1. **Introduction**

The WVU Plug-N-Play instructional technology classroom configuration provides an established requirement for function in any general-purpose classroom. WVU requires that these guidelines be followed as designated iDesign-Classroom (formerly known as CTec) Plug-N-Play instructional facilities are renovated or newly installed at WVU, as well as recommends these guidelines for all instructional technology facilities at our various campuses. These guidelines were designed and are being continually updated based on issues such as system functionality commonly requested by users, equipment that has a good record of usability, and equipment specifications that set devices apart from similar equipment, stemming from experience with past installations, on-going classroom maintenance, and feedback from WVU faculty, staff, and administration.

These guidelines may change to accommodate future functionality needs and technological evolution at any time without notice. Also, please note that iDesign-Classroom does not provide installation or support services to all WVU departments, but can provide consultation in selecting an appropriate vendor who can provide installation and integration for technology facilities.

**Definition of Terms:**
- General Contractor – “GC”
- Electrical Contractor – “EC”
- Audiovisual Installer – “Vendor”

The following project specification details the system needs and must be strictly followed. No deviations will be accepted without written authorization.

2. **Project Stipulations**

2.1 **System Description**

The typical WVU Plug-N-Play classroom facility is to provide for a variety of activities including, but not limited to: lectures, symposia, and meetings. The system will include a video projection system, multimedia input device, signal processing and routing, a media sound reinforcement audio system, and a touch pad control system. The completed project must include training, equipment/cabling documentation and an electronic copy of all software code and computer configured equipment. A more specific system description for the particular installation being created may accompany the proposed equipment list and signal flow diagram being bid.

2.2 **Contact Information**

The term “Owner” refers to the following groups within WVU:
- Project Client: West Virginia University – Representative of faculty and staff “Users”
- Project AV Supervisor: iDesign-Classroom Designee, (304-293-2832)
- Project Manager: Facilities Management Designee, (304-293-2330)
- Procurement Officer: Administration and Finance Designee (304-293-5711)

2.3 **Substitutions**

No substitutions/deviations will be accepted without prior approval from the Project Manager or AV Supervisor. Requests for substitutions must be in writing and denote reason(s), as well as cost and functionality differences. WVU reserves the right to decline any proposal due to substitutions that do not meet the needs of the Project Client.
2.4 Bidding

A mandatory walk-through may be held (Date and Time TBA) to provide the vendor with an opportunity to visit the facility, address any questions or concerns up to that point, and to obtain room layouts and measurements.

Bids must include a proposed equipment list with itemized costs, proposed wiring diagram (if different from the one submitted for the bid), and a substitutions request (if needed). All expected compensations should be itemized. All work performed either by the bidding Vendor or by their Subcontractor must be clearly defined and shall be the responsibility of the Vendor. Any additional detail for support of the bid should be attached at time of submission. Documents must be signed and dated by a principal or officer of the company.

Bid documents must be submitted before (Date and Time TBA) to the Procurement Officer, Project Manager, and AV Supervisor. Bidding Vendors are responsible for contacting the Project Supervisor to make sure bid documents have arrived before the submission deadline.

Costs and functionality changes of deviations are the sole responsibility of the Vendor. Any substitutions made after bid acceptance are considered deviations.

3. Classroom Description

The WVU “Plug-N-Play” general purpose technology classroom is designed to meet the needs of various teaching methods through the use of a simplified, user customizable multimedia routing system. It utilizes AMX DXLink to route user specific media sources to a wall mounted projector and audio system. Variations in design are used to fulfill different space requirements, but the overall scheme remains the same. While suggestions are desired to optimize classroom stability, no changes will be made to the design without expressed approval from the Project Manager.

4. Installation Guidelines

Outside of specified timeframes, each classroom being installed must be kept usable for classes. The Vendor shall work in a professional manner, with proper safety measures taken into account at all times. Per state contract, the Audiovisual Vendor will supply labor, equipment, tools, materials, testing, as-built drawings, and follow up support for the audiovisual systems. All Vendor supplied equipment and material for installation will be the responsibility of the Vendor and should arrive with the Vendor on the installation date new, and shipped in factory sealed containers. All shipping charges shall be considered as part of the total proposal. All products will be installed as indicated in these referenced standards unless recommended otherwise by the product manufacturer or specifically indicated otherwise by WVU. The completed project should meet or exceed West Virginia University standards and meet all applicable codes.

4.1 General Installation Requirements

Any electrical outlet, network outlet, or structural work not already complete but needed for the completion of the project must be coordinated with the Project Manager within two weeks after bid acceptance. Equipment for installation with network connectivity must have its network hardware address (i.e. mac address) and room installation location provided to Owner at least 2 weeks prior to installation, so that network access, IP addresses, and other installation needs can be made available from Owner by the time Vendor arrives on-site.

