SECTION 27 40 00

AUDIOVISUAL

PART 1 - GENERAL

SUMMARY

A. The objective of this document is to describe audio-visual systems.

1.02 RELATED DOCUMENTS

A. Refer to drawing TA-000 “Audio-Visual Drawing List” for a list of drawings to be considered part of this specification.

B. Section 26 2717 - Electrical supply, conduit, and wiring for electric motor operated projection screens.

1.03 DEFINITION OF TERMS

A. The following definitions shall apply herein.

1. The term Owner: “SUNY Purchase College”

2. The term Construction Manager: “Hill International”

3. The term General Contractor: “Worth Construction Co”

4. The term Architect: “FXFOWLE”

5. The term Consultant: “Cerami & Associates, Inc.”

6. The term “shall” is mandatory, the term “will” is informative, the term “may” describes an option and the term “should” is advisory.

7. The term “OFE” shall refer to “Owner Furnished Equipment,” which shall be provided by the Owner to the AV Contractor. This contract shall be responsible for installing and integrating this equipment as detailed herein.

B. The basis for the terminology used in this document is standard construction and sound & communications industries practices and that of IEEE/ANSI-100-1988.

1.04 WORK BY OTHERS

1. Conduits, wireways, connection boxes, pull boxes, junction boxes, A/V floor boxes and outlet boxes permanently installed in floors, walls and ceilings

2. All electrical breaker panels and power receptacles necessary to bring power to the audio-visual systems equipment racks and to devices in the Project as indicated in the drawings

3. Room lighting fixtures, dimmers, power receptacle outlets, and interconnecting wiring for these circuits

4. Structural work, wall openings, platforms, railings, stairs, fire prevention and safety devices, rough and finished trim, painting and patching, drapes, carpets, floor coverings, computer floors, glazing, acoustical treatments, and heating, ventilating, and air conditioning systems unless noted otherwise

5. Moveable furniture, desks, and chairs

6. Installation of structural ceiling or wall mounts (kindorf, threaded rod, blocking, etc.) for screens, projectors, and ceiling and wall mounted flat panel displays.

7. See “Detailed Equipment List” at end of specification.

1.05 SCOPE OF WORK

A. Provide materials, labor, and equipment including but not limited to:

1. The delivery, unloading, setting in place, fastening to walls, floors, ceilings, counters, or other structures of audiovisual equipment, as required.

2. All cameras, projection screens, projectors, flat panel display, mounts and devices. Coordinate blocking and electrical with GC.

3. Provide and install low voltage cable as per A/V drawings.

4. Interconnecting wiring of the system components and equipment alignment and adjustment

5. All other work whether or not expressly specified herein and on the drawings to provide complete operational turnkey systems.

B. These specifications and the drawings do not necessarily indicate every single component part of each system. It is the responsibility of the AV Contractor to engineer each system and its interconnection in order to provide, furnish, and install completely operational turnkey systems. No error or omission herein or on any related Construction Documents shall relieve the AV Contractor from this responsibility to do so.

C. Install all equipment to industry safety and ergonomic standards, local building and safety codes, as applicable, and provide full engineering and technical support throughout the installation process.

D. The AV Contractor shall study the drawings and familiarize himself with the Work of the entire project scope. The Work of this section shall be carefully organized and programmed so that its progress shall be concurrent with the work of all other trades and so that the work shall proceed as expeditiously as possible.

E. The AV Contractor shall be responsible for the correct placing of the Work of this section, equipment to fit into the structure as built, and attachment of equipment to the work of all other trades and Owner furnished equipment and facilities.

F. It shall be the responsibility of the AV Contractor to coordinate with those performing related work and to interface other systems with the Work of this section. The AV Contractor shall ensure that the work by others shall integrate properly with the Work of this section and that all such work collectively complies with all requirements as specified herein.

1. Coordination shall include providing timely submittal and field coordination of mounting requirements, dimensions, and any other information required by other trades.

2. Maintain constant communications with all designated personnel of the GC and attend all construction meetings as requested by the GC.

G. The AV Contractor shall generate all shop drawings and information for the complete installation and wiring of the system. The AV Contractor shall provide (or sub-contract for) the on-site installation and wiring and shall provide on-going supervision and coordination during the implementation phase.

H. System Interconnections

1. The functional interconnections of the audio, control, and video systems shall comply with the manufacturer's system installation guidelines industry standard practices, and as specified herein

2. The AV Contractor shall provide all interconnection cable, connectors, terminal strips, wire-way, flexible conduit, raceways, etc., to facilitate the audio-visual systems as detailed within these specifications and drawings

3. The AV Contractor shall provide all custom connector panels required

I. The AV Contractor shall be fully responsible for the coordination of the control system custom programming. Further, the AV Contractor shall be responsible for coordinating the on-site programming, software de-bugging, and revision of custom screens after initial use, as required by the Owner, and/or AV Consultant.

J. The AV Contractor shall be responsible for the comprehensive adjustment of the systems as specified herein and shall provide all test equipment for the system checkout and acceptance tests. AV Contractor shall provide on-the-job training in systems operation and maintenance to Owner designated personnel

1. Adjust and balance all circuits as specified herein. Set all controls and software parameters to render fully and optimally operating systems and subsystems. All computer controlled functions shall require complete audio/computer/software setup, balancing, label-entry and documentation

1.06 SUBMITTALS

The AV Contractor shall submit at least five (5) full sets of pre-construction submittals or electronic set (to be determined at kickoff), all of which to the consultant via the architect as described in this section unless instructed otherwise by the construction manager or Construction Manager. The consultant shall mark and return copies for distribution except one to be kept for record.

A. Equipment Submittals

1. Submit for approval a binder of all equipment detailed herein w/table of contents. When manufacturers cut sheets indicate more than one model number, identify the correct model number to be provided by means of arrow or check mark or similar. DO NOT INCLUDE OPERATION MANUALS, only specifications.

B. Conduit and Cabling Submittals

1. Submit for approval all cable pull schedules and/or run sheets prior to cable installation. Documentation of the entire conduit and cabling installation shall be fully performed to construction documentation standards and as specified herein

C. System Design Submittals

Prior to fabrication the AV Contractor shall submit for approval, all designs pertaining to the systems. These designs include, but are not limited to, the following:

1. Complete system construction and point to point wiring schematic drawings, including all component values and showing complete letter and number identification of all wire and cable as well as jacks, terminals, and connectors

2. All panels, plates, and designation strips, including details relating to terminology, engraving, finish, and color

3. All custom designed consoles, tables, carts, support bases, and shelves

4. Schematic drawings of all custom components, assemblies, and circuitry

5. All equipment modifications

6. Patch-panel assignment layout drawings

7. Front mechanical drawings of each equipment rack

8. All items of equipment whether a stock manufactured item or custom built shall be supported by complete and detailed schematic drawings and replacement parts lists. No “black boxes” or unidentified components shall be acceptable

9. All touch panel and computer GUI interfaces and DSP programs

D. Equipment Substitution Submittals

When submitting a request for substitution or deviation, include:

1. Descriptions of the total foreseeable effect of the substitution or deviation upon the design of the Project and agree to be directly responsible for any resultant extra costs

