



UNIVERSITY OF CALIFORNIA, DAVIS
MATERIEL MANAGEMENT/PURCHASING SERVICES
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REQUEST FOR PROPOSAL

RFP # 01-014170426AM

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The **UNIVERSITY** Web address for downloading this document and any updates or addendum until the submittal due date is:

<http://purchasing.ucdavis.edu/ucdbids/index.cfm>

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PROPOSAL FOR: Audio Visual System

REQUEST FOR PROPOSAL CONTENTS:

- Introduction
- Specification/Scope of Work
- General Information/Terms and Conditions
- Appendix A
- Drawings

Deviations from Specifications: Any deviation from the specifications shall be identified and fully described. The right is reserved to accept or reject proposals on each item separately, or as a whole, and to waive any irregularities in the proposal; irregularities may, however, render the proposal non-responsive.

Public Disclosure: Responses to Become Public Records:
All materials submitted in response to this solicitation become a matter of public record and shall be regarded as public record.

Designation of Confidential Information:

The Regents will recognize as confidential only those elements in each response, which are trade secrets as that term is defined in the law of California and which are clearly marked as "TRADE SECRET," "CONFIDENTIAL," or "PROPRIETARY." Vague designations and blanket statements regarding entire pages or documents are insufficient and shall not bind The Regents to protect the designated matter from disclosure.

The California Public Records Act limits The Regents' ability to withhold prequalification and bid data to trade secrets or records, the disclosure of which is exempt or prohibited pursuant to federal or state law. If a submittal contains any trade secrets that a Contractor does not want disclosed to the public or used by The Regents for any purpose other than evaluation of the Contractor's eligibility, each sheet of such information must be marked with the designation "Confidential." The Regents will notify the submitter of data so classified of any request to inspect such data so that the submitter will have an opportunity to establish that such information is exempt from inspection in any proceeding to compel inspection.

The Regents Not Liable for Required Disclosure:

The Regents shall not in any way be liable or responsible for the disclosure of any records if they are not plainly marked "TRADE SECRET," "CONFIDENTIAL," or "PROPRIETARY," or if disclosure is required by law or by an order of the court

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1. INTRODUCTION

The University of California, Davis, Architect & Engineering Department, is currently seeking bids for audio visual systems. The successful **BIDDER** shall provide all requested products and requirements listed below and shall coordinate delivery and scheduling with University's Representative.

1.2 BIDDER PRE-QUALIFYING CRITERIA

BIDDER eligibility to respond to this RFP is based on **BIDDER'S** ability to meet the qualification requirements listed below. The **UNIVERSITY**, in its sole discretion, reserves the right to determine whether any **BIDDER** meets the minimum eligibility standards, to determine whether a proposal is responsive, and to select a proposal which best serves its financial and program objectives. The **UNIVERSITY** reserves the right to reject all proposals.

If **BIDDER** cannot meet all qualification requirements as stated herein, **BIDDER'S** proposal shall be rejected without further consideration.

To have a proposal considered **BIDDER'S** must be well qualified in the following categories:

1. Successful installation of an equal or greater project of similar size, type, and complexity.
2. Ability to develop a fully operational system as jointly defined, portions of which can be installed and functioning within the agreed upon time frames.
3. Ability to commit to a multi-phase project with implications for long-term support.
4. Demonstrated track record of acceptable performance on similar projects, to be evaluated from comments of **BIDDER** references.
5. Submit confirmation of current state or local contracting licenses, as required to perform the work under this section.
6. Outline the general scope of past projects, normal staffing levels, and licensing status of shop as well as field installation personnel.
7. Ability to provide timely on site resources and support to UC Davis.

1.3 REFERENCES

Please list references of at least 3 customers that are currently using this solution in production under similar circumstances as UC Davis proposes. Upon successful **BIDDER** qualification, the **UNIVERSITY** may contact some or all of these references to better understand your services and performance levels. References should be of comparable size and complexity to the **UNIVERSITY** installation.

For each reference **BIDDER** must state contact names and telephone numbers and a brief description of the nature and outcome of each project.

Reference information shall be considered in determining **BIDDER** pre-qualification (see **Section 1.2** above) and may also be considered within the evaluation process in determining **BIDDER'S** compliance with applicable criteria.

The **UNIVERSITY** may contact references furnished by the **BIDDER**, in addition to other individuals not furnished by **BIDDER**. The **UNIVERSITY** is not limited to specific contacts at any reference company. The **UNIVERSITY** reserves the right to obtain and use, in its evaluation, information from sources not necessarily identified by **BIDDER**.

Furnishing incorrect and/or incomplete reference information may lead to **BIDDER'S** elimination from consideration for award. In addition, poor reference feedback shall eliminate **BIDDER** and **BIDDER'S** proposal rejected without further consideration.

