



DIVISION 27 APPENDIX – CLASSROOM TECHNOLOGY STANDARDS (revision 18)

The following standards are for classrooms on all Western Michigan University campuses. This document shall be used in connection with any consulting pertaining to classroom technology projects. Outside consultants shall use this standard and adhere to the equipment listed herein to prepare all written bid documentation.

(Submitted by the Classroom Technology Support Group, Division of Customer Service
Office of Information Technology, Western Michigan University)

Level 1: OIT supported classroom designed for twenty to forty-nine students.

General equipment list:

- Screen, manual, 16:10 format
- HD LCD projector, ceiling mounted
- Crestron touch panel
- Classroom technology station
- VOIP two-way Communication using Crestron RAVA SIP
- Three (3) Ethernet connections at cart. One (1) at projector.
- Crestron control system
- Blu-ray player
- HD Document camera
- Audio system (speakers and amplifiers)

Level 2: OIT supported classroom designed for fifty to ninety-nine students (and some special rooms with less than 50 seats). These classrooms use the equipment as described in Level One. At 50 seats or above, ADA (Americans with Disabilities Act) requires speech/program reinforcement and assistive listening devices; these requirements are reflected in the equipment choices.

General equipment list:

- Screen, manual, 16:10 format
- HD LCD projector, ceiling mounted
- Crestron touch panel
- Classroom technology station
- VOIP two-way Communication using Crestron RAVA SIP
- Three (3) Ethernet connections at cart. One (1) at projector.
- Crestron control system
- Blu-ray player
- HD Document camera
- Audio system (speakers and amplifiers)
- 1 wireless microphone: lapel
- Adaptive listening system for ADA compliance



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Level 3: Large classroom designed for one hundred or more students (and some 50+ tiered rooms). Fixed auditorium seating is typical in these classrooms. There are state/federal rules controlling the design of these rooms to assure compliance with ADA (Americans with Disabilities Act). An auditorium would be equipped with items included under Level 2, and additional adjustments made because of room size (i.e. audio system complexity, powered projection screen and dual projection).

General equipment list:

- Screen(s), motorized, 16:10 format
- HD LCD projector(s), ceiling mounted
- Crestron touch panel
- Classroom technology station
- VOIP two-way communication using Crestron RAVA SIP
- Three (3) Ethernet connections at cart. One (1) at projector.
- Crestron control system
- Blu-ray player
- HD Document camera
- Audio system (voice and program speakers w/ amplifiers)
- 2 wireless microphones: 1 lapel, 1 handheld
- Adaptive listening system for ADA compliance

AV Component Specifications

1. Screens

- A. Screens shall be mounted flush with the ceiling or above the ceiling in rooms that have 8-foot ceilings. The bottom of the projected image should be no less than 38" off the floor.
- B. Image size should be calculated using the following formula:
For HDTV projection (16:9), Widescreen, 16:10, or 15:9 formats, screen height should equal 1/5 the distance from the screen to the furthest most seat or maximum height less than 38" from the floor.
- C. Screens in level 1 and level 2 rooms are a 16:10, 123" (104" x 65") manual screen.
- D. Level 3 rooms require a 16:10 ratio motorized screen.
- E. Screen location is determined by locating the screen away from the teaching station. Use the center of the front of the room as a starting point for the edge of the screen. Imagine a 2- screen setup and remove the screen closest to the teaching station. (Fig. 1)