2. Note:

   Materials and equipment proposed as being in compliance with or in deviation from specified standards or as a substitute for specified items shall be indicated as soon as possible. Upon receiving disapproval for any item, the AV Contractor shall immediately resubmit a revised list for approval and, thereafter, continue to resubmit a revised list until complete written approval of all items has been obtained

E. System Installation Submittals

1. Provide week-by-week Work Progress schedules keyed to personnel, vendors, and tasks as specified herein and provide updates as requested by General Contractor (GC), Construction Manager (CM), consultant or owner

2. Provide a chart showing wireless microphone frequencies to be used. Delineate on a per room basis.

F. Close out Documents

1. At the completion of the installation, the AV Contractor shall provide the following items, and submit at least four (4) sets of each. Two full sets shall be submitted to the owner, one to the Construction Manager and one to the consultant. The following list shall define “Close out Documents”.

a) Full equipment with serial numbers

b) Equipment manufacturer's operation and maintenance manuals for each piece of equipment, bound in a three ring binder. Include any "as modified" drawings pertaining to any equipment that has been modified by the AV Contractor

c) A full set of "As Built" or "As Installed" drawings showing all final connections and field wiring numbers

d) A simplified functional block drawing identical to the specification drawing with the addition of all input and output circuit cable and terminal block numbers as well as all jack field circuit I.D. designations. A copy of this drawing shall be framed in protective plastic and mounted on the inner surface of the equipment rack door

e) System Operation and Maintenance Manual

The AV Contractor shall produce this manual specifically for the systems detailed herein. The "Operation" section shall describe in detail, all typical procedures necessary to activate each system to provide for the functional requirements as listed under the Specifications. The reader of this manual shall be assumed to be technically competent, but unfamiliar with this particular facility

The "Maintenance" section shall provide a recommended maintenance schedule with reference to the applicable pages in the manufacturer's maintenance manuals. Where the manufacturer provides inadequate information, the AV Contractor shall provide the information necessary for proper maintenance

In addition to the more detailed System Operation and Maintenance Manual, prepare a more simplified "Quick Start" or "Executive Summary" version that shall consist of no more than one 8 ½ by 11 inch sheet describing the most basic functions. Laminated copies of this instruction sheet should be located for easy access by the user

f) AV Contractor is to provide control programming source code and all DSP program files and the end of the project.

1.07 QUALITY ASSURANCE

A. AV Contractor Qualifications

1. AV Contractor shall have at least ten (10) years experience in the fabrication, assembly, and installation of audio-visual systems of similar magnitude and quality as specified herein, and shall submit documentation. This documentation must identify, specifically, similar projects of the same or greater magnitude. Of those projects noted, the bidder must provide current contact names and telephone numbers, as well as a job description with a clear delineation between labor and equipment costs, as well as duration of project. The descriptions supplied must clearly indicate the firm submitting the bid response has actively been involved in these projects and that the firm has actively been involved for at least ten years in projects of this magnitude

2. The supervisor of the work of this section shall have at least five (5) years direct professional experience with devices, equipment, and system installation of the type and scope specified herein

3. All personnel engaged in the installation of this Section shall have at least three (3) years direct experience with devices, equipment, and system installations of the type and scope specified herein.

4. There shall be one (1) point of contact for the project assigned as a project manager.

5. The AV Contractor staff must hold industry certifications with ICIA (CTS or higher) or EST.

6. The AV Contractor must be a certified dealer and installer in all major components being provided as part of this system; including but not limited to:

   a) Crestron Digital Media systems

   b) Crestron control systems and programming

   c) Extron systems for transport and control

   d) Meyer Sound powered speaker systems with PowerCon distribution

   e) Yamaha digital mixing boards

   Documentation shall be provided in bid return

B. Quality of Materials and Equipment

1. All materials and equipment supplied by the AV Contractor shall be new and shall meet or exceed the latest published specification of the manufacturer in all respects

2. The AV Contractor shall supply the latest model, available at the time of bidding, of each piece of equipment

3. The materials and completed Work of this Section shall conform to the applicable requirements of all current local and state codes, and of the following reference codes:

   a) Occupational Safety and Health Act of 1970 and all amendments thereto

   b) National Electrical Code, ANSI C1, as amended by all state and local codes

   c) New York State Building Code 2010

   d) All Authorities Having Jurisdiction (AHJ)

1.08 TIMELY DELIVERY AND STORAGE

A. Timely delivery and installation of material required for the Work of this Section is the responsibility of the AV Contractor. The AV Contractor shall be held responsible for all delays associated with both specified and alternate materials, and for the timely submittal of proposals, submittal items, drawings, and other information in order to expedite the Work and to avoid delays

B. Costs of all shipping to the site, and of all storage requirements, shall be borne by the AV Contractor. It shall be the responsibility of the AV Contractor to make appropriate arrangements, and to coordinate with authorized personnel at the site, for the proper acceptance

C. During the installation, and up to the date of final acceptance, the AV Contractor shall be under obligation to protect his finished and unfinished work against damage and loss. In the event of such damage or loss, he shall replace or repair such work at no cost to the Owner

1.09 PROJECT SITE CONDITIONS

A. The AV Contractor shall be responsible to survey all areas to locate poke-thrus, furniture openings, sleeves, conduits, cable trays, conduit stub-ups, back boxes and pull boxes provided by others for Audiovisual Cabling.

B. The AV Contractor shall be responsible for verifying on-site conditions of all systems, equipment and conditions that directly or indirectly affecting the AV Contractor's scope of work to include but not limited to:

1. Walls painted

2. Carpet or other floor covering installed

3. All power and conduit installed as per consultant's drawings

4. All A/V devices installed by the CM such as: projection screens, screen low voltage control interfaces, video projector and plasma lifts, A/V back boxes, A/V floor boxes, room lighting A/V interfaces and window shade low voltage control interfaces

5. All A/V related CATV, data, ISDN, T-1, IP, voice and analog lines as specified by the consultant

6. All A/V related furniture installed such as lecterns, credenzas, board/conference tables, closets and other millwork designed to house A/V equipment

1.10 SERVICE CONTRACT

A. The AV Contractor shall offer a separate annual service contract covering all installed systems. This service contract shall cover a minimum of four (4) visits per year, at regular intervals, to perform operation checks of the equipment; check focus, alignment, and convergence; clean recording/playback heads and other critical surfaces and to lubricate moving parts as recommended by the respective manufacturers. The service contract shall commence immediately after expiration of the initial base-bid warranty period and continue for one year. This service contract may be renewed under separate agreements between the AV Contractor and the owner

B. The AV Contractor shall also submit separate costs for emergency situation "on-call" service visits and an "in-shop" hourly-rate for repair and maintenance work as part of the post-guarantee period herein. Spaces have been provided for on the bid forms for "on-call" and "in-shop" service contract pricing

C. The costs for this service contract shall not be commingled with the costs for the systems base bid. Spaces have been provided for on the bid forms for "SECOND YEAR" and "THIRD YEAR" service contract pricing.