Before and during the project, the Vendor must coordinate with the Project Manager, Project AV Supervisor, GC, EC, and any applicable subcontractors. Items to coordinate include the shipment and delivery dates of GC and EC installed items, attending construction meetings, and positioning of projector mounts and lifts.
All cabling, connectors, and interfaces needed to complete the project requirements must be provided by the Vendor. Cables must be clearly labeled with input and output connections and neatly secured using cable management. All power cabling shall be routed separately from low-voltage audio, video, and control cabling. Only power strips with surge projection and lighted switches shall be used. The Vendor is to install and operationally test all components of the system, including those provided by the Owner, to ensure proper system functionality. Vendor is responsible for the removal and disposal of all packing material and other debris at an “off campus” land fill or recycling center and shall be responsible for repairing any damage caused to the premises by their installation activities, at no cost to the Owner. (Construction and Electrical tasks further explained in the WVU Construction Standards Document)

4.1.1 Installation

4.1.1.1 Instructor Stand

A stand for input source usage will be provided at some future time by the Owner (brand and model to be determined).

4.1.1.2 Source Input

A wall mounted input panel for connecting portable equipment to the multimedia system must meet configuration standards and be incorporated into the system. Connections will be provided for both HDMI input and VGA input with 1/8” stereo audio input. All will be routed over CAT6a shielded-twisted-pair to a receiver box at the ceiling above the projector mount, to be transferred over to HDMI and sent to the projector. A wired network connection and power must also be available at the input location. Locations of all mounted equipment is to be identified on-site by Owner.

4.1.1.3 Control

The projection and volume must be controllable through an AMX control system by a six button control pad (AMX components are Vendor furnished, Vendor Installed, and Vendor programmed). The control pad will be located on the wall near the input panel (preferred mounting height greater than 36” above finished floor). It will control projector on and off, volume up and down, video mute, and source selection the resets the input of the projector to HDMI. Remote access for reporting and technician control of the AMX system must be provided and configured on Owner’s AMX RMS server to match existing WVU standards.

4.1.1.4 Audio

A stereo audio system (i.e. amplifier, speakers) will be incorporated into the audio/visual system, controllable via the AMX touch pad, capable of reproducing the projected source(s) audio. For this style of room, audio is routed over CAT6a STP, converted to HDMI by a DXLink receiver, and run into the projector. The audio is then split from the video source and routed into an amplifier and connected to the wall mounted speakers. (Construction and Electrical tasks further explained in the WVU Construction Standards Document)

4.1.1.5 Projection

In Plug-N-Play classrooms, a short throw projector is to be wall mounted on a mount arm at a distance that fills the screen appropriately. The chosen model should be able to separate audio from an HDMI signal. The projection screen size should be
selected so that it allows proper viewing for the classroom space. For best results, the projected image **height should be at least 1/6 of the distance from the screen to the farthest average seat.** Also, it is preferable that the first row of seats be no closer than 2 times the measurement of the screen height. WVU maintains a minimum 40 lumen per square foot ratio. In order to maintain this level, the projector output requirement is increased with the size of the image. Since ambient room light has a dramatic effect on image clarity, each installation has to be evaluated with the particular conditions that exist for the room’s natural light and dimming system. The screen should be mounted below the projection system to avoid complications. The projector is to be mounted within an appropriate height above the screen surface, but above the WVU minimum required height for proper human clearance underneath. The screen should be mounted at least 4 inches away from the wall to avoid contact with the tack bar or the chalkboard tray, and descend no lower than the 3" above the chalkboard tray. The system should send a warning indication to the technician (email is preferred) when maintenance is needed. (Construction and Electrical tasks further explained in the Construction Standards Document)

4.1.1.6 System Connections

For the appropriate signals to reach the projector, a GC installed wall box will have cable paths available for all system cabling, to be pulled by the EC. Two twisted pair cables (Cat6a) will provide HDBaseT audiovisual/control transmission from the transmitter at the wall plate through wire mold and/or conduit to the projector’s DXLink receiver. Signals will then be split into RS-232 and HDMI for direct connection to the projector. Audio cabling from the projector’s audio output will go to the audio amplifier and on to the speakers. Low voltage wiring will run to the motorized screen from its wall-mounted control switch.

4.1.1.7 Network

Each room requires two network ports for classroom use. They must be set to DHCP to allow for instructors bringing their laptops.

