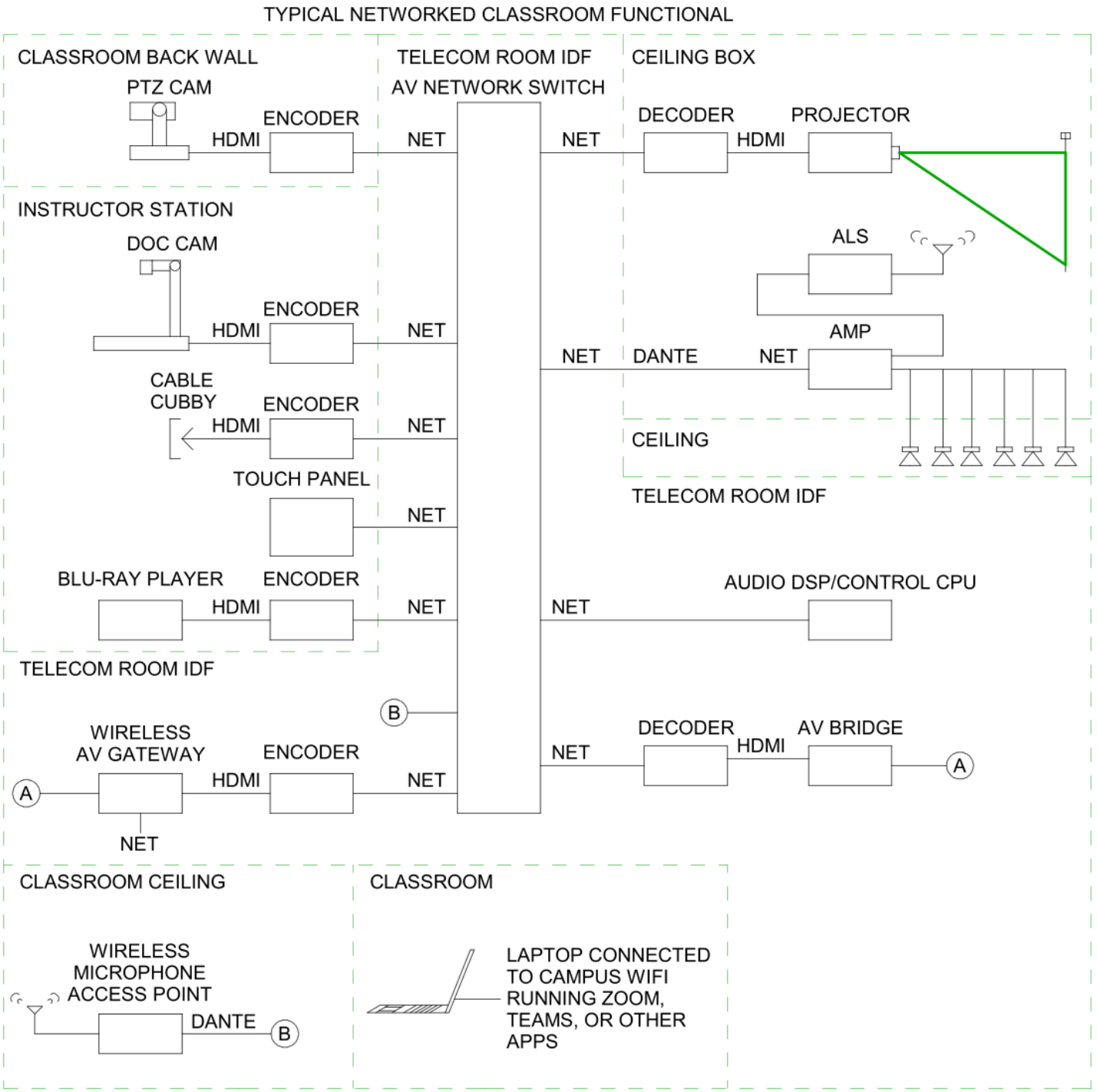
APPENDIX

TRADITIONAL "LOCAL" AUDIOVISUAL SINGLE-LINE FOR CLASSROOM



NOTE: LAPTOP TO RECIEVE PTZ CAM AND DOC CAM IMAGE VIA WIRELESS GATEWAY FOR FAR-END TRANS-MISSION. LAPTOP TO SEND FAR-END AUDIO TO CLASSROOM AV SYSTEM VIA WIRELESS GATEWAY.