D. This “Service Contract” shall not in any way conflict with the first year warranty covered as specified herein. The intent of this paragraph is for the Owner’s option in preparing budgets and comparing long-term costs between vendors. As such the Bidder shall provide costs for year two and three to include cost escalations

PART 2 – SYSTEMS AND EQUIPMENT

2.01 SYSTEM DESCRIPTIONS

1. The audio visual systems within this room are intended to provide the audio visual capabilities required for effective communications and entertainment. The systems include the following.
   a. Display Systems.
   b. Video Systems.
   c. Audio Systems.
   d. Control Systems.

2. The spaces and/or facility systems are as follows:
   a. Performance Theater “E”
   b. Performance Studio
   c. Studio Classroom “B”
   d. Smart Classroom
   e. Computer Labs
   f. Fabrication Lab
   g. Senior Works/Crit Room
   h. Soundstage
   i. Pavilion
   j. Digital Signage

3. AV functional narrative

Performance Theater “E”

The Performance Theater will operate as a multi-purpose “Blackbox” style theater. There will be audio, video, network and power connection points throughout the Theater providing many opportunities to set up the facilities in different configurations. The operator will have the flexibility to connect speakers, microphones, portable projection, network audio or video devices, and theater intercom at the catwalk, light rope grid, and at the Theater ground level. Networked audio will be leveraged for distributing audio channels to and from the control room mixer. The control room will house the head end equipment such as mixing console, source devices, and digital matrix routing for video. A projector mounted in the control room will serve as the main projection for the room, projecting onto a motorized screen. A motorized PTZ camera will capture and provide the video feed to supporting areas such as the green room and dressing rooms. System controls will be achieved via a combination of wireless, tethered touch panel controller, and manual operation at the mixing console in the control room.

4. **Video**

   a. Flat Panel(s)

      1) 40” HD display wall mounted in the Green Room, His and Her Dressing Rooms

   b. Projector(s)

      1) Fixed HD Projector mounted in the control room

   c. Projector Screen(s)

      1) Fixed motorized projection screen

d. Source(s)

1) OFE provided PC
2) DVD recorder
3) Bluray player
4) HD PTZ Camera with a multi format PTZ controller and switcher operated from the control room.

e. Switching

1) Digital Matrix switcher

f. AV Wall Plates

1) Video transmitter device mounted in the wall plate for connecting a local laptop, tablet, or other mobile device at the Theater floor level. The wall plates that will not receive a video transmitter in the wall plate will have a 2-gang opening with a blank cover ready for future device and configuration.
2) RJ45 Digital Media connection input. Requires using a Digital Media or HDBaseT transmitter that will connect to the RJ45 Digital Media connection in the wall plate for sending a local source video feed to the digital matrix switcher. This setup is in the spirit of flexibility and reduces the need and qty of fixed installed devices.
3) RJ45 Digital Media connection output. Requires using a Digital Media or HDBaseT receiver that will connect to the RJ45 Digital Media connection in the wall plate for receiving a video feed from the digital matrix and sending to a mobile projector or display.

5. **Audio System**

a. Sources(s)

1) CD/Media Playback-iMAC with Qlab4 and Dante Virtual Soundcard

b. Audio Recording

1) iMAC with Logic ProX and Dante Virtual Soundcard

c. Mixer(s)

1) Compact 32-mic/line input 64-channel digital mixer with a Dante audio networking card
2) Dedicated wireless access point for connecting a mobile device installed with the mixer control app

d. Distribution

1) I/O stagebox with 32 in and 16 out rack mounted in the Control Room not only allows access for operator patching but also employs Dante network audio protocol for flexibility in setup placement, and routing audio to and from the Theater.
2) Portable I/O stagebox with 16 in 8 out with Dante network audio to connect to any of the Theater AV wallplates for sending and receiving audio channels from the Control Room.

e. Amplification

1) Multi-channel amplifier for powering Green room, and His and Her dressing rooms ceiling speakers and will provide amplification for future speaker configurations in the Theater.

f. Speaker(s)

1) Portable powered loudspeakers to mount to pipe grid and connect in multiple possible configurations via the audio access panels located at the catwalk wall.
2) Portable powered subwoofers mounted to light rope grid
3) Fold back powered monitor speakers
4) Control Room speakers
5) In-ceiling speakers connected to audio attenuators in the Green Room and Dressing Rooms

g. Audio Access Panels

1) Multi format audio I/O connections. Consists of a group of (3) wall boxes designated with either configuration of XLR male and female, shielded Ethercon for networked AV, or Powercon Tru 1 connections for powering the loudspeakers. Powercon Tru 1 by electrical contractor

h. Powered speaker distribution (by others)

1) Ability to isolate individual speakers if experiencing audio issues and shut them off at the breaker.
2) Performance Theater will have (12) possible Powercon outlet locations (one wallbox of the Audio Access Panel) for speakers and subwoofers. (6) at catwalk back wall, (2) at lighting rope grid, and (4) wall mounted at ground level. Those (12) Powercon outlets will run to ETC 9306B pig tail boxes wall mounted behind the rack location in the Control Room. The ETC 9306B pigtail boxes will be patched as needed by a Theater operator into (1) Motion Lab Rac Pac L21-30A w/ 6 20A Breakers mounted in the rack.
3) Due to the high voltage system, this scope will be installed by electrical contractor but listed here for reference and coordination. For final power distribution layout -reference electrical drawings and spec.

i. Microphone(s)

1) 8 channel wireless microphone system with wireless handheld and body pack transmitters for lavalier mics
2) Wired mics

j. Theater Intercom

1) 4 channel wireless intercom system with beltpacks and headsets. Multiple connection points at the catwalk wall for the wireless antennas allow for best coverage configuration and future system expansion
2) Wired beltpack and headsets that can be connected throughout the Theater space.
3) Wired Intercom stations located at the Control Room, Green Room, and Dressing Rooms

6. **Control System(s)**

a. Touch Screen Panel(s)

1) 7” touchscreen for control of video presentation located in the Control Room such as power on/off of projectors, digital matrix video source routing, volume control of video source output

Performance Studio

A smaller version of the Performance Theater, The Studio will be feature rich with most of the same technology and flexibility.

1. **Video**

   a. Projector(s)

      1) Fixed HD Projector mounted in the control room

   b. Projector Screen(s)

      1) Fixed motorized projection screen

   c. Source(s)

      1) OFE provided PC
      2) Bluray player
      3) HD PTZ Camera with a multi format PTZ controller and switcher operated from the control room.

   d. Switching

      1) Digital Matrix switcher

   e. AV Wall Plates

      1) Video transmitter device mounted in the wall plate for connecting a local laptop, tablet, or other mobile device at the Theater floor level. The wall plates that will not receive a video transmitter in the wall plate will have a 2-gang opening with a blank cover ready for future device and configuration.
      2) RJ45 Digital Media connection input. Requires using a Digital Media or HDBaseT transmitter that will connect to the RJ45 Digital Media connection in the wall plate for sending a local source video feed to the digital matric switcher. This setup is in the spirit of flexibility and reduces the need and qty of fixed installed devices.
      3) RJ45 Digital Media connection output. Requires using a Digital Media or HDBaseT receiver that will connect to the RJ45 Digital Media connection in the wall plate for receiving a video feed from the digital matrix and sending to a mobile projector or display.

