



DoDEA FACILITIES MANAGEMENT GUIDE: TECHNOLOGY SYSTEMS DESIGN GUIDELINES DODEA SPECIAL SYSTEMS VERSION 2.0

DEPARTMENT OF DEFENSE EDUCATION ACTIVITY

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DoDEA Technology Systems Design Guide DoDEA Special Systems Requirements

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System Oversight Responsibilities			
System	HQ DoDEA Lead	E-Mail	Phone #
Designer Requirements	HQ Facilities	jansen.moon@hq.dodea.edu	571-372-1342
Access Controls	HQ Safety/Security	<i>See Section 6.0</i>	<i>See Section 6.0</i>
CATV & IPTV	HQ IT ASA	dodeaasa@hq.dodea.edu	571-372-1465
Audio-Visual Systems	HQ Education	patrick.martin@hq.dodea.edu	571-372-5841
Telephone (VOIP & Analog)	HQ IT ASA	dodeaasa@hq.dodea.edu	571-372-1465
PA/Intercom/Clocks/Bells	HQ Education	patrick.martin@hq.dodea.edu	571-372-5841
Building Automation System	HQ Facilities	jansen.moon@hq.dodea.edu	571-372-1342
Monitors & Displays	HQ Education	patrick.martin@hq.dodea.edu	571-372-5841
Stage (sound, lighting, AV, rigging)	HQ Education	patrick.martin@hq.dodea.edu	571-372-5841
Broadcast Room	HQ Education	patrick.martin@hq.dodea.edu	571-372-5841

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ACRONYMS

ADA	Americans with Disabilities Act
A/E	Architect/Engineer
AFCEC	Air Force Civil Engineer Center
AGC	Application Generic Controllers
AI	Access Intercom
ASA	Architecture, Standards and Auditing
ASC	Application Specific Controllers
AV/A/V	Analog Video/Audio-Visual
BAS	Building Automation System
BICSI	Building Industry Consulting Services, International
CAT6	Category 6 UTP Cable
CATV	Cable Television
CCTV	Closed Circuit Television
CFCI	Contractor Furnished Contractor Installed
COW	Computers on Wheels
CTE	Career Tech Education
BAS	Direct Digital Control
DIACAP-DITSCAP	Department of Defense Information Assurance Certification and Accreditation Process/Defense Information Technology Security Certification and Accreditation Process
DID	Direct Dial Access
DMX	Direct Media Exchange
DoDEA	Department of Defense Education Activity
DSO	District Superintendent's Office
DVD	Digital Video Disc
DVI	Digital Video Interface

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FF&E	Furniture, Fixtures and Equipment
GFGI	Government Furnished Government Installed
GPS	Global Positioning System
HD	High Definition
HDMI	High Definition Multimedia Interface
HVAC	Heating, Ventilation and Air Conditioning
IP	Internet Protocol
IPTV	Internet Protocol Television
ISBN	International Standard Book Number
IT	Information Technology
IWB	Interactive White Board
LAN	Local Area Network
LC	Local Call
LCD	Liquid Crystal Display
LED	Light Emitting Device
LEED	Leadership in Energy and Environmental Design
LIMM	Learning Impaired Mild Moderate
LIMS	Learning Impaired Moderate to Severe
MDF	Main Distribution Frame
MILCON	Military Construction
MNS	Mass Notification System
NAVFAC	Naval Facilities Command
OSP	Outside Plant Cables
OTPT	Occupational Therapy/Physical Therapy
PA	Public Address
PBX	Private Branch Exchange
PM	Project Manager

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POS	Point of Sale
PV	Photo Voltaic
QC	Quality Control
RF	Radio Frequency
SATT	School as a Teaching Tool
SC	Single Channel
SCPT	Standard Defined Configuration Parameter Types
SNVT	Standard Network Variable Type
TM	Technical Manager
TR	Telecommunications Room
UFC	Unified Facilities Criteria
USACE	United States Army Corps of Engineers
UCPT	User Defined Configuration Parameter Types
USB	Universal Serial Bus
VGA	Video Graphics Accelerator
VOD	Video on Demand
VoIP	Voice over Internet Protocol

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1.0 PURPOSE

This design guide has been prepared to provide the Architect/Engineer (A/E) community with the necessary criteria to assist in the design of the special (non-network) systems that are typically found in an educational facility. While certain features of the system design shall vary from project to project, the requirements reflected in this guide are intended to provide the minimum requirements required by the Department of Defense Education Activity (DoDEA). This document represents the Special Systems portion of the design guide. The DoDEA Network guidelines shall accompany this document and include standards for additional network systems.

2.0 APPLICABILITY

These instructions apply to DoDEA, the US Army Corps of Engineers (USACE) Norfolk DoDEA Design Center, Construction Agents having DoDEA Military Construction (MILCON) responsibilities to include USACE, Naval Facilities Command (NAVFAC), and the Air Force Civil Engineer Center (AFCEC), as well as Architect/Engineer (design) firms, and construction contractors. These instructions are intended to be used for new DoDEA MILCON projects or projects that are modifying existing facilities.

For all new or modified DoDEA facilities, the designer/construction contractor must demonstrate that the criteria outlined in this and other relevant guides for each special (non-network) technology system have been met. Host Nation funded projects should comply with this guideline to the greatest extent possible; after standard warranty periods have expired, any modifications to host nation funded facilities shall comply with the criteria outlined in this guide.

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3.0 REFERENCES

References include, but are not limited to, the following documents. Use the most recent version available of the listed references, if the listed version has been superceded.

NFPA 70, National Electrical Code

NFPA 101, Life Safety Code

ANSI/IEEE C2-2007, National Electrical Safety Code

UFC 3-410-02, Direct Digital Control for HVAC and Other Building Control Systems

Unified Facilities Criteria (UFC) 4-021-01, Mass Notification Systems

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4.0 RESPONSIBILITIES

4.1 HEADQUARTERS, DEPARTMENT OF DEFENSE EDUCATION ACTIVITY

HQ DoDEA is responsible for program management by providing scope, direction, funding, and financial management of the entire DoDEA Military Construction (MILCON) design and construction program. HQ DoDEA Facilities Branch, in coordination with the DoDEA Design Center, and each DoDEA Area Project Manager (PM), is responsible for ensuring that design submittals for DoDEA projects are routed through HQ DoDEA's Information Technology (IT) Architecture, Standards and Auditing (ASA) MILCON review team. The HQ IT ASA MILCON review team reviews and provides timely comments on design submittals to ensure compliance with this guide and other relevant standards, and provides review comments to the respective DoDEA Area PM to be implemented into the project. Other HQ DoDEA functions, such as, but not limited to, the Office of Safety and Security or Education Division, shall also provide guidance where their Areas of Responsibility intersect with Special Technology System requirements.

4.2 DODEA AREAS (DODEA-AMERICAS, EUROPE AND PACIFIC)

The DoDEA Area Offices shall provide a Project Manager (PM) who shall coordinate with the School Superintendent, local logistical staff, and host installation representatives regarding local Special technology requirements. This individual, the Logistics Division Facilities Engineer for the project, shall be referred to throughout this document as the DoDEA Area PM. In concert with the HQ staff, to include the IT ASA MILCON review team, DoDEA Area Facilities and IT representatives, the DoDEA Design Center, and the Construction Agent Project Manager, the DoDEA Area PM shall ensure that the A/E and construction contractor implement the latest DoDEA standards for DoDEA Network and Special systems within DoDEA projects. The DoDEA Area PM shall initiate coordination with IT ASA at the Planning stage of the project, with detailed IT ASA drawing reviews beginning at the 35% stage for all projects.

4.3 HOST INSTALLATION

The host installation and supporting agencies (such as the Network Enterprise Center on Army installations) are responsible for working with the DoDEA Area PM to ensure DoDEA projects satisfactorily incorporate local Special technology requirements.

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4.4 CONSTRUCTION AGENT

The Construction Agent Project Manager for USACE, NAVFAC or AFCEC, in concert with the DoDEA Area Office PM, and the DoDEA Design Center, shall ensure that the A/E and construction contractor implement the latest DoDEA standards for DoDEA Network and Special systems within DoDEA projects.

4.5 DODEA DESIGN CENTER – NORFOLK DISTRICT TECHNICAL MANAGER (TM)

The Norfolk District TM supports HQ DoDEA, the DoDEA Area Office PM, the Construction Agent, and the A/E as a technical subject matter expert. The Norfolk District TM shall support IT design reviews to verify compliance with the latest DoDEA standards for DoDEA Network and Non-Network systems. Along with the DoDEA Area PM, the Norfolk District TM shall ensure that review comments provided by the IT ASA MILCON review team are adequately addressed in DoDEA project designs.

4.6 ARCHITECT/ENGINEER DESIGNER AND CONSTRUCTION CONTRACTOR

The Architect/Engineer designer and construction contractor must demonstrate that the criteria outlined in this and other relevant guides for each special technology system have been met in all new or modified DoDEA facilities.

In general, telecommunications racks, conduit, cable trays, terminations, and outlets shall be MILCON funded. Rack switches are typically Operations & Maintenance (O&M) funded. Controllers and amplifiers for PA/Intercom/Clocks/Bells, proximity card access controls, Ai-Phone access controls, etc. can be MILCON or O&M funded depending upon the interpretation of the contracting authority in an individual Area, but, if funds are available, use of MILCON funds for these systems is preferred in order to ensure complete and usable/testable systems at construction completion.

5.0 DESIGNER/CONSTRUCTION CONTRACTOR REQUIREMENTS

5.1 All IT and special systems, both software and hardware, installed, intended to be procured as FF&E or otherwise used in DoDEA schools must have prior approval and are subject to DITSCAP/DIACAP security provisions. A/E design teams shall contact their DoDEA Area PM at the appropriate time during design to obtain the latest listing of approved systems and software. These items are suggested for use as basis of design, but not required. Items not specifically listed on this pre-approved listing that are intended for use in a DoDEA school design or used as a basis of design intent should be submitted as a separate, independent package to HQ DoDEA, Attn: Director of Information Technology, for review and preliminary

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approval. DoDEA will initiate the approval of these systems if they are deemed appropriate. Software must also be approved as discussed in Section 5.6, below.

5.2 Systems are integrated for operational efficiency, cost, and functionality. The systems designer shall research and identify existing telecom solutions approved for use on DoDEA and DoD networks. The systems designer shall make recommendations for telecom solutions that do not exist in DoDEA that shall improve operational efficiencies of existing systems.