4.2 Project Completion

Equipment and system configuration (both hardware and software), associated files, and development software (and all relevant documentation and license) must be provided to the owner with the final documentation on CD-ROM or USB stick. The software developer shall retain intellectual property rights; the Owner shall have a license for perpetuity for use as it applies to this project, including the right to modify/enhance. The software code may not be sold or used, in part or in whole, in any other project or application other than that intended by this specification, in part or in whole, by the Owner or any other party.

The Vendor must also provide the Owner with the following “As Built”:
- All spare documentation and accessory items shipped with equipment from manufacturers shall be provided to the owner
- All equipment manuals, service documentation and warranty information which indexes all documentation that came with the installed equipment
- Wiring diagram of the installed system (detailed drawings indicating equipment wiring, signal flow, layout and orientation) printed on paper mounted in tech-side of each lectern and provided in electronic format
- Spreadsheet that lists brand, model, serial number and a functional description for each piece of vendor installed equipment
- All equipment configuration settings (including those set physically or through computer interface) provided in electronic format for all installed equipment.
- For every two installed lamps (of the same model) of projector(s), one spare lamp will be provided, and one spare filter for each installed projector.

Total installation and proof of performance is the responsibility of the Vendor and must be demonstrated to the Owner by completion date. The Vendor shall assist the Owner in final system tests and adjustments. The Vendor’s representative assisting in the performance of these tests shall be thoroughly familiar with the details of the system and shall include the field supervisor responsible for installing the system. Training on operation and maintenance procedures must be provided to the Project Manager, AV Supervisor and other designated personnel. The Vendor can anticipate providing required training sessions of an average of 1 hour per room after final testing has been completed.

The Vendor shall provide a service contract to WVU for a period of one year that covers the provided hardware, software, and functionality. The contract shall cover repairs of hardware or control system software during WVU business hours. All travel expenses, labor, shipping and parts shall be covered by this service contract. This contract does not supersede any manufacturer warranties and shall not be construed as part of said warranties.
HD Plug-And-Play Classroom Wiring Paths: AV Run Above Drop-Ceiling

LEGEND

Equipment: Vendor Furnish & Install, GC Furnish & Install, Vendor F. & GC Install, GC F. & GC I. (Wiremold)

Cabling / Connectivity: HDMI or DVI, Stereo-Audio, Network (Cat5), Speaker, Control cabling

Design Classroom Technology Diagram
West Virginia University
September 28, 2010
New HD Plug-And-Play Classroom Signal Flow Diagram

Three Example “Mobile” Devices Brought into Classroom by Instructor (only one connected at a time):

- VCR / DVD
- Laptop w/HDMI
- Laptop w/VGA

At Short-Talk Projector Wall Mount System:

- High Power USL Injector
- PowerStrip* (or other HDMI capable display)
- Projector
- Audio Amplifier
- Uni-Mount Speaker
- Uni-Mount Speaker

Network Switch
POE Injector

*Note: Install PowerStrip on extension-arm with power switch by hole for easy access to reset it.

LEGEND
Equipment:
@Ceiling
@Wall
@Mobile

Cabling / Connectivity:
- Power Needed
  - AV (Cat6a STP)
  - Network (Cat6)
- Control Cabling
  - HDMI or DVI
  - Composite Video
  - VGA/RGB
  - Stereo-Audio
  - Speaker

IDesign Classroom Technology Diagram
West Virginia University
September 28, 2015
6. Equipment List

Projection Equipment:
1 Eiki LC-WAU200 Short-Throw Projector

Input Panel Equipment:
1 AMX DX-TX-WP-BL DXLink Multi-Format Wallplate Transmitter
1 AMX PS-POE-AT-TC PoE Injector for DXLink Devices

Video Equipment:
1 AMX DX-RX DXLink HDMI Receiver Module

Control Equipment:
1 AMX MCP-106P-BL 6-Button Massio Control Pad
1 AMX PS-POE-AF-TC PoE Injector for Control Pad
1 Linksys SD205 5-Port 10/100 Data Switch

Miscellaneous:
All manuals, tools, software, and spare parts packaged with these products
Cables, connectors, surge protection power strips, and any additionally needed accessories

Audiovisual Vendor (AV) Furnished & General Contractor (GC) Installed:
1 Premier Mounts UNI-EFTP-AUD Short-Throw Projector Wall Mount System
with audio amplifier, speakers, and extension pole
1 Audiovisual Cable Runs Through Conduit-Wiremold to/from Room Equipment
(complete set)
1 Da-Lite Motorized Wall Mounted Projection Screen, Tensioned, w/ Wall
Switch Control
1 Da-Lite Wall Bracket Set

General Contractor (GC) Furnished & Installed:
Conduit, Wiremold, and/or J-Hooks for Routing Cable
Power
Data Cable Runs to Network Closet