Customer Account	Contact Information	Organization Name and Address	Context (list work performed and what information organization can provide)
Contact #1 Title	Tel. E-Mail:		
Contact #2 Title	Tel. E-Mail:		
Contact #3 Title	Tel. E-Mail:		

2. SPECIFICATIONS/SCOPE OF WORK

SECTION 27 41 00 COMMON WORK RESULTS FOR AUDIOVISUAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes, but is not necessarily limited to:
 - 1. Common standards and procedures for the Audiovisual Work.
 - 2. Design, engineer and provide complete, all means of support, suspension, attachment, fastening, bracing, and restraint (hereinafter "support") of the Audiovisual Systems. Provide engineering of such support by parties licensed to perform work of this type in the Project jurisdiction.
- B. Provisions of this Section apply to Audiovisual Systems Work, including the following Sections:
 - 1. Section 27 41 01 – Grounding and Bonding for Audiovisual Systems
 - 2. Section 27 41 02 – Hangers and Supports for Audiovisual Systems
 - 3. Section 27 41 03 – Conduits and Backboxes for Audiovisual Systems
 - 4. Section 27 41 06 – Noise and Vibration Controls for Audiovisual Systems
 - 5. Section 27 41 07 – Identification for Audiovisual Systems
 - 6. Section 27 41 08 – Audiovisual Cabinets, Racks, Frames and Enclosures
 - 7. Section 27 41 09 – Audiovisual Cable Management
 - 8. Section 27 41 16 – Integrated Audio-Video Systems and Equipment

1.2 REFERENCES

- A. Usage: In accordance with Division 01 - Regulatory Requirements

1.3 DEFINITIONS

- A. General Abbreviations used in these specifications. Refer additionally to the abbreviations list appearing on the Drawings.
 - 1. ADA Americans With Disabilities Act.
 - 2. AFC Above Finished Ceiling.
 - 3. AFF Above the Finished Floor.
 - 4. BLDG Building
 - 5. CAT Category
 - 6. CL Centerline
 - 7. DIV Division
 - 8. (E) Existing
 - 9. FBU Furnished By University
 - 10. HR Home Run
 - 11. ID Inside Diameter
 - 12. LAN Local Area Network
 - 13. MAX Maximum
 - 14. NIC Not In Contract.
 - 15. OD Outside Diameter
 - 16. PSRH Project Standard Receptacle Height.

- | | |
|----------|---------------------------------|
| 17. PSSH | Project Standard Switch Height. |
| 18. TYP | Typical |
| 19. UFE | University Furnished Equipment. |
| 20. UON | Unless Otherwise Noted. |

- B. Electrical and electronics terms used in the Audiovisual Systems Sections shall be as defined in:
1. ANSI/TIA/EIA-568-B.1
 2. ANSI/TIA/EIA-568-B.2
 3. ANSI/TIA/EIA-568-B.3
 4. ANSI/TIA/EIA-569-B
 5. ANSI/TIA/EIA-606-A
 6. IEEE Std 100
 7. This Section.
- C. Open Cable - Cabling that is not run in a raceway as defined by NFPA 70. This refers to cabling that is open to the space in which the cable has been installed and is therefore exposed to the environmental conditions associated with that space.
- D. Open Office - A floor space division provided by furniture, moveable partitions, or other means instead of by building walls.
- E. Pathway - A physical infrastructure utilized for the placement and routing of Audiovisual Systems cable.

1.4 SUBMITTALS

- A. Comply with Division 01 - Shop Drawings, Product Data and Samples and the following:
1. Submit all materials for review arranged in same order as Specifications, individually referenced to Specification Section, Paragraph and Contract Drawing number. Conform in every detail as applies to each referencing Section.
 2. Submit 8 1/2"x 11" items bound in volumes and drawings in edge bound sets. Submit all drawings on sheets of the same size.
 3. Make each specified submittal as a coordinated package complete with all information specified herein. Incomplete or uncoordinated submittals will be returned with no review action.
 4. Progress Schedule: Comply with Division 01 - Scheduling Requirements.
- B. Contractor and Key Personnel Experience.
1. A minimum of 30 days prior to installation, submit documentation of the experience of the low voltage systems, equipment and infrastructure contractor(s) and of their key personnel.
 2. Qualifications shall be provided for:
 - a. the low voltage systems, equipment and infrastructure contractor(s),
 - b. the low voltage systems, equipment and infrastructure installers,
 - c. and the supervisor(s) (if different from the installers).
 3. Refer to Quality Assurance paragraph in this section for complete requirements.
- C. Manufacturer's Product Data:
1. Manufacturer's Product Data Sheets. Collate in sequence of List of Materials:
 2. Data sheet for each item in each Audiovisual Systems Section, including all accessories, clearly marked for proposed product.