5.3 The systems designer shall ensure that the project specifications require training on all systems that will be provided at the actual facility 30 days prior to student occupation. Length of training shall be in accordance with manufacturer's recommendations, and an operation's manual and instructional materials specific to each system installed shall be provided. The manuals and instructional materials shall be approved by the end user (DoDEA Area PM) before being finalized. A DVD video of each training session shall also be provided. This training shall include follow-on assistance by system installers or solution providers for 90 days after the facility is occupied. The user shall be supported telephonically, through web training, and/or onsite if necessary.

5.4 Coordinating through the DoDEA Area PM, the contractor shall provide qualified personnel at the facility on the first day of actual operation to observe and assist school administration with the systems' operation. It is the system designer's responsibility to coordinate through the DoDEA Area PM to identify the DoDEA personnel who shall be trained on each system. Each system identified may have different personnel.

5.5 Non-DoDEA Network systems like phone (non-VOIP), BAS, HVAC controls, access controls, energy dashboard, PA/intercom/clocks/bells, audio-visual, projection, lighting, and sound systems shall be designed with a stand-alone cabling system. **These systems shall not rely on DoDEA network operability.** These Special systems shall be on a single separate "facilities network" with one connection to the DoDEA Network (after software approval). Total building automation integration is desired (one entity to integrate all above systems to ensure they are complete, useable, and fully functional). In some cases, only the primary controller/computer of a non-network system may be allowed to connect to the DoDEA Network so it can be monitored/controlled remotely and have its software periodically updated. The systems designer shall require the construction contractor to gain approval of any proposed software that will be connected to the DoDEA Network (i.e. BAS, Access Controls, PA/Intercom) and provide a free copy of the software to HQ DoDEA for testing. For planning, software approval will take 120-days (upon request through the DoDEA PM); **DoDEA software approval must be gained prior to connecting any system to the DoDEA Network.**

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5.6 As soon as a proposed technology (hardware/architecture) system is identified for inclusion in a new (or modified) DoDEA facility, the construction contractor shall provide a white paper discussing the system specifications (type of wiring and make/model for each device which shall connect to the DoDEA Network) for HQ IT Architecture, Standards and Auditing (ASA) review and approval. White papers shall be submitted through the DoDEA Area PM to the HQ IT ASA office for review and approval. Software must also be approved; software approval requests must include all software to be installed on servers/computers proposed to be connected to the DoDEA Network (i.e. Siemens v3.13, Johnson Controls, etc.), including the operating system for the server and/or computer (i.e. Windows OS 2012, Windows 2007), etc. The following information must be sent via the DoDEA Area PM to HQ IT ASA:

- Software Title: Identical name of the software title.
- Version: Exact version number of the software.
- Software Publisher: Name of software publisher.
- ISBN: Identify the ISBN (non-mandatory field -- This is usually located on the cover of the CD over the bar code or the publisher website).
- Publisher Web site: Web address/URL (i.e. <http://www...>).
- Software Description: (What does the software do?)
- CD, DVD, or download link (with User ID and password if required) of the proposed software to the address below to be used for DoDEA testing

See the IT Submission Checklist at Appendix 4 for more information on submittal requirements.

5.7 Catalog cuts for the basis of design for systems are available from the DoDEA Area PM.

6.0 ACCESS CONTROL

Refer to the DoDEA Educational Facilities Physical Security and Antiterrorism Design Specifications for guidelines regarding the Access Control system. The systems designer shall design a complete and usable proximity card access control system (or, in Europe, a Simons Voss electronic lock system) and access-intercom phone system. In new (and modified) DoDEA facilities, all access control systems shall be stand-alone cabled systems that do not rely on any Ethernet network switches or hubs on the DoDEA Network to function. Questions pertaining to Access Control Systems shall be vetted through the DoDEA Area PM who will coordinate with the assigned OSS Security Specialist.

6.1 PROXIMITY CARD READER SYSTEM

See DoDEA Educational Facilities Physical Security and Antiterrorism Design Specifications.

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6.2 ACCESS-INTERCOM/VIDEO PHONE (AI PHONE)

See DoDEA Educational Facilities Physical Security and Antiterrorism Design Specifications.

6.3 AUTOMATED ACCESS GATE CONTROLS

See DoDEA Educational Facilities Physical Security and Antiterrorism Design Specifications.

6.4 INTRUSION DETECTION AND CCTV

See DoDEA Educational Facilities Physical Security and Antiterrorism Design Specifications.

6.5 DURESS BUTTON

See DoDEA Educational Facilities Physical Security and Antiterrorism Design Specifications.

6.6 DOOR BUZZ-IN

See DoDEA Educational Facilities Physical Security and Antiterrorism Design Specifications.

6.7 ADA ACCESS

See DoDEA Educational Facilities Physical Security and Antiterrorism Design Specifications.

6.8 MASS NOTIFICATION SYSTEM (MNS)

For guidance on individual building Mass Notification System requirements, please refer to the UFC 4-021-01, Mass Notification Systems.

Provide speakers mounted on the exterior of the building in accordance with UFC 4-021-01, Mass Notification Systems. System should provide scrolling text capability to the marquees in high noise areas typically defined as rooms normally containing 50 or more people in high activity areas such as the gymnasium, cafeteria, multi-purpose rooms, or other areas that are not conducive to legible voice transmissions. The systems designer is required to determine each of these locations during the design phase. If possible, the visual announcement capability may be designated to operate through the school's media systems. The visual alert should be installed so that an announcement is readable in conjunction with the audible voice message.

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Emergency notifications should occur over the Mass Notification System in accordance with the UFC 4-021-01, Mass Notification Systems.

7.0 CATV SYSTEMS (CABLE TV) (SEE ALSO SECTION 9, IPTV)

Generally, CATV signals are distributed from the DoDEA school on each installation that contains the IT server-hub. The CATV cable is run to the IT server hub, then typically translated to digital signal and distributed to other schools. The systems designer is required to design a pathway (conduit/duct with pull-string) for future CATV cabling from the site perimeter to the main telecommunications room. The systems designer shall coordinate with the DoDEA Area PM regarding basis of design products.

8.0 A/V SYSTEMS

8.1 LEARNING NEIGHBORHOOD VOICE ENHANCEMENT

Voice enhancement or voice reinforcement systems are not permanently installed systems (they are procured as FF&E). The facility should be fitted with portable systems that remain in storage until needed for a particular learning space activity. Any 120v outlet (or host nation electric standard outlet, i.e. 240v outlet in Europe) in the learning space may be used to operate these systems.

Because the voice enhancement systems are portable, there are no connections to the building network, and no network audio transport systems are used within the learning spaces.

8.2 INTERACTIVE WHITE BOARD - IWB

An interactive whiteboard (IWB) should be provided in each learning space identified in the IT Connections Matrix at Appendix 2, typically on the teaching wall centered for optimal viewing from the geometric center of the room. IWBs may also be portable, which requires an electrical connection and wired or wireless data connections; refer to the IT Connection Matrix at Appendix 2 for more information. IWBs typically connect to a computer using HDMI, USB, and DVI cable interfaces. Two quad AC power outlets are required for each IWB and instructional computer location to provide power for; (1) IWB, (2) projector, (3) computer, (4) height adjustable mount, (5) speakers (note that most IWBs typically include integral speakers, but this should be verified with the DoDEA Area Project Manager), (6) document reader, and (7) camera. The systems designer should show the instructional computer location on document drawings to include data network connections. A data connection (BLUE) and LAN video

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connection (RED) shall be provided adjacent to each IWB for future video devices. The mounting height for video devices must be identified. Typically, IWBs are mounted on an adjustable vertical track (typically GFGI) allowing the bottom of the unit to travel nearly to finish floor level. Caution: Outlets shall NOT be placed within +/- 1-ft of the centerline of any IWB, or plugs may be sheared off.

Mounting of the IWB shall require coordination during design with other wall mounted furnishings. See Appendix 1 for IWB mounting details. Note that most items shown in Appendix 1 (with the exception of data/power connections, which are CFCI) are typically GFGI. The IWB and program loudspeakers (typically integral to the IWB) will be addressed as part of DoDEA IT's outfitting process.

As IWB technology continues to change, the systems designer/contractor shall coordinate via the DoDEA Area PM with Area Education representatives and local school officials regarding the current IWB Basis of Design and plan to accommodate current technology requirements.

8.3 VIDEO PROJECTION AND PROJECTOR

Video projection is used at elementary, middle, and high schools to deliver multimedia services to large audiences. Typically, a projector is desired in the performance/stage and multi-purpose/platform areas. Projection screens shall be sized for the room and located downstage. Screens shall be the electric retractable type. The projector shall be sized based on screen size throw distance and ambient lighting in the space.

At middle and high schools, a second projector and upstage screen shall be provided for backdrop projection. Each screen shall be the electric retractable type. Other screen custom considerations shall be employed for the black box and other performance spaces established by the A/E during charrette level interviews.

An HDMI cable is required to be run from the projector location to each of four AV-Lighting-screen-curtain control stations, with appropriate amplification to accommodate cable length. The HDMI connection must allow a computer to control the projector and sound system. Also, two 8P8C (RJ-45) data connections shall be provided at each projector, and terminated on a patch panel in the nearest telecommunications room. The 8P8C (RJ-45) data connections shall be used to control the projector (with HD-Base-T transmitter, and sound/microphone connection) to video, and to control projector settings from any network-connected computer in the school. Alternative cables such as VGA and DVI cabled outlets to/from projectors may be explored if proven to be a better substitute for HDMI cabling.

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8.4 DISTANCE LEARNING

All equipment to support distance learning is part of HQ IT's outfitting package. The A/E shall confirm requirements at the charrette level interview.

8.5 VIDEO PRODUCTION (BROADCAST ROOM)

The Broadcast Room is a small TV studio. The system designer should document DoDEA requirements through the DoDEA Area PM to insure building infrastructure allows for technical integration throughout the building. Two strands of CAT-6 8P8C (RJ-45) terminated to the nearest Telecommunication Room (TR) and four strands of OM-4 multimode fiber with LC connections shall terminate in the Main Telecommunications Room (TR1). No fiber patch panel is required in the Broadcast/Control Room. The connections shall be housed in recessed wall outlet boxes in the broadcast room at the Elementary School level, or, in a middle or high school, in the control room. FF&E/outfitting equipment typically includes: broadcast integrator (NewTek Tricaster or equivalent), light sets, backgrounds, green screen, microphones, wireless intercom, sound system, and cameras w/tripod mounts. Contact the DoDEA Area PM for catalog cuts for the basis of design for broadcast room equipment. See Section 16.1 for Broadcast Room lighting control requirements.

8.6 COW OR SMART CART

The A/E shall coordinate connection locations for Computer-on-Wheels (COW) charging racks or SmartCarts (via the DoDEA Area PM) with school faculty/staff ensuring no less than 20 amperage electrical service for each COW/SmartCart. The typical locations for COW charging racks/SmartCarts are within each studio or their supporting staff collaboration areas, at the Information Center, and in the Computing Center. Ensure the heat load for these systems are considered in the HVAC calculations. Catalog cuts for the basis of design for COWs or SmartCarts are available from the DoDEA Area PM.