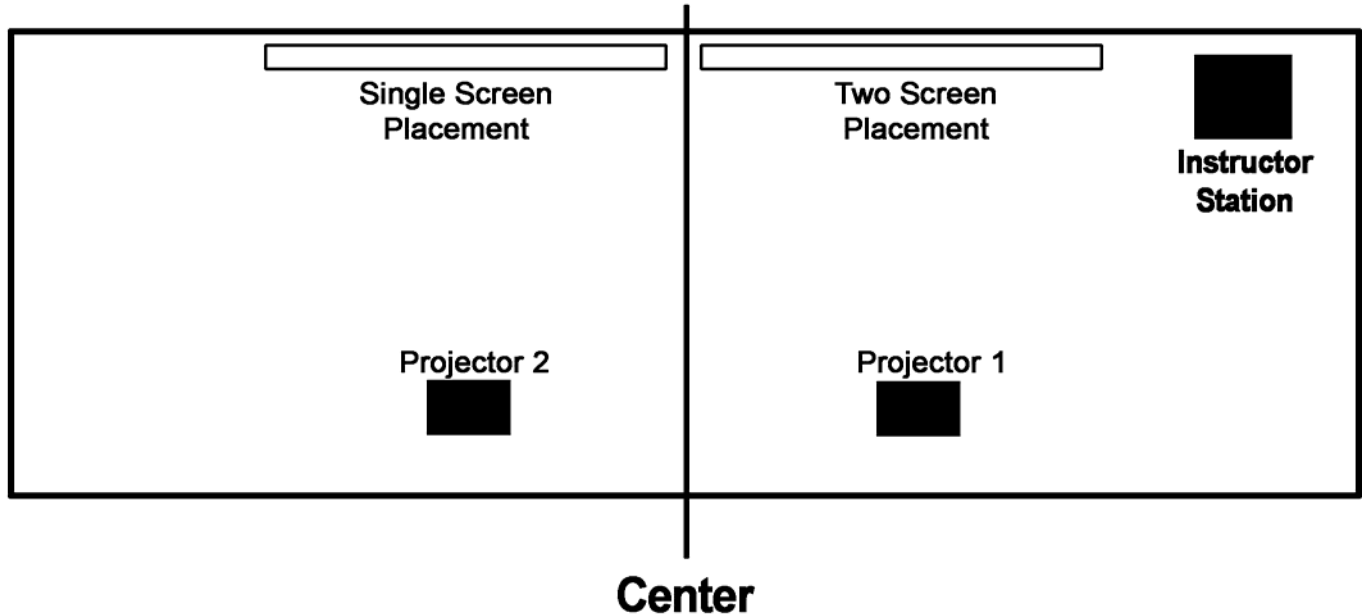


Figure 1

2. Projectors

- A. Projectors are purchased by Western Michigan University under a contract with EPSON America, Inc.
- B. Current projectors being used in classrooms:
 - i) Level 3: Pro L1500UH
 - ii) Level 1 & 2: Powerlite L610U
- C. Projectors should be mounted using above ceiling grid mounts where appropriate.
 - i) The projector should also be mounted as close to the top of the screen as possible with minimal keystone of the image.
 - ii) Lecture hall projectors will be mounted with a projector lift (where necessary).
- D. Projection distance can be calculated using EPSON's Distance Calculator:
 - i) http://www.epson.com/alf_upload/landing/distance-calculator/
- E. In a two-projector room, the projectors shall be labeled on the front facing the instructor as "Projector 1" to the left and "Projector 2" to the right. (Fig. 1)
- F. The primary projector will be that projector farthest from the technology station. This projector would be the single image projector and the second projector would be used only when two projectors are being used.



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3. Touch Panels

- A. Touch panels shall be from Crestron Inc.
- B. Current touch panels being used:
 - i) Level 3: Crestron TS-1542-B-S
 - ii) Level 1 & 2: Crestron TSW-732-B-S
- C. Side buttons shall be engraved according to the following matrix. (Fig. 2)
 - i) MIC + and MIC – should only appear when applicable.
- D. Bezels shall be model TSW-730-BTNO-B-S.
- E. Panels shall be mounted using TSW-730-TTK-B-S.

Buttons	Left	Right
1 (Top)	LAPTOP	VOL +
2	BLU-RAY	VOL -
3	DOC CAM	MIC +
4		MIC -
5 (Bottom)	POWER	HELP