3. Material Safety Data Sheet, where applies.
4. List of Materials Schedule. For each item, include:
 - a. Referencing Specification Section
 - b. Referencing Paragraph
 - c. Referencing Drawing, if specified only on plans
 - d. Manufacturer.
 - e. Model number.
 - f. Listing, including name of Nationally Recognized Testing Laboratory.
 - g. Precede each submittal book with a summary schedule, with columns for each item above and rows for each item submitted.
 - i. Example:

Specification Section	Paragraph	Contract Drawing Reference	Manufacturer	Model No.	UL/CLA Listed
27 41 00	2.3 C.		XYZ	123	Y
27 41 03	2.7 A. 1.		AAA	34-56	Y
		AV7.02	ZZY	456	Y

D. Field (Installation) Drawings:

1. General
 - a. Drawings shall use the present the proposed installation using the makes and models of devices proposed for use this project; replace vendor neutral nomenclature used in bid set with.
 - b. Where the existing systems and/or infrastructure are used and integrated into the work of the project, indicate them on drawings, including points of interface and demarcation of existing and new work.
 - c. Collate, in sequence, at least the following minimum drawings, for each infrastructure and system to be installed under the work of this contract:
2. Drawing index/symbol sheet.
3. Site plans, floor plans and reflected ceiling plans.
 - a. General
 - i. The identifier for each termination and cable shall appear on the drawings, either directly on the floor plans, through an associated schedule or an unique identifier associated with a fully annotated single line diagram.
 - ii. Include wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure a coordinated installation. Drawings shall indicate adequate clearance for operation, maintenance, and replacement of operating equipment devices.
 - iii. At scale of Contract Documents, show:
 - (1) Device locations and type
 - (2) Rough-in.
 - (3) Mounting height.
 - (4) Conduit size.
 - (5) J-hook routes
 - (6) Wire type.
 - (7) Wire fill.

- iv. On the floor plans, indicate floor and wall mounted devices and pathway below a height of 7 feet above finish floor. Indicate the locations of the Audiovisual Program and Control Rooms and provide reference to the enlarged Audiovisual Program and Control Rooms plans.
 - v. On the reflected ceiling plan, indicate ceiling and wall mounted devices and pathway above a height of 7 feet above finish floor. Indicate the locations of the Audiovisual Program and Control Rooms and provide reference to the enlarged Audiovisual Program and Control Rooms plans.
 - b. Audiovisual Systems, including MATV Systems, Audiovisual Systems and Public and Mass Notification Systems
 - i. Indicate:
 - (1) Device locations, orientation and depict integration of systems that need to be viewed from the complete building perspective.
 - (2) For distributed speaker systems, indicate limits of zones of coverage.
 - (3) Vertical and horizontal pathways
 - (4) Equipment rooms and racks
 - (5) Reference to enlarged plans and related details.
- 4. Enlarged Plans
 - a. General
 - i. Indicate at least as much information as is provided in the Contract Documents, supplemented by the dimensions and arrangement of the proposed equipment, trade coordination and field conditions.
 - b. Audiovisual Systems
 - i. At equipment rooms
 - (1) Rack elevations, showing
 - (a) all equipment occupying the actual number of rack units required
 - (b) blank panels
 - (c) vent panels
 - (d) aux panels
 - (e) power strips
 - (f) UPS
 - (g) Reference mounting details.
- 5. System Conduit and Riser Diagrams,
 - a. General:
 - i. Wiring diagrams shall identify circuit terminals and indicate the internal wiring for each item of equipment and the interconnection between each item of equipment.
 - ii. Single line diagram of structured wiring
 - iii. Grounding and bonding scheme
 - iv. Terminal cabinets.
 - v. Coordination with floor plans.
 - vi. Wire runs not shown on floor plans.
 - vii. Wire type.
 - viii. Wire fill.
 - ix. Interface to work provided by work of other Sections, University Furnished Equipment, existing equipment and/or future equipment.