9.0 IPTV

9.1 INTERNET PROTOCOL TELEVISION - IPTV

For the purposes of this document, television, video on demand (VOD) content, and menu information are all the same.

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In some locations, DoDEA uses digital video encoders and decoders to support content streaming over the network. Encoders, which shall be provided by DoDEA IT, shall be located in the main server room. Content shall either be delivered locally or from a remote DoDEA facility. Coordinate with the DoDEA Area PM for requirements at each school.

Video distribution within the facility and local school community shall be IP based. Distribution over coaxial cable is not desired, but is permitted where needed to meet educational requirements. In those situations, DoDEA IT will not support coaxial cable distribution or maintenance. An 8P8C (RJ-45) video receptacle shall be provided at the IWB, instructional computer location, and other areas within the building that require video display or distribution.

A video receptacle shall be provided at all display devices in accordance with Appendix 2. The cables shall be terminated in the nearest telecommunications room on the dedicated patch panels. Locations shall be coordinated (through the DoDEA Area PM) by the A/E with the school administration. Common display devices include message boards, TV Display panels, and digital projectors, etc. This cable and receptacle shall be labeled red.

10.0 TELEPHONE SYSTEMS

10.1 SERVICE COORDINATION

The systems designer must coordinate with the DoDEA Area PM who coordinates with the base phone service regarding phone service availability early in the design process. Some schools use DoDEA VOIP for phone services; other schools use the installation phone system. The systems designer must include the phone requirements in a design table that includes the phone system type, required infrastructure, and available feature requirements such as number of DID (direct dial access) numbers. The table shall identify Outside Plant and Inside Plant requirements as separate line items.

10.2 PHONE LINES

The number of direct phone lines required is based upon the number of phones in the facility. The minimum number of copper pairs and associated pathway infrastructure is 50, unless the systems designer determines that the school requirements exceed 75%, not allowing for growth. The phone requirements shall be determined by a survey and analysis with the local military telecommunications office and the DoDEA school administration (coordination occurs through the DoDEA Area PM). The survey should include requirements for FAX, 911,

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emergency response, mass notification, fire alarms, and other base level services which use copper telecommunications services.

The systems designer must clearly document phone requirements identified in the survey analysis for Outside Plant, Inside Horizontal Distribution between telecommunication rooms, and phone instruments. All requirements for systems shall be clearly identified in systems design documents, i.e. OSP cable, Inside Horizontal Distribution, PBX, Krone blocks, copper cable, etc.

Phone line configuration for outside access shall be configured to be a hunt group selection methodology.

Final phone system electronics are the responsibility of DoDEA. The systems designer shall coordinate with the DoDEA Area PM regarding the phone system to be used and number of lines.

10.3 PHONE LOCATIONS

The matrix at Appendix 2 identifies desired phone locations. In general, the requirements are that there should be one phone location in each education space (i.e. Studio, Hub, 1-to-1, Group Learning, Art, Music, Gym, Performance, Multi-purpose, L IMM, LIMS, Computing Center, Science, etc.), one for each teacher/staff work-station (and Staff Collaboration area), one for each office, and one for each point of sale (POS) for the food serving line (see IT Connections Matrix, Appendix 2). Note: the MILCON project should provide wiring from the appropriate TR room to data connection jacks supporting each point of sale. The DoDEA Area PM shall facilitate coordination with the local Army and Air Force Exchange Service (AAFES), Naval Exchange (NEX) or Marine Corps Community Service (MCCS) entity that will support this function, who will provide a switch and make the connection to the outside plant for external connections needed to support their program. Wireless or WiFi phones are strongly preferred to allow teachers full communications capability throughout the campus. Where wireless/WiFi phones are allowed and specified, the number of phone connections may be reduced as allowed by the School/District. Where the WiFi network is not robust enough to handle pass off from a roaming WiFi phone, use network.

10.4 911 SERVICE

Schools with VOIP capability typically rely on analog phone capability for 911, fax, and elevator phone services. 911 emergency phone services (or applicable host nation emergency dialing services, such as 112 in Germany) are provided by base services/local installation emergency services only. Regular 911 services provided by the locality shall not be utilized. The designer is required to identify and document all life safety services in the system design drawings. This

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may change for each military community, but it is important to show integration of 911 services (including caller location identification) with phone system design. This should be included in the design matrix.

11.0 INTERCOM/CLOCK/PA/BELL SYSTEM

11.1 GENERAL

The systems designer should provide a complete public address (PA) system that integrates the PA, intercom, clocks, and speakers/bells to provide a turnkey solution for the school. The PA/Intercom/Clock/Bell system shall be a stand-alone system that does not rely on the DoDEA Network to operate. Clocks must use the same time source as the PA-Bell system. The instant that the PA-Bell system rings to signal an event is when the clock changes to the time that the bell should ring. The PA-Bell-Clock time source can either be GPS or DoDEA Network time. GPS time is typically easiest, because it does not require connection to the DoDEA Network (and software and hardware approval) prior to testing the system during construction. Using DoDEA Network master clock time would only be allowed if; (1) software and hardware/architecture are approved by HQ DoDEA, (2) all telecom rooms are “construction complete” early, and (3) DoDEA IT installs network switches in the school before construction completion (in enough time to test the PA/Intercom/Clock/Bell system for commissioning, before overall construction completion).

11.2 CLOCK SYNCHRONIZATION

Clocks shall be provided by the construction contractor. Either 4-inch LED digital display clocks (4-each 4-inch digits) or 13-inch diameter analog clocks are acceptable; a combination 13-inch diameter hands-clock with 4-inch LED digital display on the clock face is desired as a teaching tool for elementary schools (if available). Electric non-battery clocks are preferred.

Clocks shall be mounted at least 8-ft (96-inches) above finished floor. Clocks in education spaces shall be mounted on a permanent wall, parallel to the walls’ surface, at a location that does not conflict with the height adjustable IWBs. Clocks in corridors/hallways/learning-streets shall be two-faced clocks mounted on and perpendicular to the walls.

Clock synchronization shall be via RF signal based upon the PA-system or GPS based time code. GPS signals are acceptable as long as the systems design is clearly documented in drawings, the PA system uses the same GPS signal, and the GPS signal can reach each interior clock location of the school.

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Clocks shall be installed in every room identified in the “clock” column of the IT Connection Matrix (Appendix 2). A clock shall be visible from all locations in the main school corridor, so spacing needs to be determined by designers based on corridor geometry and sight lines, and coordinated (through the DoDEA Area PM) with the School/District. See Appendix 5 for a Sample Clock Layout Diagram.

11.3 INTERCOM

A bi-directional intercom system is required in occupied rooms (i.e. learning spaces and offices). Intercom systems may consist of loudspeaker communications, handsets, or a push-talk button with a 2-way speaker. Each occupied room shall have a capability to contact the main administration desk.

The systems designer is responsible to provide transmit-receive coverage to occupied spaces. Additional locations shall be determined at design meetings.

The transmit-receive location shall be near the primary entrance to the room. Intercom and PA speakers shall be provided at exterior learning areas that are immediately adjacent to the school, such as the Art Patio, outdoor classrooms, etc.

Systems designers shall coordinate with the DoDEA Area PM for the basis of design for the intercom system.

11.4 PA SYSTEM

The PA system (a distinct system from the Mass Notification System) shall be integrated into every studio location as a minimum, and other locations as identified in Appendix 2. Additional locations may be determined early in the design process.

PA system design and paging zone identification is the responsibility of the design team and must be included in the design documents. The submittal shall be marked “for government approval” in the specifications. Coordination with the DoDEA Network and proposed phone system is also the responsibility of the systems designer. The PA System must be zone programmable with at least 48-zones. Training must be provided to the School/District so the local user can modify, delete, or add new zones.

For school opening, zone paging capability must be set-up to include at least the following zones:

- All call (all interior and exterior speakers)
- All interior speakers

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- All exterior speakers
- Each neighborhood
- Each separate instructional area (Art, Music, Info, L IMM/LIMS, Gym, Performance, Multi-purpose/Commons, Science, CTE, OT/PT, etc.)
- Each outdoor classroom/learning area
- Commons/Performance
- Other zones as identified by the School/District

Integrate the PA system with the telephone system providing an access security code as well as global and individual zone access. The intent is to allow the Principal to dial the PA controller via any phone, enter a security code, select a zone, and make an announcement. This includes access via wireless or WiFi phones, to provide full telephone and intercommunications throughout the building and campus.

Every speaker must be equipped with user adjustable tap settings or volume control to allow adjustment (without the use of tools or special equipment), after installation, to meet local audibility needs.

Installation of marquees shall also be considered during the design phase to accommodate areas that may be routinely occupied by hearing impaired and special education students.

12.0 AUTOMATED PARENT NOTIFICATION SYSTEM

Where allowed, DoDEA Schools use the “One Call Now” (reverse 911), or equivalent, notification system that is available without special equipment. Therefore, a special capability inside the school, other than an operational phone system, is not required.

13.0 BUILDING AUTOMATION SYSTEMS (BAS)

13.1 REQUIRED FUNCTIONS

The BAS, Direct Digital Control (DDC) or Energy Management System (BAS), henceforth referred to as BAS shall be a single, complete, non-proprietary BAS system. The BAS system must be a complete system (albeit without a front end) suitable for the control of heating, ventilating and air conditioning (HVAC) and other building-level systems as indicated and shown below:

[1] Refrigerator/Freezer temperature systems. When the alarm condition is sensed,

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then the designated representative for the refrigerator/freezer system is alerted.

- [2] Mechanical Systems such as HVAC units.
- [3] Carbon Dioxide Sensors.
- [4] Lighting Control Systems.
- [5] Energy Consumption (metered and sub-metered).
- [6] Provide telemetry and feedback.
- [7] Digital dashboards shall be configured to read data from the BAS.

All BAS control systems must be designed in accordance with UFC 3-410-02, Direct Digital Control for HVAC and Other Building Control Systems.

The building control network shall be an Open implementation of BACnet or LonWorks technology using ASHRAE 135 protocol or ANSI/EIA 709.1B communications protocol, respectively, as the only communications protocols, and shall use only BACnet ASHRAE 135 Services or LonMark Standard Network Variable Types (SNVTs) as defined in the LonMark Resource Files, respectively, for communication between BAS Hardware devices and to allow multi-vendor interoperability.