Figure 2

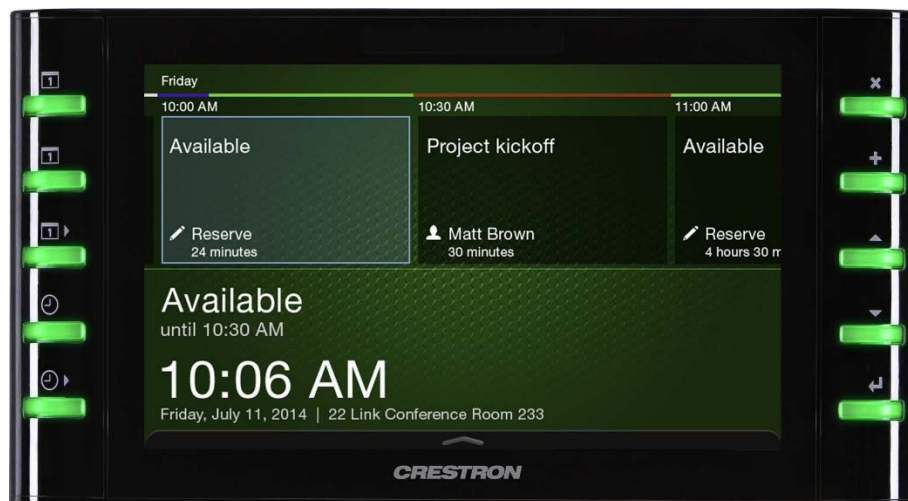


Figure 3 – See drawing: Appendix A.1

4. Classroom Technology Stations

- A. Classroom technology stations shall be provided according to the following specifications:
- i) Level 3: Spectrum (Model: 55260HD) (Fig.4)
 - (1) Metal – color and laminate color to be determined by WMU.
 - (2) Logo Panel (Model: 55261) or (Model: 55141).
 - (3) Shelf on side for document camera (Model: 55263) or (Model: 55140).
 - (4) One handle opposite the shelf (Model: 55265) or (Model: 55132).
 - ii) Level 1 & 2: Spectrum (Model: 55260HD) (Fig.4) or (Model: 55117HD) (Fig. 5).
 - (1) Metal – color and laminate color to be determined by WMU.
 - (2) Logo Panel (Model: 55261) or (Model: 55141).
 - (3) Shelf on side for document camera (Model: 55263) or (Model: 55140).
 - (4) One handle opposite the shelf (Model: 55265) or (Model: 55132).



Figure 4 – See drawing: Appendix A.2



Figure 5 – See drawing: Appendix A.3



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5. Lighting Zones

- A. Classroom lighting shall have a minimum of two zones:
 - i) Lighting fixtures closest to the projection screens should be dimmable or on their own switch.
 - ii) Preferably each zone would be dimmable and controllable from the front of the classroom.
 - iii) Classroom lighting should be installed so as to allow for the projectors to be mounted as close to the ceiling as possible.
- B. In Level 3 rooms the lighting shall be set through the lighting control to:
 - i) Scene 1 Default, when room is opened. All lights on 80% but slightly dimmer on screen.
 - ii) Scene 2 All on. 100% on. Evenly bright throughout room.
 - iii) Scene 3 Note taking with projection. 35% on. No light on screen
 - iv) Scene 4 Watching screen with safe lights on. Floor and exit door lights.
 - v) Scene 5 All off.

6. White Boards

- A. White boards shall be mounted on as much front wall surface, as is practical.
- B. Allow at least 6' continuous whiteboard space to side of lowered screen, closest to teaching station.
- C. Marker boards shall be provided with a full width tray for erasers and markers and map rail with cork insert.

7. Intercom System

- A. The unit shall utilize the Crestron touch panel's built-in RAVA SIP client.
- B. Programming code shall work in connection with the RAVA SIP client to show touch panel help pages during communication.

8. Network Lines

- A. There shall be four (4) Cat-6 network lines used in each classroom technology environment.
 - i) One (1) for the instructor's laptop.
 - ii) One (1) connected to a router, Cisco RV345P-K9-NA (Fig. 6).
 - iii) One (1) for backup/misc. use.
 - iv) One (1) line to projector.
- B. One (1) network line will run directly into the technology station and be terminated into the router (Fig. 8). Three 3' patch cables are used to connect the Crestron processor, touch panel and Blu-ray player. The touch panel patch cable shall run to a POE port.

- C. One network line will run directly into the technology station with a single termination and 7' patch cable to the desktop.



Figure 6

9. Control Units

- A. The control unit shall be a Crestron DMPS series.
 - i) Level 1 & 2 classrooms shall use model DMPS3-4K-350-C.
 - ii) Level 3 classrooms shall use model DMPS3-4K-350-C.

10. Digital media distribution

- A. The media distribution unit shall be a Crestron DM series.
 - i) Level 1 & 2 classrooms shall use model DMPS3-4K-350-C.
 - ii) Level 3 classrooms shall use model DMPS3-4K-350-C or DM-MD8x8 or larger as needed.