2. **Audio System**

   a. Sources(s)

      1) CD/Media Playback-iMAC with Qlab4 and Dante Virtual Soundcard

   b. Audio Recording

      1) iMAC with Logic ProX and Dante Virtual Soundcard

   c. Mixer(s)

      1) Compact 16-mic/line input 32-channel digital mixer with a Dante audio networking card
      2) Dedicated wireless access point for connecting a mobile device installed with the mixer control app

   d. Distribution

      1) I/O stagebox with 16 in and 8 out rack mounted in the Control Room not only allows access for operator patching but also employs Dante network audio protocol for flexibility in setup placement, and routing audio to and from the Theater.
      2) Portable I/O stagebox with 16 in 8 out with Dante network audio to connect to any of the Theater AV wallplates for sending and receiving audio channels from the Control Room.

e. Amplification

1) Multi-channel amplifier will provide amplification for future speaker configurations.

f. Speaker(s)

1) Portable powered loudspeakers to mount to pipe grid and connect in multiple possible configurations via the audio access panels located at the catwalk wall.
2) Portable powered subwoofers mounted to light rope grid
3) Fold back powered monitor speakers
4) Control Room speakers
5) In-ceiling speakers connected to audio attenuators for volume control in the Green Room and Dressing Rooms

g. Audio Access Panels

1) Multi format audio I/O connections. Consists of a group of (3) wall boxes designated with either configuration of XLR male and female, Ethercon for networked AV, or Powercon connections for powering the loudspeakers.

h. Powered speaker distribution (by others)

1) Ability to isolate individual speakers if experiencing audio issues and shut them off at the breaker.
2) Performance Studio will have a possible (9) Powercon outlet locations for speakers and subwoofers. (6) at light rope grid, (3) wall mounted at ground level. Those (9) Powercon outlets will run to ETC 9306B pig tail boxes wall mounted behind the rack location in the Control Room. The ETC 9306B pigtail boxes will be patched as needed by Theater operator into (2) Motion Lab Rac Pac L21-30A w/ 6 20A Breakers mounted in the rack.
3) Due to the high voltage system, this scope will be installed by electrical contractor but listed here for reference and coordination.

i. Microphone(s)

1) 8 channel wireless microphone system with wireless handheld and body pack transmitters for lavalier mics
2) Wired mics

j. Theater Intercom

1) 4 channel wireless intercom system with beltpacks and headsets. Multiple connection points at the catwalk wall for the wireless antennas allow for best coverage configuration and future system expansion
2) Wired beltpack and headsets that can be connected throughout the Theater space.
3) Wired Intercom stations located at the Control Room, Green Room, and Dressing Rooms

3. **Control System(s)**

a. Touch Screen Panel(s)

1) 7” touchscreen for control of video presentation located in the Control Room such as power on/off of projectors, digital matrix video source routing, volume control of video source output

Studio Classroom B

Setup as a classroom, the Studio Classroom will feature fixed projection and screen, AV playback, PC and laptop interfaces. Audio shall be manually mixed via a mixer mounted with rack rails within a mobile equipment cabinet.
A wall mounted keypad controller will serve to address the systems functions such as on/off, volume, source select.

1. **Display(s)**
   a. Projector(s)
      1) Ceiling mounted projector, approximately 6,000 ANSI lumens, 1080p resolution
   b. Projector Screen(s)
      1) Ceiling mounted motorized projection screen with raise/lower switch

2. **Video System**
   a. Source(s)
      1) BluRay player
      2) OFE local PC
      3) AV Laptop
      4) PC/Laptop interface wall plate

3. **Audio System**
   a. Microphone(s)
      1) 6 wired microphones
   b. Sources(s)
      1) CD / Media Player with Digital Audio Outputs
   c. Mixer(s)
      1) Compact portable digital mixer
   d. Amplification
      1) 2 channels, 200 watt per channel ,70V amplifier for powering pole grid mounted speakers and future expansion
   e. Speaker(s)
      1) Portable pole grid mounted loudspeakers

4. **Control System**
   a. Control
      1) Small automation system with wall mounted keypad control

Smart Classroom, Computer Labs
These rooms will be traditional in AV classroom design. Podium will house instructor PC and all headend devices for the classrooms. The instructor's PC will connect to a presentation switcher which will displays the image onto a motorized projection screen when selected by a button controller. Audio program reinforcement is via ceiling mounted speakers.

1. **Display(s)**
   a. Projector(s)
      1) Ceiling mounted projector, 6200 ANSI lumens, 1080p resolution
   b. Projector Screen(s)
      1) Ceiling mounted motorized projection screen with raise/lower switch
2. **Video System**
   a. Source(s)
      1) OFE local PC located in podium
      2) Presentation Switcher
      3) Laptop connectivity at podium location
3. **Audio System**
   a. Microphone(s)
      1) Podium mic
   b. Amplification
      1) 2 channels, 200 watt per channel ,70V amplifier
   c. Speaker(s)
      1) In-ceiling speakers
4. **Control System**
   a. Control
      1) Small automation system with podium mounted keypad control

Fabrication Lab
This room will be simple in AV design. An input wall plate will connect directly to the projector location for displaying the mobile source video to the motorized projector screen and sending the source audio to the ceiling speakers. An audio matrix switcher will distribute audio to the amplifier for the ceiling speakers and the assisted listening transmitter. A wall mount controller will control the devices on/off, source selection, volume control.

1. **Display(s)**
   a. Projector(s)
      1) Ceiling mounted projector, 6200 ANSI lumens, 1080p resolution
   b. Projector Screen(s)
      1) Ceiling mounted motorized projection screen with raise/lower switch
2. **Video System**
   a. Source(s)

1) OFE local PC located in podium
2) Presentation Switcher
3) PC interface wall plate mounted in floor box at podium location

3. Audio System
   a. Microphone(s)
      1) Podium mic
   b. Amplification
      1) 2 channels, 200 watt per channel ,70V amplifier
   c. Speaker(s)
      1) In-ceiling speakers

4. **Control System**
   a. Control
      1) Small automation system with podium mounted keypad control

Senior Works/Crit Room
A presentation space with 2 locations for local input and projection onto motorized projection screens. The 2 locations can be zoned together with same content and audio through the in-celling speakers or individually zoned separately. Wall button controllers will control system on/off, source selection, and volume control.

Soundstage

The Small soundstage will require a portable sound system. Speakers on stands or mounted to the lighting grid will connect to a portable mix rack to be rolled around to 2 locations.

Video
- (2) ceiling mounted projectors, 6200 ANSI lumens
- AV input wall plate will extend video to the rack
- AV presentation switcher with matrix source selection and output to the two projectors

Audio
- (9) Ceiling recessed speakers
- (1) Audio DSP within AV presentation switcher
- (1) 2 channel 70V amplifier

Control
- (2) Wall mounted push button interface plus IP control

Entry Pavilion

The Pavilion will function as a public multi-purpose space and a feature signage wall. There will be an audiovisual component built in for presentations.

Video
- (6) Projector, 6200 ANSI lumens,
- (6) Signage Media Players
- (1) Video Switcher

Audio
- (12) Ceiling recessed pendant loudspeakers
- (1) Audio DSP/amplifier

Control
- Wall mounted touch panel

Digital Signage

Located throughout the facility there will be video displays to show schedules of upcoming events, directories or any kind of signage to be displayed. The displays will be driven by small media players residing on the network with a main server to address and distribute new source material to the distinct displays.