The building automation system shall be open in that it is designed and installed such that the Government or its agents are able to perform repair, replacement, upgrades, and expansions of the system without further dependence on the original Contractor. This shall include, but is not limited to the following: 1) Install hardware such that individual control equipment can be replaced by similar control equipment from other equipment manufacturers with no loss of system functionality; 2) Necessary documentation (including rights to documentation and data), configuration information, configuration tools, programs, drivers, and other software shall be licensed to and otherwise remain with the Government such that the Government or its agents are able to perform repair, replacement, upgrades and expansion of the systems without subsequent or future dependence on the Contractor.

The following systems are prohibited for new installation: proprietary BAS systems, pneumatic systems or combination BAS/Pneumatic systems. Gateways may be used provided that each gateway communicates with and performs protocol translation for control hardware controlling: 1) A single major component (chiller, boiler); 2) Legacy or existing equipment in a building that is to remain.

BAS Hardware (controller) requirements are as follows: All BAS Hardware: 1) Shall be connected to a control network via the ASHRAE 135 (BACnet), or via TP/FT-10 ANSI/EIA 709.3 (LonWorks), respectively; 2) Shall communicate over the control network via ASHRAE 135 Service or over the control network via ANSI/EIA 709.1B, for BACnet or LonWorks, respectively; 3) Shall communicate with other BAS hardware using only the ASHRAE 135 (BACnet) or using only SNVTs (LonWorks), respectively; 4) Shall conform to the BTL Device Implementation

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Guidelines or shall conform to the LonMark Interoperability Guidelines (LonWorks) or shall conform to the Interoperability Guidelines (LonWorks); 5) Shall be locally powered (link power over the control network is not acceptable); 6) Shall be fully configurable, without limitation for LONWorks, via standard or user-defined configuration parameter types (SCPT or UCPT), standard network variable type (SNVT) network configuration inputs (nci), or hardware settings on the controller itself; and 7) For BACnet, analog inputs/outputs must be implemented using ASHRAE 135 requirements, and for LONworks, shall provide input and output SNVTs required to support monitoring and control (including but not limited to scheduling, alarming, trending and overrides of the application). Required SNVTs include but are not limited to: SNVT outputs for all hardware I/O, SNVT outputs for all setpoints, SNVT inputs for overrides of all setpoints, and SNVT inputs for overrides of all hardware Outputs.

Application Specific Controllers (ASCs) for BACnet shall be BTL listed as B-ASC. LonWorks controllers shall have a fixed factory-installed application program (i.e. ProgramID) with configurable settings and shall not have the ability to be programmed for custom applications. In addition to the requirements for all BAS Hardware ASCs shall: 1) Be BTL Listed or LonMark Certified unless otherwise approved; and 2) LonWorks controllers shall be configurable via an LNS plug-in unless otherwise approved.

Application Generic Controllers (AGCs) for BACnet shall be BTL listed as B-AAC. LonWorks controllers shall have a fixed factory-installed application program (i.e. ProgramID) with configurable settings and shall not have the ability to be programmed for custom applications. In addition to the requirements for all BAS Hardware, AGCs shall: 1) Have a fixed ProgramID and fixed XIF file and 2) Shall be fully programmable and configurable for the application through one or more LNS plug-ins unless otherwise approved.

General Purpose Programmable Controllers (GPPCs) are not installed with a fixed factory-installed application program and must be programmed for the application.

Do not rely on the control network to perform BAS sequence applications unless otherwise approved. Where multiple pieces of BAS Hardware are used to execute one sequence, all BAS Hardware executing that sequence shall be on a common segment and isolated from all other BAS Hardware via a BACnet/IP or CEA-709.1B Router. For LonWorks, each scheduled system shall accept a network variable of type SNVT_occupancy and shall use this network variable to determine the occupancy mode. If the system has not received a value to this network variable for more than 60 minutes it shall default to a configured occupancy schedule, the occupied mode.

The building automation systems must integrate with existing DoDEA systems for remove monitoring. In some cases, existing DoDEA computers (i.e. School District Superintendent's

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Office/DSO facility maintenance computers) that remotely monitor and control multiple school BAS systems may need to have their software upgraded to read BAS systems for a new school; in this case, the construction contractor shall coordinate with the DoDEA Area PM, who will identify the computers that require a software upgrade and will assist with scheduling the contractor a time to provide and upload the software. Note: the software must first be tested and approved by HQ DoDEA (Section 5.7).

Where required, the A/E and/or construction contractor shall coordinate with the local Public Works Department, Civil Engineer or Directorate of Public Works on the required process to share BAS system data with the installation via a smart meter.

Prior to the BAS system installation, the following should be submitted for Government approval (also see the BAS System QC Checklist, Appendix 6):

- Points Schedules: Submit Points Schedules using the Points Schedule template located at <https://eko.usace.army.mil/fa/bas/> for each piece of BAS Hardware. The Points Schedules shall be submitted in hard copy (11"x17") and electronic format. Electronic submission shall be in AutoCAD, Microstation and Excel format and submitted on CD or DVD.
- Control System Schematic diagram and Sequence of Operation for each HVAC system.

Upon completion of the project, the following should be delivered to the Government for acceptance:

- eXternal Information Files (XIF), Resource files and Plug-ins for the completed system.
- Point Schedules: Final (as-built) Points Schedules using the Points Schedule template located at <https://eko.usace.army.mil/fa/bas/> for each piece of BAS Hardware. The Points Schedules shall be submitted in hard copy (11"x17") and electronic format. Electronic submission shall be in [AutoCAD][Microstation][Excel] format and submitted on CD or DVD.
- Control System Schematic diagram and Sequence of Operation for each HVAC system.
- Programming Software: All software, including licensing information and user manuals, necessary to program GPPCs installed under this contract.
- Copies of the installed application programs (all software that is not common to every controller of the same manufacturer and model) as source code compatible with the supplied programming software.
- Operation and Maintenance Instructions including procedures for system start-up, operation and shut-down, a routine maintenance checklist, and a qualified service organization list.
- Quality Control (QC) checklist (Appendix 6) completed by the Contractor's Chief Quality Control (QC) Representative.

Perform a Performance Verification Test prior to system acceptance. During the test, demonstrate to a Government representative that the system performs as specified, including

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but not limited to demonstrating that the system is Open and correctly performs the Sequences of Operation.

Provide a 1 year unconditional warranty on the installed system and on all service call work. The warranty shall include labor and material necessary to restore the equipment involved in the initial service call to a fully operable condition. Subsequent integration of the building control system into a basewide Utility Monitoring and Control System by the Government or its agents shall not void warranty.

Provide training for the system in accordance with Section 5.4 of this guide.

13.2 COMMUNICATIONS

The communication of BAS systems shall be network based with a centralized monitoring system located at the DoDEA Area Office or another centralized location identified by HQ IT ASA (systems designers shall coordinate with the DoDEA Area PM regarding this location). All servers, equipment, and data related to building automation systems shall reside at the DoDEA Area or centralized location and not in the local building or campus.

13.3 THERMOSTATS

The desired thermostats shall display room/space temperature and relative humidity levels on a rotating cycle. This provides an indoor air quality survey about every 15-seconds to be read in the room and on the BAS system. A separate CO2 sensor shall be provided, co-located with the thermostat.

14.0 SPORTS FIELDS FIBER OPTIC CABLE

Fiber optic cable shall be provided from the school IT main connection point to the athletic pressbox and athletic fields (if required) to support point of sale stations and scoreboards.

Network connectivity must be provided for the following:

- [1] Pressbox
- [2] Concessions
- [3] Field Houses
- [4] Sound System
- [5] Video Capture/Broadcast
- [6] Scoreboard

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The style of fiber optic cable shall be determined by the distances to the school and the athletic field being served. OM4 50 micron laser optimized having 4700 MHz*km EMB bandwidth designed for 10 Gb/s, and 100 Gb/s transmission is the preferred type of fiber unless the distance is greater than 300 meters in which case the systems designer should consider using outside plant single mode armor fiber.

Fiber connections should be made with LC type connectors.

Direct bury or aerial cable is not permitted. The systems designer shall provide detailed specifications in the document drawings that indicate the correct pathway infrastructure.

15.0 MONITORS AND DISPLAYS

15.1 INTERIOR MESSAGE DISPLAYS

At least one digital LED/LCD message display shall be provided in or near the Commons, or in a common area on each floor/level. The intent of this display is to show scrolling messages about school activities and events. This message display shall be designed to have connectivity to a computer in the main administrative suite. This message display may be co-located with the energy dashboard.

A LED/LCD display is desired near the food service serving line dedicated to display menus.

LED/LCD displays may be desired in the Multi-Purpose Room and Performance Space that open to the Commons via operable partition walls. This display shall (1) enable audience members at off-center viewing angles to see live video-taped performances/presentations, and/or (2) allow audience members at a long distance to get a better view of live video-taped performances/presentations.

LED/LCD message displays shall not be less than 50" flat panel televisions. The contract shall include cabling and mounts for the televisions (televisions shall be mounted at age appropriate heights), with the televisions themselves being provided with FF&E funding. Message displays in the commons/multi-purpose room areas are typically connected to an individual computer nearby, while message displays in the commons area/each floor are typically able to connect to the data network so messages can be input from the administration area.

15.2 ENERGY DASHBOARDS

Power and data drops, metering and other building infrastructure shall be provided to support an energy dashboard system.

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A digital LED/LCD Energy Dashboard display shall be provided in each school. There shall be a minimum of one Dashboard display (GFGI), with additional displays considered, budget permitting. The main Dashboard display and supporting computer system shall be placed in or near the Commons, with additional dashboards placed in common areas on each floor/level. Displays shall be a minimum 42 inch flat panel monitor in size.

If budget permits, a touch screen display or kiosk can be provided; it should have the capability to be set in either interactive or non-interactive mode. Kiosks shall support touch-screen control and keyboard/mouse control.

At a minimum, the Dashboard display shall have the capability to receive information from the Building Automation System (BAS) and shall have the capability to display information about metered utility system usage, current demand, and sub-metered systems; for example, information about all electrical, gas and water being consumed by the building on a real time basis (15 minute interval minimum). There shall also be capability to extract data from other data sources on site (such as demonstration solar, demonstration PV, geothermal, solar water heating systems, etc.) and the Dashboard system shall subsequently have the capability to display information about energy generation. The Dashboard system shall be able to present:

- [1] Overall building energy consumption
- [2] Overall building gas consumption (where applicable)
- [3] Overall building electrical consumption
- [4] Neighborhood electrical plug load consumption (for each Neighborhood)
- [5] Neighborhood electrical lighting load consumption (for each Neighborhood)
- [6] Neighborhood electrical HVAC
- [7] Overall building water consumption
- [8] PV Output
- [9] Solar hot water output
- [10] Rainfall/weather data

15.3 EXTERIOR ELECTRONIC MARQUEES

Systems designers shall include an exterior electronic marquee display unit, with LED display integrated into the school sign, near the main entrance to new schools. The Marquee display unit shall be connected to the DoDEA Network for content and control.