NETWORK-BASED AUDIOVISUAL SINGLE-LINE FOR CLASSROOM



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OPINION OF COST FOR "LOCALIZED" CLASSROOM AV SYSTEM

LOCAL CLASSROOM							
VIDEO COMPONENTS							
TYPE	**MODEL #**	**MANUFACTURER**	**PER ROOM QUANTITY**	**QUANTITY**	**LIST PRICE**	**TOTAL LIST PRICE**	**DESCRIPTION**
8X2 SYSTEM SWITCHER	60-1583-23A (DTP CROSSPOINT 82 4RK IPCP MA 70)	EXTRON	1	8	$ 10,600.00	$ 84,800.00	*8x4 Seamless 4K scaling Presentation Matrix Switcher with Audio DSP w/ AEC, Audio Power Amplifier, and Control Processor.*
DTP RECEIVER	60-1271-13 (DTP HDMI 4K 230 RX)	EXTRON	1	8	$ 480.00	$ 3,840.00	*HDMI Twisted Pair Receiver; 230 ft*
WIRELESS PRESENTATION	SOLSTICE POD	MERSIVE TECHNOLOGIES	1	8	$ 1,450.00	$ 11,600.00	*The Solstice Pod is a turnkey wireless presentation solution that combines collaboration software integrated on a dedicated hardware platform. Soltice offers video conferencing, room calendar integration, digital signage playback, centralized monitoring and management, and meeting analytics to drive meeting productivity and ROI.*
PROJECTOR	RZ570	PANASONIC	1	8	$ 5,999.00	$ 47,992.00	*HD Projector*
PROJECTOR MOUNT	RPA324	CHIEF	1	8	$ 180.00	$ 1,440.00	*Projector Mount*
PROJECTION SCREEN	DALITE	DALITE	1	8	$ 6,000.00	$ 4,000.00	*Projection Screen*
PTZ CAMERA	AW-HE38H HD	PANASONIC	1	8	$ 2,100.00	$ 16,800.00	*HD PTZ Camera*
AV-to-USB BRIDGE	BLACK MAGIC DESIGN	WEB PRESENTER	1	8	$ 500	$ 4,000	*For sending AV signals to laptop running Zoom, Teams or similar app*
BLU-RAY PLAYER	DENON	DN 500BD	1	8	$ 399	$ 3,192	*BLU-RAY PLAYER*
DOCUMENT CAMERA	VSOLUTION CAM	WOLFVISION	1	8	$ 1,750.00	$ 14,000.00	*Document-Camera*
					Video Sum:	**$ 191,664.00**	
AUDIO COMPONENTS							
WIRELESS MICROPHONE BODYPACK TRANSMITTER	MXW1/O	SHURE	1	8	$ 698	$ 5,584	*Wireless Microphone*
HANDHELD TRANSMITTER	MX2/SM58	SHURE	1	8	$ 716	$ 5,728	*Wireless Microphone Bodypack*
TWO-CHANNEL ACCESS POINT TRANSCEIVER	MXWAPT2	SHURE	1	8	$ 1,625	$ 13,000	*Wireless Microphone Receiver with Dante audio outputs*
ALS SYSTEM	LP-3CV-072-01	LISTEN TECHNOLOGIES	1	8	$ 1,500.00	$ 12,000.00	*Assistive Listening System (ALS) for the hearing impaired*
CEILING LOUDSPEAKERS	CS 26T PLUS	EXTRON	4	32	$ 160.00	$ 5,120.00	*Ceiling Loudspeakers*
					Audio Sum:	**$ 41,432.00**	
CONTROL COMPONENTS							
TOUCH-PANEL 7"	EXTRON	TLP PRO 725T	1	1	$ 2,190.00	$ 2,190.00	*Touch-Panel for control*
AV NETWORK SWITCH	M4250-16XF	NETGEAR	1	1	$ 1,250.00	$ 1,250.00	*AV Network Switch*
					Control Sum:	**$ 3,440.00**	
HARDWARE & MISC COMPONENTS							
CEILING-BOX; FOR PROJECTOR	CB-12	FSR	1	1	$ 400.00	$ 400.00	*Ceiling-box serving Projector*
AV CABLING	VARIOUS	VARIOUS	1	8	$ 1,500	$ 12,000	
INSTRUCTOR LECTERN	TBD	TBD	1	8	$ 7,500.00	$ 60,000.00	*Middle Atlantic L7 Series Lectern with Connectivity*
					Hardware Sum:	**$ 72,400.00**	
					TOTAL SUM FOR 8 CLASSROOMS:	**$ 308,936.00**	