Video
- (5) Wall mounted flat panel displays
- (5) Signage Media players
- (1) Digital signage server with appropriate software

5. Control (wherever applicable)
   - All system devices shall be controlled through a remote-control system with a touch panel as user interfaces which can be connected at the floor boxes in the room. This shall include the control of screens, shades, and lighting. The remote-control system shall provide for transparent operation.

   - The AV Contractor shall coordinate the software programming with the client and consultant prior to implementation including Mobile software application.

   - The general design approach of the GUI shall follow the intent to minimize the amount of button pushes to accomplish any actions. For basic functions, the AV Contractor shall preprogram macros of certain actions, which shall be coordinated with the consultant prior to implementation.

   - For systems with touch panels, the screens shall include full control over setup and call pages for audio and video conferencing where applicable. These pages shall include speed dial directories.

   - Programming shall allow simple re-configuration of any switching and/or control scenario. Program sources; video conferencing; audio conferencing; local microphones; and microphone mix for speech reinforcement shall have its own volume control and mute; when switching between user pages, the control system shall track and “remember” each setting.

   - The system shall feature a power up routine. The power up routine shall:
     Set variables;
     a) Initiate routes;
     b) Set levels to defined states;
     c) Update all user interface feedback functions.

   - An automatic system shut down shall be implemented when the system has not been used for a software configurable period of time or selectable time of day. The code shall be written using persistent variables and tracking touch panel pushes with resetting timeout timer. The shut down routine shall:
     Clear all routes;

d) Set levels to defined states;
e) Reset all non-persistent variables;
f) Stop all device transports;
g) Shut down devices where applicable, especially projectors, displays, and power amplifiers for LEED considerations, device life span optimization, and limited heat development;
h) Set the touch panel's internal audio level to the previous level;
i) Reentering the system shall trigger the default power up routine.

- The time/data display shall be generated by the remote control master, which shall generate the time stamp for the variable text button under consideration of day light savings time.

- When a device provides real feedback, the AV Contractor shall support this information with the appropriate updates on the user interface: i.e. Projector (on/off/input/aspect ratio, picture mute), ATC/DSP (status of various functions) etc.

- The AV Contractor shall provide the touch panel design snapshots and/or user interface layout files to the Consultant for review and acceptance.

- The AV Contractor shall coordinate the touch panel design file with the Consultant for final approval.

- The lighting system shall be interfaced by the remote control system in order to recall predefined lighting scenes via the lighting presets. The AV Contractor shall coordinate the lighting system presets with the Owner.

- The AV Contractor shall provide on-site Programmer for de-bugging prior to final commissioning; during punch-list check-outs; and as a call-back to provide additional features as are required as a result of the Owner actually using the system.

- The AV Contractor shall deliver the source code for all software programming, the touch panel design files and/or user interface layout files of the latest revision date including all service updates for the remote control system.

- Upon system acceptance, the AV Contractor shall deliver configuration files of all software controlled electronic devices.

- The AV Contractor shall coordinate with the Owner for IT and telco related configurations.

PART 3 – GENERAL REQUIREMENTS

A. All equipment shall be rack-mounted and permanently attached. All power supplies, rack-mounts, interconnects, brackets, etc., shall be included while they may not be specifically called out herein.

B. All equipment shall be new and the latest model number and revision as of the proposal date.

C. Material and equipment specified herein have been selected as the basis of acceptable quality and performance and have been coordinated to function as component parts of the included systems. Where a particular material, device, equipment or system is

specified directly, the current manufacturer's specification for it shall append these specifications.

D. Subject to the functional and minimum performance requirements for each item, the Consultant may require independent laboratory tests proving equivalence of certain alternative equipment not fully or adequately described by the technical specification of the manufacturers. Any and all costs arising from equivalency testing shall solely and completely be the responsibility of the AV Contractor.

E. Verify with all manufacturers and/or suppliers' availability and cost of all material and equipment proposed, including all material and equipment specified herein. No cost increases shall be allowed for manufacturers' cost increases, or for substitutions required because of unavailability of proposed equipment.

F. The manufacturer specifications shall be considered as minimum performance levels of acceptance. Where a particular model is specified its performance, operating, and physical characteristics are part of these specifications. Further, these characteristics are part of a design as a whole and particularly the Architect's and Engineer's designs are in full coordination with these characteristics.

3.01 CUSTOM WALL PLATES

A. *Submit sample of engraved plate for owner approval before fabrication of job plates.*

B. All plates shall be equivalent in type, color and finish to other plates in the same room, unless otherwise specified by the Architect or Owner.

C. Unless otherwise noted, all plates shall be 0.125-inch thick brushed and anodized aluminum with 45-degee chamfered edges.

D. Mounting screws shall be matching stainless or black Allen flat-head screws.

E. Custom-fabricate to size indicated on drawings.

F. Black or white filled engraving, whichever provides the highest contrast to the plate color and finish.

G. Typeface shall be 14 pt Helvetica Bold.

3.02 CUSTOM EQUIPMENT RACKS PANELS

A. Standard EIA specifications, nominal 19-inches wide, number of spaces as indicated or required.

B. Material shall be brushed and anodized Aluminum, minimum 0.125-inch thick.

C. Finish black anodized.

D. White filled engraving.

E. Typeface shall be 14 pt Helvetica Bold.

F. Provide panel stiffeners as required to prevent panel deformation during normal plugging and switching operations.

G. Mounting screws shall be matching stainless or black Allen flat-head screws with lock washers.

PART 4 - EXECUTION

4.01 EQUIPMENT LAYOUT

A. The equipment layout and locations shall be as detailed herein and in the audio-visual section of the drawing as well as all architectural drawings that pertain to this area.

4.02 PROJECT MEETINGS

A. It shall be the responsibility of the AV Contractor to supply any necessary requested information and have its project supervisor in attendance at all project meetings in order to coordinate with all related trades.

4.03 COORDINATION

A. All the Work of this section shall be coordinated with the current operation of the system(s).

B. The AV Contractor shall coordinate the finish required for all fixtures, plates, panels, grilles, and enclosures supplied as part of this specification section with the Architect and Owner. The AV Contractor shall supply finish samples as requested by the Architect or Owner.

C. The AV Contractor shall be responsible for coordination with the Millworker for any audio-visual items to be built or mounted into millwork.

D. It shall be the responsibility of the AV Contractor to cooperate at all times with all other Contractors doing work in the building, to the end that lost time, work stoppages, interference, and inefficiencies do not occur.

E. Maintain constant communications with all designated personnel of the GC and CM and attend all construction meetings as requested by the GC and CM.

F. Coordinate the switch over of all systems; subsystems; and software with OWNER operations and maintenance personnel as designated by the CM.

G. Perform field surveys to determine existing cabling and mechanical conditions.

H. Verify existing as-builds including cable labeling and ensure new documentation and installation cabling is coordinated and appropriately labeled.

4.04 WORKMANSHIP

A. Maintain a competent supervisor and supporting technical personnel, acceptable to the Architect, General Contractor, Construction Manager, Owner, and Consultant during the entire installation. The AV Contractor shall submit the name and telephone number of the supervisor. Change of supervision during the project is not acceptable without prior written approval from the Owner, Architect, and Construction Manager.