11. Crestron Programming

- A. Programming for any non OIT supported classroom shall be based on programming provided by WMU and modified by a certified Crestron programmer. All modifications returned to WMU as source code.
- B. Touch Panel standards and programming will be provided by WMU.
- C. Review of programming shall be done during install.
 - i) A minimum of one review before download for all level of classrooms shall be completed between the programmer and a WMU classroom technology staff member.



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- ii) All corrections are to meet the WMU classroom technology standard and shall be completed in a timely manner with regards to project deadline completions.
- D. Programming will include Crestron's Fusion room symbols and e-control pages.
 - i) The programmer shall use current version of Fusion and establish an IPID matching existing environment IP tables.
 - ii) The programmer will work with classroom technology staff to establish connection from each classroom to CTHD.

12. Power Requirements

- A. There shall be a standard outlet box within one stud width from where the cables come out of the wall for the main power line to the classroom technology station.
- B. There shall be two power outlets available in the cable cubby on the technology station.
- C. Multi-outlet surge protectors shall be used for equipment power and attached to the rack within the technology station, behind the equipment.
- D. Power at the projector location should have a standard outlet either directly above the ceiling or flush mounted in a ceiling tile within close proximity of the projector location.

13. Cabling

- A. DM-CBL-ULTRA-P, and audio cabling should run from the projector or speakers to the provided conduit down the wall to a two gang extra deep box that has a 2" grommet hole on the cover. Conduit through the wall shall be 1 ½".
- B. All DM cabling should terminate to DM-CONN-ULTRA-RECP RJ45 jacks. DM-CBL-ULTRA-PC patch cables should be used for all endpoint connections.
- C. All cabling in the 10-foot umbilical should be sheathed in snakeskin from the wall plate into the technology station with strain relief inside the cart.
- D. The power cord to the technology station should match the umbilical length and be "zipped" to the umbilical cord as one run across the floor.
- E. All cables should be labeled at each end.

14. Documentation from Installer

- A. Final drawings shall be provided electronically.
- B. A copy of all manuals and warranties shall be provided.
- C. Before installation completion, WMU and the installer shall provide the make, model and serial numbers for all equipment and in which rooms this equipment has been or will be installed.



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- D. At least two weeks prior to the installation of equipment the MAC addresses shall be provided for the Cisco routers. WMU will then assign IP addresses to these units, and in turn give these IP addresses to the installer/programmer (if necessary).
- E. Two complete copies of the Crestron programming shall be provided on CD to the WMU classroom technology staff.
- F. Inventory (make, model, SN) of all installed equipment will be provided for each room.

15. Security

- A. Projector security shall include key-locking projector mount with security screws.