OPINION OF COST FOR NETWORK-BASED AV SYSTEM

OPINION OF PROBABLE COST FOR LOCALIZED AUDIOVISUAL CLASSROOM AV SYSTEM

NETWORKED CLASSROOM							
VIDEO COMPONENTS							
TYPE	**MODEL #**	**MANUFACTURER**	**PER ROOM QUANTITY**	**8- ROOM QUANTITY**	**LIST PRICE**	**TOTAL LIST PRICE**	**DESCRIPTION**
AV ENCODER	E4100	VISIONARY SOLUTIONS	5	40	$ 893	$ 35,720	*A/V Encoder, 4K UHD over IP cinema quality ultra-low latency visually lossless switch matrix routable, with built-in video wall functionality; POE*
AV DECODER	D4100	VISIONARY SOLUTIONS	2	16	$ 893	$ 14,288	*A/V Decoder, 4K UHD over IP cinema quality ultra-low latency visually lossless switch matrix routable, with built-in video wall functionality; POE*
WIRELESS GATEWAY	SOLSTICE POD	MERSIVE TECHNOLOGIES	8	8	$ 1,450	$ 11,600	*The Solstice Pod is a turnkey wireless presentation solution that combines collaboration software integrated on a dedicated hardware platform. Soltice offers video conferencing, room calendar integration, digital signage playback, centralized monitoring and management, and meeting analytics to drive meeting productivity and ROI.*
PROJECTOR	RZ570	PANASONIC	1	8	$ 5,999	$ 47,992	*HD Projector*
PROJECTOR MOUNT	RPA324	CHIEF	1	8	$ 180	$ 1,440	*Projector Mount*
PROJECTION SCREEN (16:9, 110" X 69")	TENSIONED COSMOPOLITAN	DA-LITE	1	8	$ 2,772	$ 4,000	*Projection Screen*
PTZ CAMERA	AW-HE38H HD	PANASONIC	1	8	$ 2,100	$ 16,800	*HD PTZ Camera*
AV-to-USB BRIDGE	BLACK MAGIC DESIGN	WEB PRESENTER	1	8	$ 500	$ 4,000	*For sending AV signals to laptop running Zoom, Teams or similar app*
BLU-RAY PLAYER	DENON	DN 500BD	1	8	$ 399	$ 3,192	*BLU-RAY PLAYER*
DOCUMENT CAMERA	VSOLUTION CAM	WOLFVISION	1	8	$ 1,750	$ 14,000	*Document-Camera*
					Video Sum:	**$ 153,032**	
AUDIO COMPONENTS							
DANTE POWER AMPLIFIER	CVA 50-1	STEWART	1	8	$ 325	$ 2,600	*In Ceiling Projector Box*
DSP (SHARED)	QSC	TBD		1	$ 3,000	$ 3,000	*In IDF*
WIRELESS MICROPHONE BODYPACK TRANSMITTER	MXW1/O	SHURE	1	8	$ 698	$ 5,584	*Wireless Microphone*
HANDHELD TRANSMITTER	MX2/SM58	SHURE	1	8	$ 716	$ 5,728	*Wireless Microphone Bodypack*
TWO-CHANNEL ACCESS POINT TRANSCEIVER	MXWAPT2	SHURE	1	8	$ 1,625	$ 13,000	*Wireless Microphone Receiver with Dante audio outputs*
ALS SYSTEM	LP-3CV-072-01	LISTEN TECHNOLOGIES	1	8	$ 1,500	$ 12,000	*Assistive Listening System (ALS) for the hearing impaired*
CEILING LOUDSPEAKERS	CS 26T PLUS	EXTRON	4	32	$ 160	$ 5,120	*Ceiling Loudspeakers*
					Audio Sum:	**$ 47,032**	
CONTROL COMPONENTS							
TOUCH-PANEL 7"	TSC-80TW-G2-BK	CRESTRON	1	8	$ 1,800	$ 14,400	*Touch-Panel for control*
48-PORT AV NETWORK SWITCH (SHARED)	QSC	NS-1148P		2	$ 4,175	$ 8,350	*In IDF*
					Control Sum:	**$ 22,750**	
HARDWARE & MISC COMPONENTS							
CEILING-BOX; FOR PROJECTOR	CB-12	FSR	1	8	$ 400	$ 3,200	*Ceiling-box serving Projector*
AV CABLING	VARIOUS	VARIOUS	1	8	$ 1,500	$ 12,000	
INSTRUCTOR LECTERN	TBD	TBD	1	8	$ 7,500	$ 60,000	*Middle Atlantic L7 Series Lectern with Connectivity*
					Hardware Sum:	**$ 75,200**	

TOTAL SUM FOR 8 CLASSROOMS:	**$ 298,014**
OPINION OF TOTAL INSTALLED COST FOR 8 CLASSROOMS	**$ 476,822.40**

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