B. Adjust and balance all circuits as specified herein. Set all controls and software parameters to render a fully and optimally operating systems and subsystems. All computer-controlled functions shall require complete audio/computer/software setup, balancing, label-entry and documentation.

C. Install all equipment to industry safety and ergonomic standards and provide full engineering and technical support throughout the installation process.

4.05 FABRICATION & INSTALLATION

A. All installation practices shall be in accordance with, but not limited to, these specifications and drawings. Installation shall be performed in accordance with the applicable standards, requirements, and recommendations of authorities having jurisdiction.

B. If, in the opinion of the AV Contractor, an installation practice is desired or required, which is contrary to these specifications or drawings, a written request for modification shall be made to the Consultant. Modifications shall not commence without written approval from the Consultant.

C. Provide intelligible, permanent identification on or adjacent to all patching jacks, connectors, receptacles, terminal blocks, meters, indicators, switches, equalizers, mixers, amplifiers, etc. The identification shall clearly indicate the function, or circuit.

D. The AV Contractor must take such precautions as are necessary to guard against electromagnetic and electrostatic hum, to supply adequate ventilation, and to install the equipment so as to provide maximum safety to the operator.

E. Care shall be exercised in wiring so as to avoid damage to the cables and to the equipment. All joints and connections shall be made with rosin-core solder or with mechanical connectors approved by the Consultant.

F. All wire and cable shall be continuous and splice free for the entire length of run between designated connections or terminations.

G. When connecting stranded wire to compression screw terminals do not tin the wire ends. When inserting wires into compression terminals take proper care to insert only the stripped portion.

4.06 EQUIPMENT RACK FABRICATION

A. Wire all racks completely in the shop. No internal rack wiring shall be done on the job site.

B. Install all rack-mounted equipment and devices in equipment racks in a logical, functional manner, demonstrative of signal flow within the respective system arranged for easy accessibility and convenient maintenance.

C. Install equipment in racks with ventilating panels as required to provide adequate ventilation and according to equipment manufacturer's recommendations.

D. Provide a.c. outlets within each rack, and appropriately circuited, to provide power to the installed equipment, with one (1) each extra outlet per blank space.

E. Provide at least one (1) each dedicated A/C service outlet per rack.

F. Ensure that all panel mounting holes are pre-tapped and free of debris.

G. Run all microphone and line level wiring in the equipment racks on the equipment input side of the rack and all AC, control, and speaker wiring on the equipment output side of the rack.

H. Do not buss the commons of the loudspeaker lines together, and do not ground.

I. Provide unused panel space with blank or ventilating panels.

J. Locate free standing racks as shown and provide access to rear without need for moving racks.

K. Equipment racks of this system shall be firmly attached to each other, both mechanically and electrically, in order to provide a good ground connection between adjacent racks.

L. Equipment racks of this system shall be totally isolated form equipment racks of other systems.

M. Provide each rack with protective plastic covers for run sheets, rack elevation, and single-line drawings.

N. All power supplies shall be located, oriented, and connected electrically so as to minimize hum and RF interference. Further, all plug-in type power supplies shall be firmly attached using mechanical fasteners to its associated power receptacle to insure against accidental removal and/or connection loss.

4.07 EQUIPMENT LABELING

A. In addition to permanently labeling each cable and termination device, each piece of equipment, device, and panel shall have permanent label corresponding to its function as shown on system drawings.

B. All user cables shall be labeled as to their function. User cables include audio, video, VGA, control or other connector cables that that the user is required to handle during normal system setup and use.

4.08 PATCH PANEL ASSIGNMENTS & DESIGNATIONS

A. All patch panels shall be wired so that signal “sources” (outputs from) appear on the upper row of a row pair; and all “loads” (inputs to) appear on the lower row of a row pair.

B. All audio and video patch panel designation strips shall utilize alphanumeric identifications and descriptive information. The jack position in each horizontal row shall be numbered sequentially from left to right. The horizontal jack rows shall be lettered sequentially from top to bottom. The alphanumeric identification of each jack shall be included on the functional block drawings, as well as on reproductions of these drawings that shall be mounted in an appropriate location near the patch bays.

4.09 GROUNDING

A. In order to mitigate electromagnetic and RF interference from improper grounding and to achieve maximum signal-to-noise ratios, the grounding procedures shall be as detailed below.

B. At no time shall there be a compromise in safety or any exception to the NEC.

C. The following grounding practices shall be employed:

1. Under no conditions shall the AC neutral conductor in a receptacle outlet be used for a system ground. “Third prong” grounding connectors shall be employed wherever such are provided with manufactured equipment

2. Audio Cable Shields: All audio cable shields shall be dc-grounded at one point only.

3. Video Receptacles: All video receptacles that are provided and installed by the AV Contractor shall be insulated from the mounting panel, outlet box, or wire-

way. Unless otherwise detailed herein, this shall be accomplished by using insulated-from-panel type receptacles.

a) When interconnecting video lines between devices that are powered from different ac power sources, the AV Contractor shall use ground-loop isolation devices as required to eliminate any ground looping that may occur.

D. It shall be the responsibility of the AV Contractor to follow good engineering practices. At no time shall there be a compromise in safety or any exception to the NEC and local codes.

E. Insulate all conductors in conduit, including shields, from the conduit, back boxes, and from each other for the entire conduit length.

4.10 IDENTIFICATION

A. All installation shall bear the following identification plate, supplied by this AV Contractor, mounted on the front of the main rack at the top:

4. SYSTEMS ENGINEERED & DESIGNED BY:
Cerami & Associates, Inc.
404 Fifth Avenue
New York, NY 10018
Tel: 212-370-1776
www.ceramiassociates.com

5. SYSTEM FABRICATED & INSTALLED BY:
AV Contractor Name
Full Address
Telephone Number

B. Engraving shall be white filled Helvetica lettering on a black background or as appropriate to the identification plate material.

4.11 OFFSITE SYSTEM CHECKOUT

A. Before onsite installation, the AV Contractor shall be prepared to perform system checkout under the supervision of the Owner and Consultant at his shop, if applicable. He shall furnish all required test equipment and shall perform all work necessary to determine and/or modify performance of the system to meet the requirements of this specification. This work shall include the following:

1. Test all audio systems for compliance with the Performance Standards.

2. Check all control functions, from all controlling devices to all controlled devices for proper operations.

4.12 DELIVERY OF EQUIPMENT

A. Ensure that the spaces where any electronic equipment is to be stored and/or installed is completely free from any foreign substances, such as concrete dust, or any other material that may otherwise be harmful to electronic equipment and connections. No allowances shall be made to the AV Contractor for equipment damage, or delays due to environmental damage.

4.13 BENEFICIAL OCCUPANCY

A. During the installation, the Owner and their representatives shall be entering and partially using devices and systems. This shall in no way be considered as any form of acceptance, or first use of the system. Further this shall have no effect whatsoever on the Warranty. The AV Contractor shall at all times be responsible for the safety and security of the equipment and the Owner shall not take on responsibility through the action of using any audio-visual equipment in advance of final acceptance.