- x. For Audiovisual Systems, including MATV Systems, Audiovisual Systems and Public and Mass Notification Systems, indicate digital or analog signal type and voltage levels (dBmV, microphone, line level, speaker level) or optical signal levels.
- 6. Detail Drawings
 - a. Mounting details:
 - i. Specific details of restraints including anchor bolts submitted under the Section 27 41 02 – Hangers and Supports for Audiovisual Systems for mounting and maximum loading at each location, showing compliance and coordination with Code and the project Architectural, Structural and Mechanical Documents.
 - ii. Stamped and signed by an Engineer licensed in the Project jurisdiction for work of this type.
 - (1) Submit an accompanying Engineering analysis stamped and signed by an Engineer licensed in California for work of this type, indicating that the Equipment Enclosure System will comply with California Building Code for the Project Seismic Zone when loaded with the weight of the equipment submitted.
 - (2) Show calculations on drawings or in bound volume for review by Authorities having jurisdiction.
 - iii. Show loads, type and strength of connections, sizes, dimensions, materials, etc.
 - iv. Provide details for:
 - (1) Equipment Rack anchorage.
 - (2) Wall Mounted Racks and Enclosures.
 - (3) Wall and ceiling mounted projectors, cameras and loudspeakers weighing 20 pounds or more.
 - (4) Projection Screens
 - b. Faceplate and Receptacles
 - i. Receptacle and jack arrangement for each condition.
 - ii. Labeling of receptacle/jacks and plate
 - iii. Plate material.
 - iv. Plate finish.
 - v. Connector types.
 - vi. Connector dimensioned layout.
 - c. Pathway
 - i. Firestopping
 - ii. Details of flexible raceway connections to be made to vibrating equipment
 - iii. Details of J-Box and sealant application for the typical conditions listed in Section 27 41 06 – Noise and Vibration Controls for Audiovisual Systems, and a schedule of rooms to receive application of mastic and sealant at J-Boxes
 - iv. An itemized list of all items of equipment to be fitted with flexible electrical connections.
 - v. Conduit racking details.
 - d. California Access Compliance Manual and Americans with Disabilities Act (ADA) compliance.
 - e. For systems with contractor or manufacturer programmed control and human interfaces submit at least:
 - i. Narrative of the sequence of operation.

- ii. Color, full-size layouts of each touchpanel and/or computer screen (menu) image, cross-referenced to the sequence of operations.
 - iii. Show chaining of sub-menus.
 - f. Terminal cabinets: Terminations.
- E. Test Plan
 - 1. Submit complete documentation of the proposed test plan and equipment to be used to document that the performance of the cabling, equipment, sub-systems and complete systems installed under the work of this project conform with the performance standards outlined in each specification section.
 - 2. Submit not less than 45 days prior to the proposed test date. Include procedures for certification, validation, and testing.
- F. Test Reports
 - 1. Manufacturer's Field Reports
 - a. Factory reel tests
 - 2. Project Site Test Reports:
 - a. Submit following system completion and prior to and as condition precedent to Acceptance Review and Testing of the Work of this Section.
 - b. Schedule: Submit test reports in timely manner relative to Project schedule such that the University's Representative may conduct verification of submitted test data without delay of scheduled progress.
 - c. Project Site test report:
 - d. Content: Include at least:
 - i. Time and date of test.
 - ii. Personnel conducting test.
 - iii. Test equipment, including serial and date of calibration.
 - iv. Test object.
 - v. Procedure used.
 - vi. Results of test
 - vii. Numerical or graphical presentation.
 - e. Submit copy of final results on paper and in electronic form, organized by circuit number, consistent with circuit numbering scheme used in preparing submittal drawings and in labeling receptacles and terminations.
 - i. Submit machine-generated documentation and raw data of all test results in electronic form on CD-R media
 - ii. Where the electronic documentation requires use of a proprietary computer program to view the data, provide the University with 1 licensed copy of the software.

1.5 QUALITY ASSURANCE

- A. Procedures: In accordance with Division 01 - Quality Requirements.
- B. Designated Supervisor: Provide a designated supervisor present and in responsible charge in the fabrication shop and on the Project Site during all phases of installation and testing of the Work of this Section. This supervisor shall be the same individual through the execution of the Work unless illness, loss of personnel, or other circumstances reasonably beyond the control of the Contractor intervene.
- C. Reference Documents: At all times when the work is in progress, maintain at the workplace, fabrication shop or Project Site as applies.
 - 1. A complete set of the latest stamped, actioned submittals of record.

2. A complete set of manufacturer's original operation, instruction and service manuals for each equipment item.

D. Standard Products.

1. Audiovisual Systems Equipment. Provide Audiovisual Systems materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship. Products shall have been in satisfactory commercial or industrial use for six months prior to bid opening. The six month period shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the six month period.
 - a. Alternative Qualifications. Products having less than a 1-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 2500 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished.
2. Material and Equipment Manufacturing Date
 - a. Products manufactured more than 3 years prior to date of delivery to site shall not be used, unless specified otherwise.