Appendix A

A.1 TSW-732 Bezel and Mounting



Engraver view

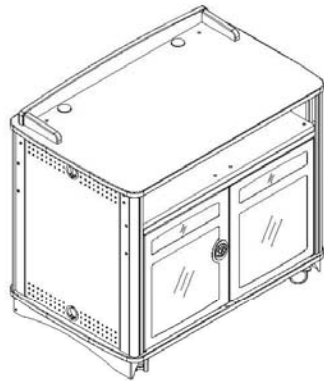


TSW-730-TTK-B-S

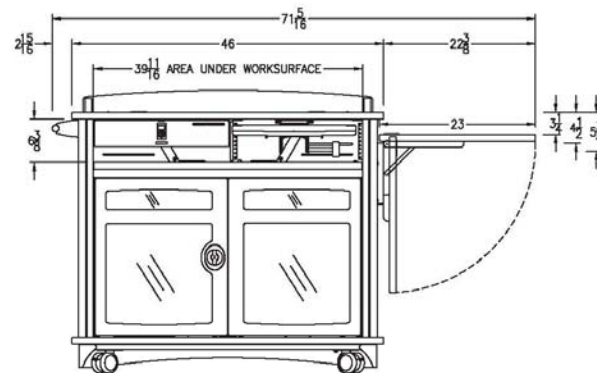
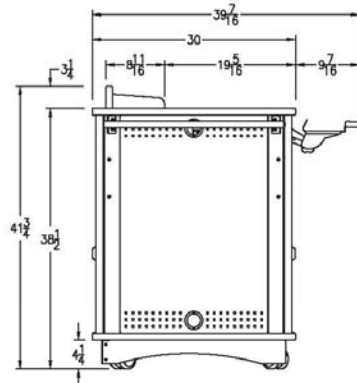
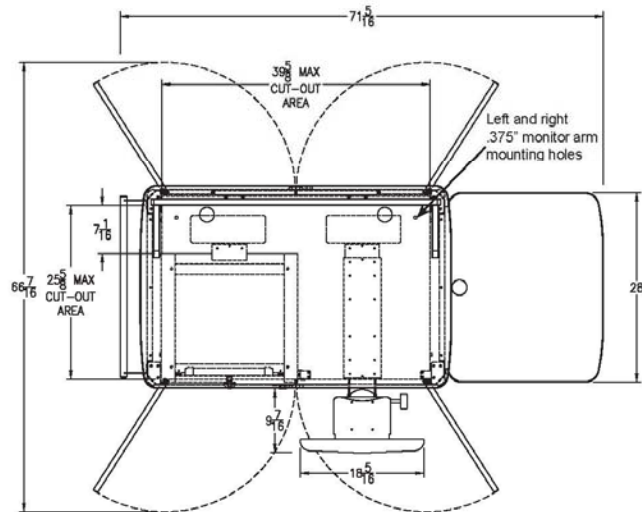


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A.2 Spectrum Media Director V2 Technology Station



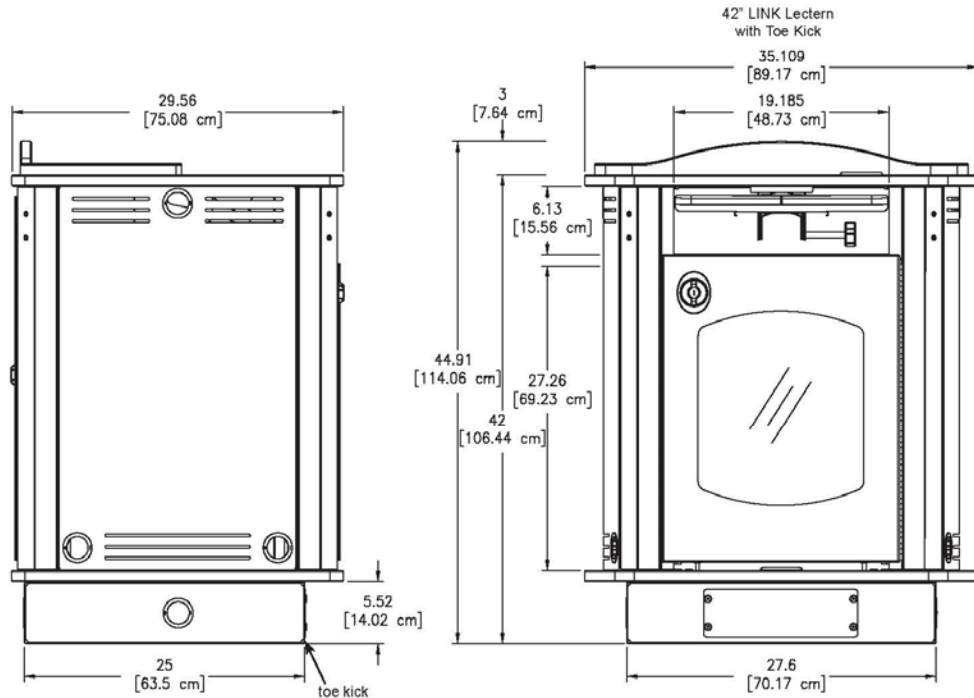
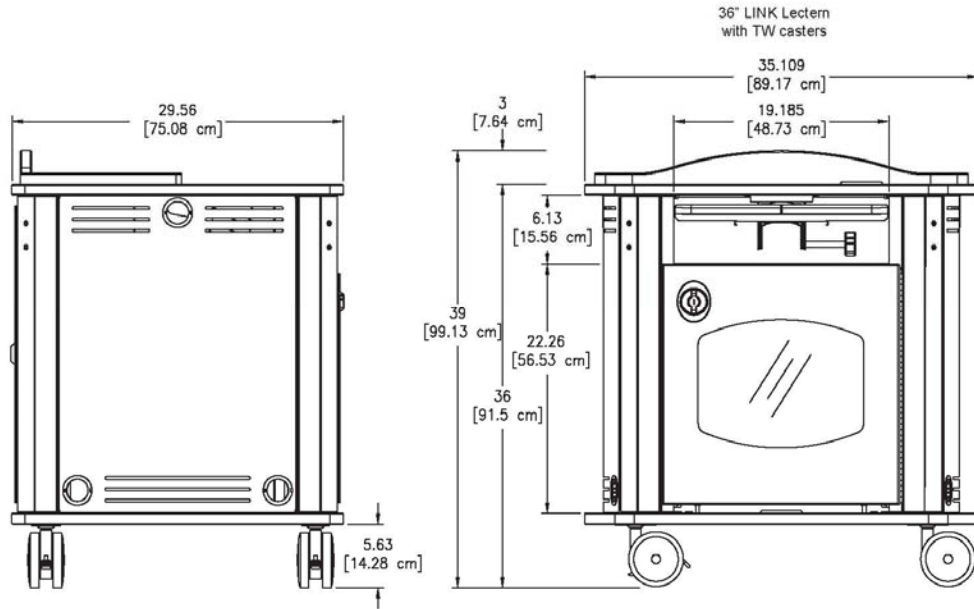
Media Director V2 with TW casters and surround
(shown with optional handle, flip-up shelf, pull-out drawer, and adjustable keyboard tray)