4.14 LOUDSPEAKER INSTALLATION

A. The following general minimum standard requirements shall be applicable to the fabrication and installation of all loudspeaker(s), and loudspeaker assemblies in the Project:

B. Provide positioning and support elements for loudspeaker assemblies wherever required.

C. Coordinate installation of all loudspeaker assemblies and baffles to ensure proper projection of the respective loudspeaker elements, and access to them for maintenance and/or removal.

D. Verify that no loudspeaker assembly is subjected to stress, abrasion, or loading effects which could contribute to extraordinary failure.

E. Eliminate all conditions causing noise, rattle, or other extraneous sounds resulting from the operation of a loudspeaker assembly under any operating condition.

F. Verify that baffle openings and loudspeaker components are clear of paint, and/or any other obstructions.

G. Use tamper/vandal-proof screws for all loudspeaker baffles in all restroom areas.

H. Connect all loudspeaker assemblies to the appropriate 70-volt line transformer tap to realize specified sound pressure levels and ensure uniform polarities of loudspeaker elements.

4.15 AC POWER

A. The AV Contractor shall ensure the Electrical Contractor has provided adequate power circuits and the grounding scheme is in accordance with the GROUNDING paragraph herein.

B. If a dedicated A/V power system is part of this design, the AV Contractor shall ensure that ONLY the audio-visual equipment is hooked up this dedicated ac power system.

4.16 PHYSICAL INSTALLATION

A. All equipment shall be firmly secured in place with a safety factor of at least five (5). All hardware shall be SAE Grade 5 minimum and all installation practices shall comply with standard rigging practice, OSHA standards, and all building codes.

B. All boxes, equipment, etc. shall be secured plumb and square.

C. In the installation of equipment and cable, consideration shall be given not only to operational efficiency, but also to overall aesthetic factors.

D. All power supplies shall be located, oriented, and connected electrically so as to minimize hum and RF interference. Further, all plug-in type power supplies shall be firmly attached

using mechanical fasteners to its associated power receptacle to insure accidental removal and/or connection loss.

4.17 CABLE LENGTH & SPLICES

A. All cables (except video and pulse cables that must be cut to an electrical length) shall be cut to the length dictated by the run. No splices shall be permitted in any pull boxes without prior permission of the Consultant. For equipment mounted in drawers or on slides, the interconnecting cables shall be provided with a service loop of appropriate length.

4.18 CABLE INSTALLATION

A. All cables, regardless of length, shall be marked with wrap-around number or letter cable markers at both ends. There shall be no unmarked cables at any place in the system. Marking codes used on cables shall correspond to codes shown on drawings and run sheets. Clear heat shrink (or equal) shall protect numbers.

B. All inter-rack cabling shall be neatly strapped, dressed, and adequately supported.

C. For all cables interfacing with racks, cabinets, consoles, or equipment modules requiring terminal blocks, boards, strips, or connectors these shall be either of the “barrier strip” type, screw down terminal strip or insulation displacement punch down type as manufactured by ADC or Siemon. No audio cables shall run directly to the audio patch panel jacks. Each audio patch panel shall be furnished with an audio terminal block and all audio cables to and from the audio patch panel shall terminate on this block.

D. All cables shall be grouped according to the signals being carried. In order to reduce signal contamination, separate groups shall be formed for the following cables:

1. Power cables
2. Control cables
3. Video cables
4. Network Cables
5. Audio cables carrying signals less than -20 dBm.
6. Audio cables carrying signals between -20 dBm and +20 dBm.
7. Audio cables carrying signals above +20 dBm.

E. All power cables, control cables, and high level cables shall be run vertically on one side of an equipment rack as viewed from the rear. All other cables shall be run vertically on the other side of an equipment rack, as viewed from the rear.

F. Cables and Connectors: Reference sheet TA-000

Cables running in plenum areas without conduit shall be plenum rated cable and match the specified cable above. Cables running in areas exposed to environmental factors such as, but not limited to, UV, chemicals, direct burial, etc. shall be rated for such exposure and shall match the performance characteristics of its equivalent cable above.

All cables (except video and sync cables which must be cut to an electrical length) shall be cut to the length dictated by the run. No splices shall be permitted without prior permission of the Consultant. For equipment mounted in drawers or on slides, the interconnecting cables shall be provided with a service loop of appropriate length.

All Category type cabling used for audiovisual purposes shall be BLACK.

No cable shall be installed with a bend radius less than that recommended by the cable manufacturer.

4.19 PERFORMANCE

6. AUDIO

a) At the maximum distance as designated by the Consultant this system shall be capable of supplying 80 dB-SPL program level plus 10 dB peaking factor over a bandwidth of 250 Hz to 4 kHz without deformation of the waveform as observed on an oscilloscope connected to the output of a SLM in every zone unless noted otherwise.

b) Distribution of sound in the listening area from 250 Hz to 4 kHz shall vary not more than +/-2.0 dB at any location, as measured in octaves with an ANSI SLM.

c) The system shall provide adequate dynamic range at an acoustic distortion level sufficiently low to ensure minimum listening fatigue and intelligibility acceptable to the Owner. The intelligibility is based on listeners not familiar with the message, or talker; no visual cues; normal activity; and moving position both within and between zones.

d) Unless restricted by the published specifications of a particular piece of equipment or unless otherwise required under the Detailed Specifications, the following performance standards shall be met by each system:

(1)	S/N (including cross talk and hum) minimum.		60 dB
(2)	Total Harmonic Distortion	1% max from	30 Hz to 16,000 Hz.
(3)	Frequency Response	+/- 1.0 dB, 30 Hz to 16,000 Hz.	

7. VIDEO

a)	S/N un-weighted DC to 5 MHz	55 dB minimum.
b)	Frequency Response	+/- 0.5 dB, to 5 MHz.
c)	Line and Field-Tilt	2% maximum.
d)	Differential Gain	3% maximum.
e)	Differential Phase	2 degrees maximum.

8. PERFORMANCE TEST SIGNAL PATHS:

The signal paths for the above Performance Standards shall be as follows:

a) Audio

From all source inputs (for microphones, audio tape units, video tape units, etc.) through all mixers, audio distribution amplifiers, switchers, etc., to all signal destinations.

b) Video

From all source inputs (for cameras, video tape units, etc.) through all processors, switchers, etc., to all signal destinations.

9. OPTICAL

All optical projection systems shall meet the following performance standards:

a. The total varied light output from a projector, in lumens, shall be within plus-or-minus 15% of that specified by the projector manufacturer.

b. The light meter used for the above measurements shall be a properly calibrated foot-candle (or Lux) meter and shall be cosine-corrected.

c. Projectors, lenses, and mirrors shall be solidly mounted and braced so that there shall be no observable movement in the image induced by motor vibration or other mechanical operations.

During performance testing, all equipment shall be operated under standard conditions as recommended by the manufacturer.

4.20 TESTS AND ADJUSTMENTS

A. Before Acceptance Tests are scheduled, the AV Contractor shall perform his own system checkout. He shall furnish all required test equipment and shall perform all work necessary to determine and/or modify performance of the system to meet the requirements of this specification. This work shall include the following:

1. Maintain documentation of all performance tests for reference by the Consultant during the System Acceptance Tests.

2. Test all audio and video systems for compliance with the Performance Standards.

3. Adjust, balance, and align all equipment for optimum quality and to meet the manufacturer's published specifications. Establish and mark normal settings for all level controls, and record these settings in the “System Operation and Maintenance Manual."