The main connections required for the marquee are power and data. The data connection is via fiber optic cable terminating on a LC connection patch panel at TR1. The fiber optic cable shall be run to the building telecommunications room TR1. The exterior marquee shall be large

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enough to be viewed from the street, shall be an off the shelf standard size, and shall have a LC connector or converter box.

The software control of the marquee shall be done from a computer located in the main office reception area (GFGI). Equipment supporting the exterior electronic marquee shall be located in TR1.

All fiber optic cabling shall comply with BICSI OSP (outside plant) standards (OS-3 single mode fiber optic cable).

16.0 STAGE/PLATFORM/SPECIAL SPACE REQUIREMENTS

16.1 LIGHTING CONTROL

A dedicated lighting and control network shall serve the theatrical, Broadcast Room, and multi-purpose spaces that require controlled specialty lighting for performances, broadcast production, or public assembly events. These systems shall be included by, and supported after installation, by the project. Spaces with special lighting and control network requirements may include proscenium stages, black box theaters, commons areas, cafeteriums, and video production suites. Functionality must include dimming control of the architectural (house and work) lights, running-lights and portable performance/production lighting within the envelope of the specific facility. Portable specialty fixtures for stage/studio use shall be included. High-output long-life LED-type stage fixtures are needed where heavy use is anticipated and/or access for lamp maintenance is limited.

The lighting and control system shall include dimmers and load circuit distribution, control devices and control network receptacles. Modular dimmer racks shall be located in a dedicated, conditioned electrical equipment room and shall be floor mounted on a suitable cleaning pad. A wall-mounted control distribution rack shall be located adjacent to the dimming racks; the control distribution rack shall serve as the central control signal distribution point. Load circuits shall run from the dimmer racks' architectural lighting fixtures and to receptacles for portable stage lighting fixtures as required for the specific space. Each load circuit shall be served by a dedicated dimmer or relay module as appropriate for the particular load type.

Control components for performance/production lighting shall reside on a dedicated distributed DMX512 (E- DMX/DMX) network. Network and DMX receptacles shall be distributed throughout the facility as required to allow control input via theatrical control consoles and output to specialty fixtures and accessories. See Section 16.2 for DMX receptacle locations. The system shall exist on a networked backbone of E-DMX (CAT 6) cabling. Control of architectural lighting shall include programmable button, slider, and/or LCD stations distributed

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at entry points, control rooms and backstage locations. Interface between control stations, dimmer racks, and the theatrical systems shall be managed by a dedicated architectural processor and network. The architectural processor shall be capable of addressing all lighting load types in the facility and shall interface with building management systems as required.

The systems designer shall indicate in the project design documents, that separate equipment racks, termination panels, etc., are necessary. Cable infrastructure and access control to the system is typically available to school staff members. DoDEA Network infrastructure does not permit staff access to telecommunication rooms or infrastructure.

16.2 A/V CONTROL INTEGRATION STATIONS

Schools with Performance/stage or Multi-purpose/platform space require A/V Control Stations for integrated control of lighting, sound, projector/computer, screen, and curtains. The systems designer shall determine (through the DoDEA Area PM) with faculty/staff the need and location for the controls integrated with lighting in a single user interface. These physical locations could be; (1) stage left, (2) stage right, (3) down stage center, and (4) the rear of the audience seating areas at a location with an unobstructed view of the stage. A mobile height adjustable A/V control desk to carry control devices and operate A/V systems during performances shall be provided. See also Section 8.3 for Projector outlet requirements.

16.3 SOUND SYSTEMS

A complete and useable sound system shall be designed for the Performance, Multi-purpose, Commons, and Gym spaces. For Performance and Multi-purpose rooms that open via operable wall to the Commons, the sound system must accommodate both spaces but have a capability to be limited to the Performance or Multi-purpose room. The sound system must support both wired and wireless microphones and have enough channels to support the varied band instrument categories, dependent on grade level of the school. Two microphone connections shall be at each A/V control station, plus additional microphone connections at the stage front and sides. At least two wireless microphone sets shall be provided as part of the sound system. Volume controls shall be provided at each AV Control station. A computer/laptop sound connection shall be provided at each AV Control station. Wireless sound systems are allowed as long as the wireless frequency does not conflict with the DoDEA wireless network. If a wireless system with a wireless control dashboard/tablet is approved, then wired volume control locations at A/V Control Stations may be reduced as coordinated with the project delivery team.

A sound system may be desired in Neighborhoods, based on the geometric configuration of the neighborhoods, to: (1) allow students in two adjacent Studios to hear a single presentation when the operable wall between the Studios is open, (2) allow students in two adjoining

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Studios and the Hub to hear a single presentation, and (3) allow students in all Studios and the Hub to hear a single presentation. Alternately, a mobile wireless FF&E/outfitting funded Neighborhood sound system may be proposed (see Section 8.1) if the frequencies do not conflict with the DoDEA wireless network, and it is capable to meet the three above Neighborhood sound capabilities desired.

16.4 IT SUPPORT

Systems designers shall determine with faculty/staff (through the DoDEA Area PM) the locations and quantity of network data connectivity. Consideration shall be given to no less than stage left, stage right, down stage center and the rear of the audience/commons area. If A/V control is required, co-locate the IT connectivity.

16.5 RIGGING AND DRAPERY

Systems shall be designed to offer flexibility in set up and use of stages, multi-purpose rooms, and Broadcast studios. Designs shall minimize the need for access to overhead equipment via portable ladders.

16.5.A RIGGING: STAGE PLATFORMS

[1] Elementary Schools

Overhead rigging shall consist of battens supporting stage drapery and performance lighting. All battens shall be dead-hung (fixed) from the overhead structure. Lighting battens above the stage shall integrate high-output long-life LED-type strip lighting. Lighting battens above the seating area providing front light shall integrate high-output long-life LED-type spot lighting.

[2] Middle Schools

Overhead rigging shall consist of battens supporting stage drapery and performance lighting. All drapery battens shall be dead-hung (fixed) from overhead structure. Lighting battens above the stage shall raise and lower via motorized hoists. Hoists shall incorporate redundant braking; operation shall be by a securable simple pushbutton station. Lighting above the seating area providing front light to the stage shall mount at dedicated catwalks or hoisted motorized battens.

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[3] High Schools

Overhead rigging shall consist of moveable battens supporting stage drapery and performance lighting. Additional utility battens shall be available to support lightweight scenery and supplemental lighting. All battens shall raise and lower via motorized hoists providing both fixed speed and variable speed options as appropriate to location and use. Hoists shall incorporate redundant braking and secondary safety mechanisms. Operation and position control shall be by an electronic control system.

A dedicated panel shall allow repeatable playback of selected scenes. Catwalks or walking grids are indicated for access and maintenance of equipment installed at structure level. Lighting above the seating area providing front light shall mount at dedicated catwalks.

16.5.B RIGGING: BLACK BOXES, HYBRID STAGES, BROADCAST ROOMS

Catwalks are indicated overhead to mount stage lighting fixtures and to support lightweight temporary scenery. For Broadcast Rooms or other spaces where overhead height is limited, pipe grids may be installed. Care shall be exercised in selecting elevations for these fixed structures to limit hazards associated with use of portable ladders in accessing equipment overhead.

16.5.C DRAPERY – STAGE PLATFORMS

Stage curtains shall be fabricated of specialty fabrics and shall be certified as flame-retardant. Inherently flame-retardant polyester velour fabrics are indicated for the majority of stage drapery. Cotton fabrics used for specialty curtains such as cycloramas shall be chemically treated for flame-retardance. Care shall be taken in sizing and layout of stage drapery systems to maximize the usable stage space and to adequately mask the audience views into the back-of house area.

[1] Main Setting – Valance and Traveler (colors selected in coordination with the interior design).

[2] Masking Leg and Border Sets – quantity as required to adequately mask the stage. Legs shall mount on walk-along tracks to allow flexible positioning (color: black).

[3] Mid-stage and Upstage Travelers – full stage curtains mounted to hand operated draw traveler tracks (color: black).

[4] Cyclorama - for High Schools and Middle Schools – bleached white cotton backdrop mounted at the rear of the stage.

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16.5.D DRAPERY – BLACK BOXES, HYBRID STAGES, BROADCAST ROOMS

- [1] Perimeter black velour masking legs mounted on walk-along tracks.
- [2] Broadcast Rooms shall also include a chroma- green cyclorama along at least one wall.