E. Test Equipment

1. Requirements:
 - a. Maintain and operate test equipment at the fabrication shop and the job site for both routine and Acceptance Testing of the Work of this Section.
 - b. Maintain test equipment at the job site while work is in progress from installation of equipment racks until University's Acceptance of this Work; thereafter remove all of this test equipment from the job site.
 - c. Unless otherwise indicated, test equipment shall remain property of the Contractor.
 - d. Provide all required test cables, jigs and adapters.
 - e. Provide equipment with traceable calibration, with calibration date not greater than one year prior to the date of the use of the equipment to perform the specified testing.

F. Qualifications

1. Audiovisual Systems work shall be performed by and the equipment shall be provided by the Audiovisual Systems contractor and key personnel.

Qualifications shall be provided for:

 - i. the Audiovisual Systems contractor,
 - ii. the Audiovisual Systems installer,
 - iii. and the supervisor (if different from the installer).
- b. A minimum of 30 days prior to installation, submit documentation of the experience of the Audiovisual Systems and of the key personnel.
2. Key Personnel, General
 - a. Indicate the proposed key persons that are currently employed by the Audiovisual Systems contractor or who have a commitment to the low voltage systems and infrastructure contractor for the work of this project. All key persons shall be employed by the low voltage systems and infrastructure contractor at the date of issuance of this project, or if not, have a commitment to the low voltage systems and infrastructure contractor to work on this project by the date that the bid was due to the University's

- Representative.
- b. Note that only the key personnel approved by the University's Representative in the successful proposal shall perform work on this project's low voltage systems and infrastructure systems. Key personnel shall function in the same roles in this contract, as they functioned in the offered successful experience. Any substitutions for the low voltage systems and infrastructure contractor's key personnel requires approval from the University's Representative.
3. Audiovisual Systems Installer
- a. The installer of the audiovisual systems shall be a firm regularly and professionally engaged in the business of installation, configuration and testing of the specified audiovisual systems and equipment.
 - i. Where the manufacturers of the specified and contractor proposed systems provide mandatory installer and programming training programs, the Contractor's programming and installation staff shall provide documentation to demonstrate their successful completion of the relevant training programs for the types and versions of equipment proposed for installation on this Project.
 - ii. Where the manufacturer of the specified and contractor proposed systems and equipment lawfully restricts sales of their equipment to a network of dealers, the contractor shall provide documentation to their standing as such a dealer in good standing at the time of bid submittal.
 - iii. The audiovisual systems contractor shall demonstrate experience in providing successful audiovisual systems of a similar scope and nature of those required by the work of this Project within the past 3 years.
 - iv. Submit documentation for a minimum of three and a maximum of five successful audiovisual system installations for the audiovisual systems contractor.
 - b. Key Personnel
 - i. Provide key personnel who are regularly and professionally engaged in the business of the installing, programming, configuring and testing of the specified audiovisual systems and related presentations and equipment.
 - (1) There may be one key person or more key persons proposed for this project depending upon how many of the key roles each has successfully provided.
 - (2) Each of the key personnel shall demonstrate experience in providing successful audiovisual systems of a similar nature scope and extent to those required by the work of this Project within the past 3 years.
 - (3) Provide specific documentation indicating that the proposed key personnel have obtained factory sponsored training and certification in the programming, configuration and adjustment of the software based controls and audiovisual systems equipment required by the work of this Project. Provide documentation demonstrating current certification of proposed personnel conforming with the requirements of this Section.

1.6 REGULATORY REQUIREMENTS

- A. Regulations Applicable: Including but not limited to those defined in Division 01 - Regulatory Requirements.
 - 1. Nothing in the Contract Documents shall be construed to permit Work not conforming to applicable laws, ordinances, rules, or regulations.
 - 2. Safety Agency Listing: All devices provided under the Work of this Section which are connected to the Project electrical system shall be listed by a Nationally Recognized Testing Laboratory, and shall be so labeled.
 - 3. In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the University's Representative. Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of NFPA 70 unless more stringent requirements are specified or indicated.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Procedures:
 - 1. As specified in the individual sections of Division 27 and the following.
 - a. Provide protection from weather, moisture, extreme heat and cold, dirt, dust, and other contaminants for cabling and equipment placed in storage.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Connecting hardware shall be rated for operation under ambient conditions of 32 to 140 degrees F and in the range of 0 to 95 percent relative humidity, non-condensing.

1.9 SEQUENCING

- A. Not Used

1.10 OPERATING AND MAINTENANCE DATA

- A. Commercial off the shelf manuals shall be furnished for operation, installation, configuration, and maintenance of products provided as a part of the low voltage systems, equipment and infrastructure work of this Project. Precede the manuals with a systems narrative specific to this Project, outlining the major systems functionality, the major systems components, and identifying which manuals document the performance of which subsystems.
 - 1. Submit operations and maintenance data in accordance with Division 01 – Record Documents and as specified herein not later than 2 months prior to the date of beneficial occupancy.