Note: Modified worksurface cutouts should be reviewed by Spectrum to ensure clearance of brackets, keyboard slides, or other objects under the worksurface.



A.3 Spectrum Link Technology Station



revised 10/1/15



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Appendix B

Level 1 Classroom Detail

Model	Make	Description
V11H901020	Epson	Projector, Powerlite L610U
RPMA298	Chief	RPA Elite custom mount
CMA450	Chief	Suspended Ceiling Kit
PX-30	Elmo	Document camera 4K
206213	Draper	Luma 2 w/ auto return, 123", 16:10, matte white, sewn hem
227212	Draper	6" wall bracket, white
55117HD	Spectrum Ind.	Link lectern 36" w/ 4" casters
55132	Spectrum Ind.	Steel handle
55140	Spectrum Ind.	Flip-up document camera shelf
55134	Spectrum Ind.	Link lectern rear rack rail kit
55141	Spectrum Ind.	Custom cut logo
60-1592-01	Extron	Cable cubby 100c black
BDP-SXXX	Sony	Blu-ray player
RSH-4A3R	Middle Atlantic	Custom rack mount for the Sony BDP-SXXX Blu-ray player
PD-815SC-NC	Middle Atlantic	Slim power strip, 8 outlets, 15-amp w/cord
DMPS3-4K-350-C	Crestron	3-Series® 4K DigitalMedia™ Presentation System 350
TSW-732-B-S	Crestron	7" Room Scheduling Touch Screen, Black Smooth
TSW-730-BTNO-B-S	Crestron	Engravable Button Covers for TSW-730 & TSCW-730, Set of 2, Black Smooth
TSW-730-TTK-B-S	Crestron	Tabletop Kit for TSW-730 & TSCW-730, Black Smooth
AW-525	Klipsch	White 5.25" woofer, 1" titanium tweeter, 30W transformer
RV345P-K9-NA	Cisco	Dual WAN Gigabit VPN Router
DM-CONN-ULTRA-RECP-X	Crestron	DigitalMedia™ Ultra Keystone RJ45 Jack
DM-CONN-ULTRA-PC-X	Crestron	DigitalMedia™ Ultra Patch Cable
DM-CBL-ULTRA-X-SPXXX	Crestron	DigitalMedia™ Ultra Cable