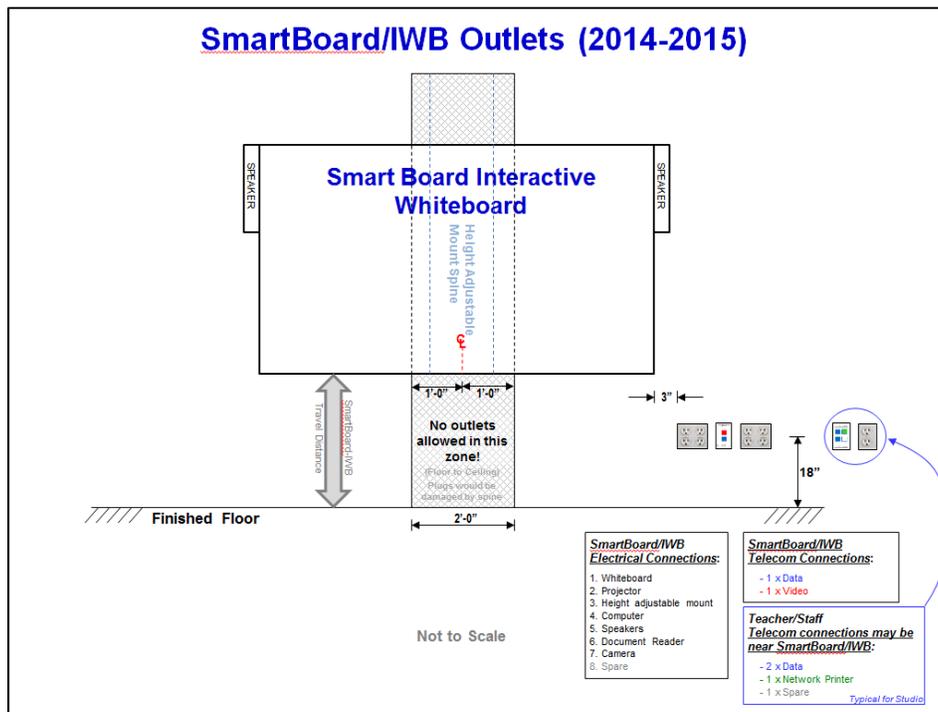
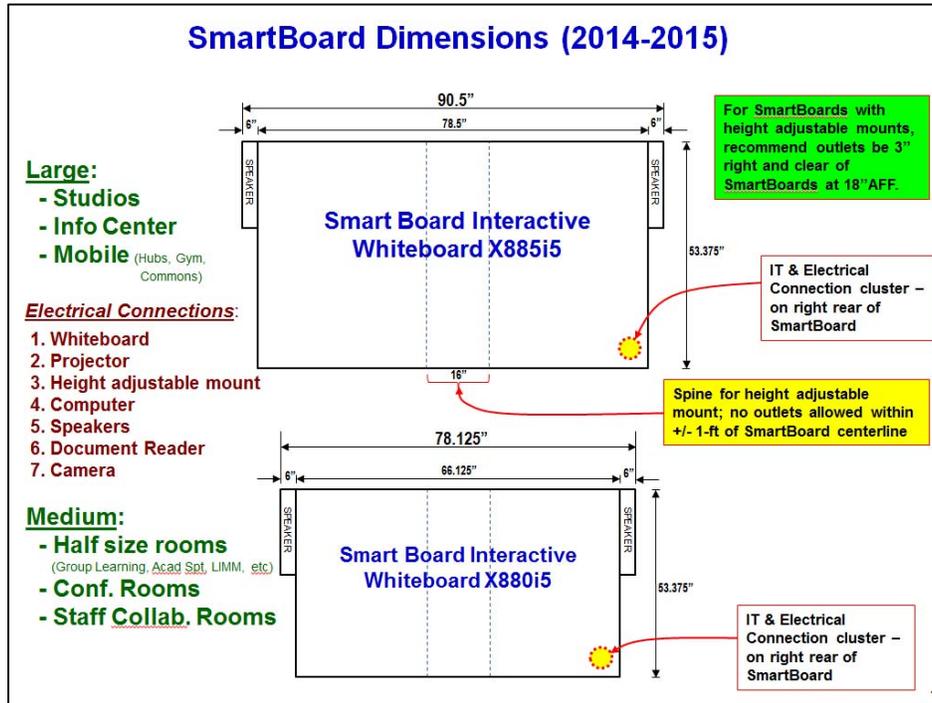
17.0 DESIGNER CHECKLIST

The following is a recommended checklist of items for the systems designer to consider as part of the project development. Each item must be addressed in the design documents in a schedule, table, matrix, or other format that can be easily reviewed (see Appendix 4).

- Stand-alone cabling for Special Network systems (separate “Facility Network” OK)
- Determine location of IWBs and Displays
- Determine type of phone service from base
- Phone line capacity
- Internet services availability (determine path of new OSP fiber cabling; hub-spoke concept)
- Integration of phone, bells and clocks with PA system
- Fire alarm integration requirements
- Access control requirements (Proximity Card Systems and Access-Intercom Phone System)
Ensure Compliance with DoDEA’s *Physical Security & Antiterrorism Design Guide*
- Mass notification integration requirements
- Building Automation System (“Facility Network” may carry Special systems)
- Electronic marquee and energy dashboard locations and requirements
- PA/Intercom locations
- PA-Intercom-Clock-Bell system integrated
- PA system zones
- Identify systems that shall be located in telecommunications rooms

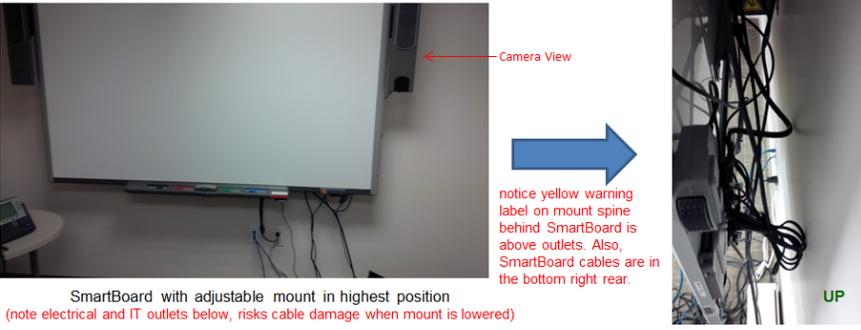
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APPENDIX-1 [INTERACTIVE WHITE BOARD DIMENSIONS]



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Why do SmartBoard outlets need to be 3" right and clear of the SmartBoard?



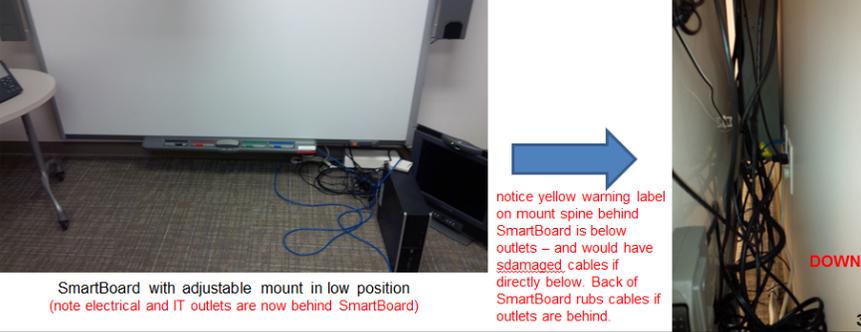
← Camera View

notice yellow warning label on mount spine behind SmartBoard is above outlets. Also, SmartBoard cables are in the bottom right rear.

SmartBoard with adjustable mount in highest position
(note electrical and IT outlets below, risks cable damage when mount is lowered)

UP

Rear View



notice yellow warning label on mount spine behind SmartBoard is below outlets – and would have ~~s~~damaged cables if directly below. Back of SmartBoard rubs cables if outlets are behind.

SmartBoard with adjustable mount in low position
(note electrical and IT outlets are now behind SmartBoard)

DOWN

3

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APPENDIX-2 [IT CONNECTIONS MATRIX]

DoDEA IT Connections Matrix											
Space/Room Type	Communications							Special			Notes
	Staff/Teacher Data Connections	Student Data Connections	Video Connections (RJ45)	Wireless Access Points*	Phone Connections (RJ45)	Network Printer Connections	Interactive White Board Data Connections	Projector Connections (RJ46, HDMI, DIVX)	PA/Bell/Intercom	Clock	
Cabling and Outlet Jacket Color (CAT 6, RJ-45)								xxx	xxx	xxx	Comm line colors
Neighborhood											
Hub	2	4	1	2	1	1	1		X	X	*Number of WAPs listed indicate minimum allowable. Actual WAPs provided should be determined based on analysis (DoDEA Network Section 5.3.8). Floor outlets in this area may permitted on a case by case basis only with HQ DoDEA ASA approval.
Studio	2	4	1	1	1	1	1		X	X	
Group Learning	2	4	1		1	1	1		X	X	Demonstrate adequate wireless coverage in these areas via heat map.
One-to-one (1-to-1)	1	2	1		1				X	X	Demonstrate adequate wireless coverage in these areas via heat map.
Staff Collaboration (Workspace)	6				6	1			X	X	1-data + 1-phone per staff
Staff Collaboration (Collaboration Area)	1		1	1	1	1	1		X	X	1-data + 1-phone
Instructional Storage											
Kitchen/explore or activity sink area											Part of hub space
Academic Support (Gifted, AVID, etc)	2	4	1	1	1	1	1		X	X	
Reading Lab	2	6	1	1	1	1	1		X	X	
Learning Impaired Mild-Moderate (LIMM)	2	4	1	1	1	1	1		X	X	
Restroom (1st-12th grade group RRs)									X	X	
Restroom (PK-K small RRs)									X		
PSCD Changing/Shower Room									X		Power for changing table
Learning Impaired Moderate/Severe											
Student Instruction Area	2	4	1	1	1	1	1		X	X	
Kitchen											Included in LIMS instructional area
Handicap-Accessible Restroom									X		
Changing and Shower Area									X		Power for changing table
LIMS Laundry Area											Included in LIMS instructional area. Washer/dryer connections
Career Technical Education (CTE)											
CTE Lab - Business/Computer	2	6	1	2	1	1	1		X	X	
CTE Lab - MS Family Consumer Science or HS Culinary Arts (Instructional Area)	2	6	1	1	1	1	1		X	X	
CTE Lab - MS Family Consumer Science or HS Culinary Arts (Food Prep Area)	2	6	1	1	1	1	1		X	X	
Video Broadcast Studio (Studio)	2	6	1	1	1	1	1		X	X	Provide combined drops from Studio & Control room in ES Broadcast Room
Video Broadcast Studio (Control Room)	2	4	1	1	1	1	1		X	X	2 strands CAT-6 8P8C to nearest TR; 4 strands OM-4 MM with LC connections to TR1. In an ES terminate in the broadcast room. See 8.5.
Science											
Science Laboratory	2	12	1	1	1	1	1		X	X	
Prep Room	2				1				X	X	
Chemical Storage Room											
Art Room											
Art Classroom	2	6	1	2	1	2	1	1	X	X	
Art Patio				1					X	X	
Kiln											208/240V power & vented
Art Workroom/Storage											
Music Suite											
Music/Band Room	2	8	1	1	1	1	1		X	X	
Music/Instrument Storage Room											
Staff Area (non-21C school)	2				1	1			X	X	
Band Office (non-21C school)	2				1	1			X	X	
Large Practice Room	1	4	1	1		1			X	X	
Small Practice Room	1	4	1	1		1			X	X	
Music Library	1	2	1								
Choral Office (non-21C school)	2				1	1			X	X	
Choral Room	2	4	1	1	1	1	1		X	X	
Computer/Keyboard Lab	2	10	1	2	1	1	1		X	X	