1.11 PROJECT RECORD DOCUMENTS

- A. Comply with Division 01 – Record Documents, and the following. Include at least as much information as required for the submittal drawings.
 - 1. Record Drawings
 - a. CAD.
 - i. Use a computer aided drafting (CAD) system in the preparation of record drawings for this Project. CAD system shall produce files in AutoCAD® .DWG format, version 2000 or later.
 - b. Except where prohibited by Contract, University's Representative will furnish

- CAD backgrounds in AutoCAD® .DWG format, for use by the Contractor in preparing Record Drawings.
- c. Contractor shall be responsible for updating building and communications plans to reflect as-built conditions.
 - i. Indicate actual work on Drawings; indicate actual products used, replace vendor neutral nomenclature used in bid set with makes and models of actual installed devices.
- d. Disk copy of Record Drawings: Provide 2 separate copies of each drawing file in the format noted above. Submit on CD-R disk.
- e. Reproduceables: Provide 1 set of Mylars.
- 2. Software
 - a. Controls and DSP Systems
 - i. Provide licensing for project specific software programming at programmable devices.
 - ii. Provide licensing and original software copies for each device provided that uses software for operation, configuration or control.
 - iii. Provide licensing for required workstation operating systems, and required third party software.
 - iv. For controls systems, provide a complete copy of the source code, including the device interface driver code modules.
 - v. Upgrade each software package to the release in effect at the end of the Warranty Period.
 - b. Provide at least a copy of software with at least 1 user license if required to view submitted test data.
- 3. Spare Parts
 - a. In addition to the requirements of Division 01 - Record Documents, provide a complete list of parts and supplies, with current unit prices and source of supply, and a list of spare parts recommended for stocking.

1.12 WARRANTY SERVICE

- A. In addition to provisions of 01780 – Guaranties, Warranties, Bonds and Maintenance Contracts, provide the following.
 - 1. Response Time: Provide a qualified technician familiar with the work at the Project Site within 24 hours after receipt of a notice of malfunction. Provide the University's Representative with telephone number attended 8 hours a day, 5 days a week, to be called in the event of a malfunction.
- B. Provide all additional Warranties as defined in each Audiovisual Systems Section.

1.13 ACCEPTANCE REVIEW AND TESTING PROCEDURES

- A. Complete all Work of this Section. Submit Test Report. Submit review copies of Operating and Maintenance Manuals, less reduced set of Record Drawings. Notify the University's Representative in writing that the Work of these Sections is complete and fully complies with the Contract Documents. Request Acceptance Review and Testing. The University's Representative will conduct Verification of Submitted Test Data, and otherwise direct testing and adjustment of this Work. These procedures may be performed at any hour of the day or night as required by the University's Representative to comply with the Project Schedule and avoid conflict with Residents. Provide all specified personnel and equipment at any time without claim for additional cost or time.

- B. Personnel: Provide services of the designated supervisor and additional technicians familiar with work of this Section. Provide quantity of technicians as required to comply with Project Schedule.
- C. In Addition, Provide:
 - 1. All tools appropriate for performance of adjustment of and corrections to this Work. Include spare wire and connectors and specified tooling for application.
 - 2. Ladders, scaffolding and/or lifts as required to access high devices.
 - 3. All test equipment.
 - 4. Complete set of latest stamped, actioned submittals of record for reference.
 - 5. Complete set of Test Reports.
 - 6. Complete set of manufacturer's original operation, instruction and service manuals for each equipment item for reference.
 - 7. Demonstrate: Complete operation of all systems and equipment, including Portable Equipment.
 - 8. Adjust: As directed by the University's Representative.
 - 9. Correct: In timely manner, failure to comply with the Contract Documents, as reasonably determined by the University's Representative.
- D. Temporary Equipment: Provide and operate, without claim for additional cost or time, temporary equipment and/or systems to provide reasonably equivalent function, as determined by the University's Representative, in place of the Work of this Section which is incomplete or found not in conformance with the Contract Documents as of seven (7) days prior to the scheduled completion date. Provide such temporary equipment until Acceptance of the Work of this Section. Thereafter, remove such temporary equipment.