4. Check all optical projection images for average light level, light fall-off, image alignment and size to comply with the Performance Standards, specifications, and drawings. Check to determine that all projectors, projector bases, carts, tables, and mirrors are rigid and vibration-less in operation.

B. Provide all required test equipment specified herein (or equal) to successfully complete the tests and adjustments. Kits, home-built, and other non-professional test equipment shall be unacceptable.

1. Digital and Analog Video signal generator, Exton VTG 400D
2. Prerecorded DVD and BluRay test media
3. Appropriate cable interconnects for testing
4. Audio and Video cable, terminations, adapters, etc
5. Signal generator, Leader LAG-120B
6. Audio test set, Audio Precision P1PLUS or similar
7. Pink noise generator IVIE IE-20B or similar
8. Spectrum analyzer IVIE-IE30A
9. Audio Test CD
10. Loudspeaker and Microphone polarity checker
11. Impedance Meter

C. Perform the following inspections and adjustments, and submit to the Consultant the written results of each inspection for inclusion in the permanent records of the audio and video system.

1. AUDIO

a. Measure and record the impedance of each active device operating as a source to any passive device or series of passive devices. Record the dc resistance of any build-out resistors used.

b. Measure and record the input impedance of any active device used to terminate passive devices, and record the total impedance of all such devices. Record the dc resistance of any terminating resistor used.

c. Measure the absolute polarity of all devices, including all loudspeakers in the signal path, correct and record any reversals.

d. Adjust the gain of all devices in the signal path for optimum signal-to-noise ratio and maximum crest factor.

e. Without changing gain, terminate microphone and line-level inputs, with shielded resistors of 150 and 600 ohms respectively.

f. Measure and record the overall hum and noise level at each power amplifier output. Level shall be at least 75 dB below rated power output of amplifier over a bandwidth of 40-16,000 Hz.

g. Measure and record the impedance of each loudspeaker line at 250, 1000, and 4000 Hz before connecting it to the output of its respective amplifier.

h. Load power amplifiers with resistors matching nominal impedance of output terminals used in system in place of actual loudspeaker loads.

i. Adjust gain of system as for hum and noise level tests above.

j. Apply 1,000 Hz. Sine-wave signal to each microphone and line-level input at level required to produce measured full amplifier output.

k. THD shall measure less than 1.0%.

l. Set up system for each specified mode of operation.

m. Use wide-bandwidth oscilloscope and loudspeaker monitoring.

n. Perform a comprehensive RF survey of the space. Check to ensure that system is free of spurious oscillation and RF pickup in the absence of any input signal and also with the system momentarily driven to full output at 400 Hz. Pay particular attention to surround spaces RF frequencies and potential interference.

o. Feed full/wide-dynamic range music to the system. Adjust the system for frequent peaks at its specified maximum sound pressure level.

p. Listen carefully for noise, rattle, or other extraneous sounds, and objectionable distortion.

q. Correct all causes of such defects. If cause is outside system, promptly notify the Construction Manager, and the Consultant, indicating cause and suggested corrective procedures.

r. Measure and record the acoustic distribution of the loudspeakers of this system at locations as designated by the Consultant, one (1) in every zone. Record the location of all position where any 1/3 octave band, deviates more than +/-3 dB from 500 Hz to 4 kHz, weighted by –5 at 800 Hz re: 2500 Hz.

2. VIDEO

a. Utilizing an NTSC color bar generator and waveform analyzer with the video signal set at 100% saturation and 75% amplitude check that the video performance specifications are met at the display devices from all source inputs to all system outputs. Connect the combined waveform monitor/ vectorscope to a final output point, e.g. an input to a picture monitor or video projector. Ensure that the test signal is routed to the selected output.

b. For all HDMI and RGBHV inputs, connect the output of the signal generator to a floor box/table/rack connector and select the SMPTE & PLUGE signal at the following computer scan rates:

(1) 640 x 480

(2) 640 x 480

(3) 800 x 600

(4) 1024 x 768

(5) 1280 x 720

(6) 1365 x 768

(7) 1600 x 1200

(8) 1920 x 1080

(9) 1920 x 1200

c. Check that the image is correctly displayed at all system outputs including the monitor(s) and/or by the video projector.

d. Repeat using Crosshatch, Checkerboard, and H Pattern Signals.

4.21 CLEANUP AND REPAIR

A. Upon completion of the work the AV Contractor shall remove all his refuse and rubbish from and about the premises, and shall leave the relevant areas and equipment clean and in an operational state. The AV Contractor shall be responsible for repairing any damage caused to the premises by the AV Contractor's installation activities, at no cost to the Owner.

4.22 SYSTEM ACCEPTANCE TESTS

A. System Acceptance Tests shall not be performed until the AV Contractor's System Checkout has been completed. The System Acceptance Tests shall be supervised by the Consultant, Owner Representative and Construction Manager and shall consist of the following:

1. A physical inventory shall be taken of all equipment on site and shall be compared to equipment lists in the specification section documents.

2. The AV Contractor shall demonstrate the operation of all system equipment.

3. Both subjective and objective tests shall be required by the Consultant, Owner’s Representative to determine compliance with the specifications. The AV Contractor shall be responsible for providing test equipment for these tests.

4. All final, “as-built" drawings, run sheets, manuals, and other required documents, otherwise known as “Close Out Documents” as detailed herein, shall be on hand. Two complete sets of these documents shall be delivered to the Owner at this time. (One complete set shall have been delivered to each the Consultant and Construction Manager prior to the scheduling of Acceptance Tests). See also section 1.06, E, 1.

5. In the event further adjustment is required, or defective equipment must be repaired or replaced, tests may be suspended or continued at the option of the Consultant and/or Owner.

4.23 OPERATION INSTRUCTION

A. The AV Contractor shall provide on-the-job training by a suitably qualified instructor, to personnel designated by the Owner, to instruct them in the operation and maintenance of the systems. At no additional cost to the Owner, the AV Contractor shall provide a manufacturer’s representative for such instruction in the event the AV Contractor does not have qualified instructors on staff for certain sophisticated equipment. All training shall take place after the systems are operational, but before the acceptance tests. There shall be a total of up to twenty-four (24) hours of training on the systems included in this specification, at the discretion of the owner.

B. The AV Contractor shall orally instruct and demonstrate, to personnel selected by the Owner, the Owner's Operating Manual and all final drawings as provided for in this Section.

C. This training session shall be performed independent of any acceptance testing procedures, and factory training at any manufacturer's facility. This training session shall be performed independent of any other clause in the Section.

D. A schedule shall be submitted clearly defining the training period two weeks prior to commencement of such training.

PART 5 – ITEMIZED PARTS LIST

A. The itemized parts list attached to this specification represents, to the best of our knowledge, all major components required for the construction of a complete and working system(s) as descried herein. It shall be the responsibility of the AV Contractor to verify that no item has been omitted that may be required for complete and working system(s). Any additional items may be listed on a separate sheet along with associated line item costs and submitted with the bid response.