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DoDEA IT Connections Matrix											
Space/Room Type	Communications							Special		Notes	
	Staff/Teacher Data Connections	Student Data Connections	Video Connections (RJ-45)	Wireless Access Points*	Phone Connections (RJ-45)	Network Printer Connections	Interactive White Board Data Connections	Projector Connections (RJ-46, HDMI, DIVX)	PA/Bell/Intercom		Clock
Cabling and Outlet Jacket Color (CAT 6, RJ-45)							xxx	xxx	xxx	Comm line colors	
OT/PT											
Therapy Area	4	8	1	1	1	1	1	X	X		
Storage/Planning/Observation Areas	2				2	1		X	X		
JROTC											
JROTC Classroom/Firing Range	2	4	1	1	1	1	1	X	X	# of drops shown is for each instruction space (2 classrooms)	
Armory	1				1					J-SIDS or IDS Req'd	
Battalion HQ		4			1	1		X	X		
Staff Collaboration (Workspace)	4				4	1		X	X	1-data + 1-phone per staff	
Staff Collaboration (Collaboration Area)	1		1	1	1	1	1	X	X	1-data + 1-phone	
General Storage		1			1						
Commons											
Commons	2	12	2	4	2	1	1	X	X	On walls, provide one drop data connection with every duplex outlet. Floor outlets in this area may be permitted on a case by case basis only with HQ DoDEA ASA approval.	
Tatami Room											
Recycle Area											
Performance Space or Multi-Purpose Room											
Performance Space	2	12	2	4	1	1	1	1	X	X	sound-lighting-proj-screen curtain; 3 x cntrl stations; one IWB connection for a mobile IWB on the stage and one at the bottom of the stage in the performance area.
Stage	2	4	2	1	1	1	1	X	X	X	
Stage Storage											
Dressing Rooms		1		1	1			X	X		One data connection and one phone per dressing room
Control Room			1	1							
Information Center											
Instructional Area	2	6	1	4	1	1	1	X	X		Floor outlets in this area may be permitted on a case by case basis only with HQ DoDEA ASA approval.
Stacks	2	4	2	2		1		X	X		
Circulation desk	4	4		1	1	1		X	X		4 "look up stations" at circulation desk
Work Room	2		1		1	1		X	X		
Staff Collaboration (Workspace)	4		1	1	4	1	1	X	X		1-data + 1-phone per staff
Staff Collaboration (Collaboration Area)	1		1	1	1	1	1	X	X		1-data + 1-phone
Computing Center											
Computing Center or Multi-Purpose Computer Center (non-21C school)	2	12	1	2	1	2	1	X	X		
Physical Education											
Gymnasium	2	8	2	2	1	1	2	X	X		Scoreboard or LED panel; Cable to scorer station; Provide IWB connection on both sides of a gymnasium with a operable partition.
Spectator Seating				2				X	X		
Auxiliary Gym	2	4	1	1	1	1	1	X	X		
PE Storage											
Staff Collaboration (Workspace)	2		2	1	2	1		X	X		1-data + 1-phone per staff
Staff Collaboration (Collaboration Area)	1		1	1	1	1	1	X	X		1-data + 1-phone
PE Teacher Restroom											
Lockers/Dressing/Showers								X	X		Demonstrate adequate wireless coverage in these areas via heat map.
Athletic locker rooms								X	X		
Athletic Team Room	1	2	2		1	1	1	X	X		Demonstrate adequate wireless coverage in these areas via heat map.
Athletic Weight Room	1	2	1		1	1	1	X	X		Demonstrate adequate wireless coverage in these areas via heat map.
Athletic Office	2		1		1	1		X	X		
Athletic Storage											
Athletic Laundry											Washer/dryer connections
Athletic Training Room	1	2	1		1	1		X	X		Demonstrate adequate wireless coverage in these areas via heat map.
Food Service											
Serving Line	4		2		2			X	X		2 x POS, Power shut-off. AAFES/NEX/MCCS to support POS connections
Food Prep (kitchen)	2				1	1					
Dishwashing											
Dry Storage											
Refrigerator/Freezer											
Food Service Office	2		1	1	1	1		X	X		
Restroom (Handicap)											
Staff Lockers								X	X		Washer/dryer hook-ups
Cashier Office (non-21C school)	2		1		1	1		X	X		
Janitor											
Receiving Area					1				X		Service gate button

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DoDEA IT Connections Matrix										
Space/RoomType	Communications						Special			Notes
	Staff/Teacher Data Connections	Student Data Connections	Video Connections (RJ-45)	Wireless Access Points*	Phone Connections (RJ-45)	Network Printer Connections	Interactive White Board Data Connections	Projector Connections (RJ-46, HDMI, DIVX)	PA/Ball/Intercom	
Cabling and Outlet Jacket Color (CAT 6, RJ-45)							xxx	xxx	xxx	Comm line colors
Administration										
Reception/Waiting Area	2	2	1	2	1			X	X	HVAC Shutoff, Duress button, exit door control
Clerical Work Area	4			2	1			X	X	2-data + 1-phone per staff
Principal's Office	2	1		1	1			X	X	
Assistant Principal	2	1		1	1			X	X	
Admin Officer (non-21C school)	2			1	1			X	X	
Registrar/Secretary Office	2			1	1			X	X	
Conference Room	4	1	1	1	1	1		X	X	
Student Records Room	2			1	1					
Work/Copy Room	4			1	1			X	X	
Mail Room								X	X	
Staff Restroom								X	X	
Suite Corridor			1					X	X	*No intercom required
Miscellaneous Offices (distributed)										
Itinerant Office (non-21C school)	2			1	1			X	X	*If not included in Info Center Staff Collaboration area
School Officer	2			1	1			X	X	
Alcohol and Substance Abuse Counselor	2			1	1			X	X	
Parents' Center - welcome center	2	1	1	1	1			X	X	
Central Workroom	4	1	1	1	1			X	X	
2nd Floor Workroom	4	1	1	1	1			X	X	
Staff Lounge (non-21C school)	2	1	1	1	1			X	X	
Shared Conference Room (Guidance-SPED)				1	1	1		X	X	
Guidance Counseling Center										
Reception/Waiting Area	2		1	1	1			X	X	
Psychologist Office	2			1	1			X	X	
Counselor Office	2			1	1			X	X	
Career Information/Exploration Center		4	1	1	1			X	X	
Special Education Office										
Technician/Waiting Area	2		1	1	1			X	X	
CSC Office/Assessor Workspace	2			1	1			X	X	
CSC Conference Room (non-21C school)	4			1	1	1		X	X	
Assessment Area/Space	2			1	1			X	X	
Locable Storage										
Health Services										
Nurse Workspace/Storage	2			1	1			X	X	
Treatment Area	1							X	X	
Restroom								X		
Storage/Screening	1			1						
Waiting Area								X	X	
Janitorial Workroom										
Janitorial Workroom	2			1						
Maintenance Support										
Maintenance Support	2		1	1	1			X	X	
Transportation Support										
Reception/Waiting/Photo Area								X	X	
School Bus Office	2			1	1			X	X	
School Supply/Storage Area										
Central Storage Area			1							
Supply Tech Work Station	2			1	1			X	X	

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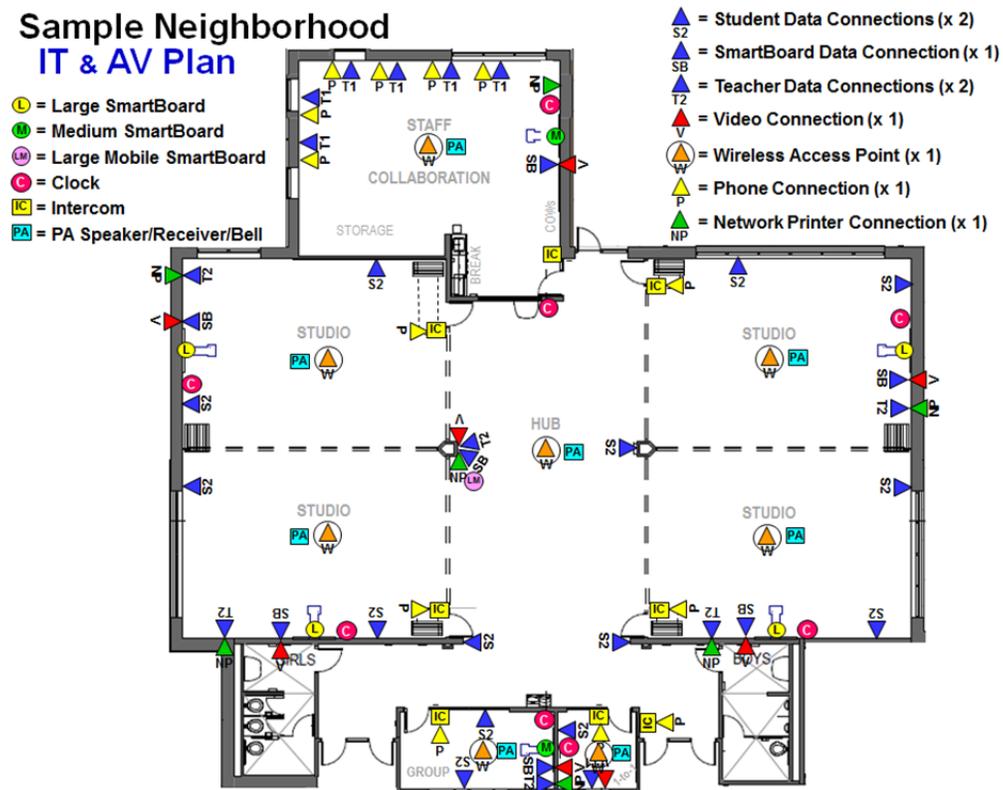
DoDEA IT Connections Matrix										
Space/Room Type	Communications							Special		Notes
	Staff/Teacher Data Connections	Student Data Connections	Video Connections (RJ-45)	Wireless Access Points*	Phone Connections (RJ-45)	Network Printer Connections	Interactive White Board Data Connections	Projector Connections (RJ-46, HDMI, DIVX)	PA/Bell/Intercom	
Cabling and Outlet Jacket Color (CAT 6, RJ-45)							xxx	xxx	xxx	Comm line colors
Technology Service Center										
AT Workspace	8				1	1			X	X
Field House										
Concession	2		1		1	1			X	X
Concession Storage										
Restrooms									X	
Team Equipment Storage										
Mechanical and Net-to-Gross Spaces										
Main Corridors & Learning Streets (each)			1	2					X	X
Main Entrance Lobby	2		2	1					X	X
Vestibules										
Main Telecommunications Rooms (TR1/MDF)	2				1				X	X
Secondary Telecommunications Rooms (TR2, TR3, etc.)	2				1	1			X	X
Main Mechanical/Electrical Room	1				1				X	X
Sub-Mechanical Rooms	1				1				X	X
Flammable Storage Room										
Elevator Equipment Room	1				1				X	X
Elevator					1				X	
Stairways/Ramps										
Public Restrooms									X	X
Exterior Features										
Outdoor Learning				1					X	
Green roof				1					X	
Art Patio				1					X	
Playground									X	
Play Lot									X	
Multi-purpose Soccer/Football Field										Wireless access to this location may be considered contingent on availability of funds with HQ and superintendent approval only
Baseball Field										Wireless access to this location may be considered contingent on availability of funds with HQ and superintendent approval only
Softball Field										Wireless access to this location may be considered contingent on availability of funds with HQ and superintendent approval only
Outdoor basketball courts										Wireless access to this location may be considered contingent on availability of funds with HQ and superintendent approval only
Outdoor tennis courts										Wireless access to this location may be considered contingent on availability of funds with HQ and superintendent approval only
Running track (and field events)										Wireless access to this location may be considered contingent on availability of funds with HQ and superintendent approval only
Press Box	2		1		1	1				Connection to scoreboard (one to one connection); Wireless access to this location may be considered contingent on availability of funds with HQ and superintendent approval only
Loading Dock										leveler, bumpers, restraint
Service Entrance door										Svc gate button inside
Service Gate										Ai & Prox on pedestal
Drop-off loop/canopy									X	
Bus loop/canopy									X	
Main Entrance door										
Bus Loop Entrance door										
Marquee Sign	2									power & fiber