Level 2 Classroom Detail

Model	Make	Description
V11H901020	Epson	Projector, Powerlite L610U
RPMA298	Chief	RPA Elite custom mount
CMA450	Chief	Suspended Ceiling Kit
PX-30		
	Elmo	Document camera 4K
206213	Draper	Luma 2 w/ auto return, 123", 16:10, matte white, sewn hem
227212	Draper	6" wall bracket, white
55117HD	Spectrum Ind.	Link lectern 36" w/ 4" casters
55132	Spectrum Ind.	Steel handle
55140	Spectrum Ind.	Flip-up document camera shelf
55134	Spectrum Ind.	Link lectern rear rack rail kit
55141	Spectrum Ind.	Custom cut logo
60-1592-01	Extron	Cable cubby 100c black
BDP-SXXX	Sony	Blu-ray player
	Middle	
RSH-4A3R	Atlantic	Custom rack mount for the Sony BDP-SXXX Blu-ray player
	Middle	
PD-815SC-NC	Atlantic	Slim power strip, 8 outlets, 15-amp w/cord
DMPS3-4K-350-C	Crestron	3-Series® 4K DigitalMedia™ Presentation System 350
TSW-732-B-S	Crestron	7" Room Scheduling Touch Screen, Black Smooth
		Engravable Button Covers for TSW-730 & TSCW-730, Set of 2, Black Smooth
TSW-730-BTNO-B-S	Crestron	
TSW-730-TTK-B-S	Crestron	Tabletop Kit for TSW-730 & TSCW-730, Black Smooth
AW-525	Klipsch	White 5.25" woofer, 1" titanium tweeter, 30W transformer
RV345P-K9-NA	Cisco	Dual WAN Gigabit VPN Router
DM-CONN-ULTRA-RECP-X	Crestron	DigitalMedia™ Ultra Keystone RJ45 Jack
DM-CONN-ULTRA-PC-X	Crestron	DigitalMedia™ Ultra Patch Cable
DM-CBL-ULTRA-X-SPXXX	Crestron	DigitalMedia™ Ultra Cable
SI 30	Sennheiser	2 channel wideband IR modulator
NT 20-1	Sennheiser	Plug-in unit for SI 30
IZK 20	Sennheiser	Mounting clamp for SI 30
QLXD124/85	Shure	Handheld and Lavalier Combo Wireless Microphone System
SBC200US	Shure	Dual-docking battery charger with US power adapter
SB900A	Shure	Lithium-Ion rechargeable battery



WMU Design Guidelines

Level 3 Classroom Detail

Model	Make	Description
V11H792020	Epson	Projector, Pro L1500u
VCMUW	Chief	Heavy duty universal projector mount
PX-30	Elmo	Document camera 4K
206213	Draper	Ultimate Access V, 16:10, matte white
BDP-SXXX	Sony	Blu-ray player
RSH-4A3R	Middle Atlantic	Custom rack mount for the Sony BDP-SXXX Blu-ray player
PD-815SC-NC	Middle Atlantic	Slim power strip, 8 outlets, 15-amp w/cord
DMPS3-4K-350-C	Crestron	3-Series® 4K DigitalMedia™ Presentation System 350
TS-1542-BS	Crestron	15.6" HD Touch Screen, Wall Mount or VESA, Black Smooth
DM-RMC-4KZ-100-C	Crestron	DigitalMedia 8G+® 4K60 4:4:4 HDR Receiver & Room Controller 100
DM-CONN-ULTRA-RECP-X	Crestron	DigitalMedia™ Ultra Keystone RJ45 Jack
DM-CONN-ULTRA-PC-X	Crestron	DigitalMedia™ Ultra Patch Cable
DM-CBL-ULTRA-X-SPXXX	Crestron	DigitalMedia™ Ultra Cable
DCi 4 300	Crown	Four-channel, 300W @ 4Ω Analog Power Amplifier, 70V/100V
CA-800T	Klipsch	White 8" woofer, 1" titanium tweeter, 60W transformer
RV345P-K9-NA	Cisco	Dual WAN Gigabit VPN Router
55260TW	Spectrum Ind.	Media Director lectern V2 w/ twin-wheel casters
55265	Spectrum Ind.	Steel handle
55263	Spectrum Ind.	Flip-up document camera shelf
55266	Spectrum Ind.	Rear rack rail kit
55261	Spectrum Ind.	Custom logo panel
FT-600-B	Crestron	FlipTop™ Basic, Black Anodized
SI 30	Sennheiser	2 channel wideband IR modulator
NT 20-1	Sennheiser	Plug-in unit for SI 30
IZK 20	Sennheiser	Mounting clamp for SI 30
QLXD124/85	Shure	Handheld and Lavalier Combo Wireless Microphone System
ULXD4	Shure	Digital wireless receiver
SBC200	Shure	Dual-docking battery charger
SB900A	Shure	Lithium-Ion rechargeable battery



END OF APPENDIX