1.14 CLOSEOUT

- A. Punch List: Perform any and all remedial work, at no claim for additional cost or time. Where required, retest and submit Test Report. Notify the University's Representative of completion of Punch List.
- B. Portable Equipment: Furnish all portable equipment and spares to the University's Representative, along with complete documentation of the materials presented. Where applicable, furnish portable equipment in the original manufacturer's packing.
- C. Operating and Maintenance Data: Install framed operating and maintenance instructions. Submit Manuals.
- D. Project Record Documents: Submit print and digital copies. Digital files shall be in CAD system shall produce files in AutoCAD® .DWG format, latest version at time of bid. (University Standard, no substitution permitted) as defined above.
- E. Keys: If applicable, replace construction locks with permanent locks. Provide 5 sets of keys to the University's Representative.
- F. Instruction: Conduct specified instruction.
- G. Warranty: Submit Warranty dated to run from date of Acceptance of the Work of this Section.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Where a particular material, device, piece of equipment or system is specified directly, the current manufacturer's specification for the same shall be considered to be a part of these specifications, as if completely contained herein in every detail.
- B. Each material, device or piece of equipment shall comply with all of the manufacturer's current published specifications for that item.
- C. Products shall be made by manufacturers regularly engaged in the production of such products.
- D. Provide quantity as shown on Contract Drawings, or as otherwise indicated.
- E. Provide all auxiliary and incidental materials and equipment necessary for the operation and protection of the Work of this Section as if specified in full herein.
- F. Unless recycled content is specified, provide new materials.
- G. Provide the manufacturer's latest design/model, permanently labeled with the manufacturer's name, model number and serial number.
- H. Where products are of similar type or use, provide products of the same manufacturer, unless otherwise indicated.
- I. Components
 - 1. UL or third party certified. Cabling and interconnecting hardware and components for Audiovisual Systems shall be UL listed or third party independent testing laboratory certified, and shall comply with NFPA 70 and conform to the requirements specified herein.
 - 2. Where equipment or materials are specified to conform to industry and technical society reference standards of the organizations, submit proof of such compliance.
 - a. The label or listing by the specified organization will be acceptable evidence of compliance.
 - b. In lieu of the label or listing, submit a certificate from an independent testing organization, competent to perform testing, and approved by the University's Representative.
 - c. The certificate shall state that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard.
- J. Enclosures:
 - 1. Provide steel frames and enclosures designed and wired to eliminate all induced currents.
 - 2. Make bolted connections with self-locking devices.
- K. Finishes: Any item or component of the Work of this Section which is visible shall comply with the following.
 - 1. Finishes noted or scheduled on the Contract Drawings take precedence.
 - 2. Where design location requires that products, materials or equipment are visible to the public, no manufacturer's logos larger than 1/2 inch shall be visible. Unless

- otherwise noted or directed, neatly remove or permanently paint out such logos.
3. Where finishes are not noted or otherwise defined in the Contract Documents, submit manufacturer's standard finish samples for selection by the University's Representative.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine existing conditions before starting work. Submit conflicts in a timely manner for resolution

3.2 WIRING CLASSIFICATION AND RELATED

- A. Audio Signal Wiring Classification:
 1. Type A-1: Microphone level wiring less than -30 dBu, 20 Hz to 20 kHz.
 2. Type A-2: Line level wiring -30 dBu to +24 dBu, 20 Hz to 20 kHz.
 3. Type A-3: Loudspeaker level or circuit wiring greater than +24 dBu, from 20 Hz to 20 kHz.
- B. Video and Related Signal Wiring Classification:
 1. Type V-1: Baseband and composite video wiring 1 volt peak-to-peak into 75 ohms, 0 to 10.0 MHz.
 2. Type V-2: Synchronization and switching pulse wiring 4 volts peak-to-peak into 75 ohms, 15.62 to 15.75 kHz.
 3. Type V-3: Color subcarrier wiring 0 to 4 volts peak-to-peak into 75 ohms, 3.57 to 4.43 MHz.
 4. Type V-4: MATV system wiring 0.1 to 1000 microVolts peak-to-peak into 50 or 75 ohms, 47 to 890 MHz.
- C. Control Signal Wiring Classifications:
 1. Type C-1: DC control wiring 0 to 50 volts.
 2. Type C-2: Synchronous control or data wiring 0 to 40 volts, peak-to-peak.
 3. Type C-3: AC control wiring 0 to 48 volts, 60 Hz.
- D. Additional Wiring Classifications:
 1. Type M-1: DC power wiring 0 to 48 volts.
 2. Type M-2: AC power wiring greater than 50 volts, 60 Hz.
 3. Wiring Combinations:
- E. Except as indicated herein, conduit, wireways and cable bundles shall contain only wiring of a single classification. The following combinations are acceptable in conduit, or cable harnesses. Additional acceptable combinations may be indicated on the Drawings.
 1. Types A-1, C-1, and M-1.
 2. Types A-2, C-1, C-2, and M-1, runs less than 20 feet.
 3. Types A-2, C-1, and M-1.
 4. Types A-3, C-1, C-2, and M-1.
 5. Types A-2, V-1, and V-3.
 6. Types V-1, V-2, V-3, and C-1.
 7. Types M-2 and C-3.