*Drops in addition to those listed (with the exception of WAPS) require approval by HQ IT ASA.
For Fire & Mass Notification Requirements, refer to the appropriate UFC (i.e. UFC 4-021-01, Mass Notification Systems).*

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APPENDIX-3 [SAMPLE NEIGHBORHOOD IT LAYOUT]

Sample Neighborhood IT & AV Plan



- L** **SmartBoards** – on the teaching wall, positioned for optimal viewing from the geometric center of the education space or staff collaboration space. For Studios, the teaching wall is the permanent wall with no windows (or fewest windows). Large SmartBoard is 87" diagonal (~90° horizontal w/speakers); medium SmartBoard is 77" diagonal (~78° horizontal w/speakers)
- S2** **Student Data Connections** – in studios, two connections massed on the permanent non-SmartBoard/non-Teaching wall (farther from the SmartBoard/Teaching wall is preferred); two connections massed on the SmartBoard Teaching Wall to the left of the SmartBoard. All 18-inches above finished floor (18" AFF).
- SB** **SmartBoard Connection** – right and 3-inches clear of the SmartBoard (as you face the SmartBoard). 18" AFF.
- T2** **Teacher Connections** - right of the SmartBoard (as you face the SmartBoard) between the SmartBoard Connection and the nearest corner of the room. 18" AFF.
- V** **Video Connection** – right and 3-inches clear of the SmartBoard (as you face the SmartBoard); adjacent to the SmartBoard Connection (or COMBINED in the SmartBoard faceplate). 18" AFF.
- W** **Wireless Access Point** – on ceiling near center of room. For studios, can be slightly closer to the hub to allow better bleed-over access from hub and other studios.
- P** **Phone Connection** – near the room door, just inside door. Co-locate with intercom button.
- NP** **Network Printer Connection** – near teacher connections.
- C** **Clock** – 3-inches left and clear of the SmartBoard or centered on another permanent wall. Mounted at 96° AFF or higher. 4" LED Display Digital clock, 13" diameter analog clock w/hands, or combination.
- IC** **Intercom** – Near the room door, just inside door (co-locate with phone outlet).
- PA** **Public Address (speaker, receiver, and bell)** - on ceiling near center of room. For studios, can be slightly farther from the intercom button to reduce feedback... or can be closer to Teacher Connections.

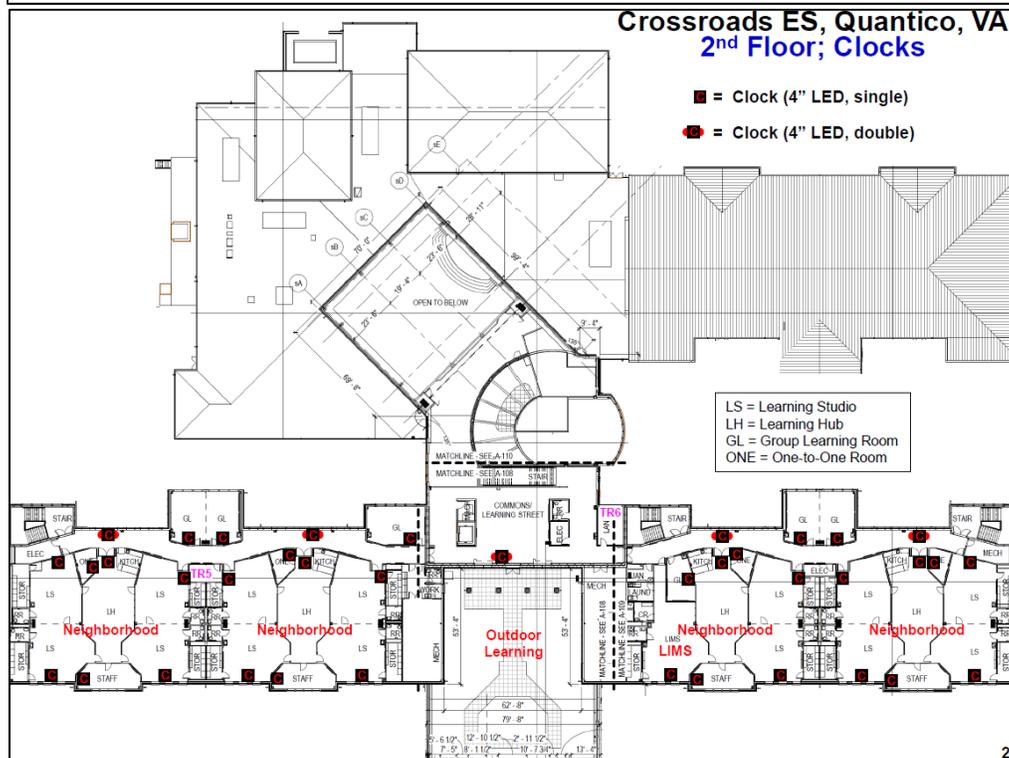
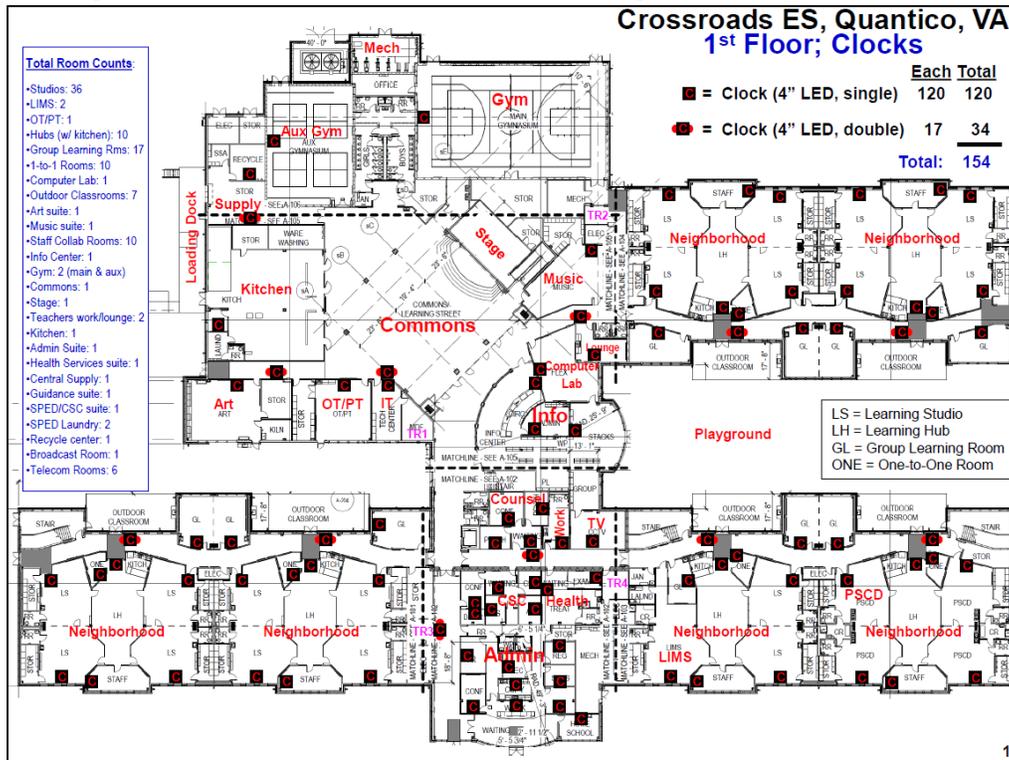
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APPENDIX-4 [IT SUBMISSION CHECKLIST]

Telecommunications Submission Checklist					
☑ Product	Design Submission				Construction Submission
	35%	65%	95%	100%	
35% Design					
Telecommunications site plan (outside plant cable route to service provider node) --> Fiber, copper, CATV, gate, marquee sign, teaching tools	X	X	X	X	
Outlet & Device Locations -- Typical Neighborhood (one Neighborhood)	X				
Longest CAT-6 cable run by TR (one drawing per floor)	X	X	X	X	
Cable Tray Paths (one drawing per floor)	X	X	X	X	
65% Design					
Outlet and device Locations (full floor plans) -- IT, Audio-Visual, Security		X	X	X	
Riser Diagrams (fiber, copper, PA/IC/Clock/Bells, BAS/DDC, Access Controls (Ai Phone + Prox Card), Lighting Controls, Dashboard, Audio-Visual		X	X	X	
Rack Elevations (all racks, all telecom rooms)		X	X	X	
Telecommunications room enlarged floor plans		X	X	X	
Faceplate Details and faceplate/cable labeling plan		X	X	X	
Wireless Heat Map		X	X	X	
Cable Pull Schedule sample format (one page only)		X			
95% & 100% RTA Design					
Cable Pull Schedule (full matrix/spreadsheet format)			X	X	
Labeling of every outlet on floor plans			X	X	
Construction		Due			
Software approval request (with free software to test, 120-day process)	6-months prior to BOD				X
Hardware/architecture approval request (wiring/riser, devices make/model, OS)	6-months prior to BOD				X
Cable Test Results	3-months prior to BOD				X
As-built telecommunications drawings w/ updated cable pull schedule	BOD				X

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APPENDIX-5 [SAMPLE CLOCK LAYOUT DIAGRAM]



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APPENDIX-6 [BUILDING AUTOMATION SYSTEM QC CHECKLIST]

Instructions: Initial each item, verifying that the requirements have been met.		
#	Description	Initials
1	All BAS Hardware is installed on a TP/FT-10 local control bus.	
2	Communication between BAS hardware is only via ASHRAE 135/EIA 709.1B using SNVTs (LonWorks). Other protocols and network variables other than these have not been used.	
3	All sequences are performed using BAS software.	
4	XIF files, Resource files and Plug-in's are up-to-date and accurately represent the final installed system.	
5	Commissioned database has been provided.	
6	All software has been licensed to the Government.	
7	Local Display Panels (LDPs) have been created for all building systems, including all override and display points indicated on Points Schedule drawings.	
8	Final As-built Drawings accurately represent the final installed system.	
9	O&M instructions have been completed and submitted.	
10	BACnet or LonWorks Network Services based software was provided.	