3.3 PREPARATION

- A. Prepare and sequence the work to minimize disruption to each room environment and existing Audiovisual Systems.
- B. Protection: Cover all computers, electronic equipment, desks, chairs, furniture and other articles when working at ceiling level and/or performing dust producing tasks.

3.4 REPAIR AND RESTORATION

- A. Where working in spaces occupied by the University, return to their original positions any furniture or articles relocated to perform the work.

3.5 CLEANING

- A. Where working in spaces occupied by the University:
 - 1. Immediately after completing work within each space, clean up and remove all materials, scrap and dust.
 - 2. All scrap material in work area shall be picked up and removed from the building at the end of each day. See also Division 01 - Record Documents for additional requirements.
 - 3. All dust resulting from work performed shall be vacuumed up daily.
 - 4. All scrap material shall be removed from Campus and disposed of in an authorized disposal site. Refer to Division 01 - Cleanup and Disposal for Project Procedures.

END OF SECTION 27 41 00

SECTION 27 41 01 GROUNDING AND BONDING FOR AUDIOVISUAL SYSTEMS

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Section includes grounding and bonding of Audiovisual Systems Work, including but not limited to:
 - 1. Audiovisual Raceways
 - 2. Cable Runway
 - 3. Cable Shields
 - 4. Protector Fields
 - 5. Audiovisual Cabinets and enclosures.
- B. Related Work Under Other Sections
 - 1. Section 27 41 00 – Common Work Results for Audiovisual Systems
 - 2. Section 27 41 02 – Hangers and Supports for Audiovisual Systems
 - 3. Section 27 41 03 – Conduits and Backboxes for Audiovisual Systems
 - 4. Section 27 41 08 – Audiovisual Cabinets, Racks, Frames and Enclosures
 - 5. Section 27 41 09 – Audiovisual Cable Management
 - 6. Section 27 41 16 – Integrated Audio-Video Systems and Equipment

1.2 SYSTEM DESCRIPTION

- A. Provide Audiovisual system grounding conductor as described herein and indicate on drawings.
- B. Except as otherwise indicated, the complete communications installation including the , metallic conduits and raceways, cable trays, boxes, cabinets and equipment shall be completely and effectively grounded in accordance with all code requirements, whether or not such connections are specifically shown or specified.
- C. Resistance:
 - 1. Resistance from the farthest ground bus through the ground electrode to earth shall not exceed 5 Ohms or the requirements of ANSI-J-STD-607-A-2002, whichever is more restrictive.

1.3 REFERENCES

- A. American National Standards Institute (ANSI)
 - 1. ANSI/TIA/EIA-606-A-2002 Administration Standard for Commercial Telecommunications Infrastructure
 - 2. ANSI-J-STD-607-A-2002 Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications
 - 3. Underwriters Laboratories (UL)
 - 4. UL 467 (1993); R 2004 Grounding and Bonding Equipment

1.4 SUBMITTALS

- A. Conform with the requirements of Division 01 - Shop Drawings, Product Data and Samples and Section 27 41 00 - Common Work Results for Audiovisual Systems.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Equal products by the following manufacturers will be considered providing that all features of the specified product are provided:
1. Ground Rod:
 - a. High strength high carbon steel, with electrolytically bonded jacket of copper on surface
 - b. UL spec. 467
 - c. ANSI C-33.8-1072.
 - d. Manufacturer:
 - i. Allied Bolt
 - ii. Inwesco 12A60
 - iii. Blackburn
 - iv. Cooper Power Systems
 - v. Weaver.
 - vi. Erico "Cadweld" Products, Inc.
 - vii. ITT Blackburn.
 - viii. Or equal.
 2. Ground Wells:
 - a. Christy Concrete Products, Inc.
 - b. Forni Corp.
 - c. Or equal.
 3. Ground Bushings, Connectors, Jumpers and Bus:
 - a. O-Z/Gedney.
 - b. Thomas & Betts Corp.
 - c. Or equal.
 4. Compression Connector Lug
 - a. Panduit
 - b. B-Line SB-479 Series
 - c. Thomas & Betts
 - d. Or equal.
 5. Ground Bus Bar
 - a. CPI
 - b. B-Line
 - c. Panduit
 - d. or equal.
 6. Rack and Cabinet Grounding
 - a. Panduit Structured Ground Kit
 - b. Chatsworth Products Inc.
 - c. or equal.
 7. Bonding Ribbon:
 - a. Annealed solid copper 3/8 inch wide x 1/16 inch thick, tin plated.
 - b. Manufacturer:
 - i. Inwesco 12A55
 - ii. Corning Cable Systems
 - iii. Preformed Line Products.
 - iv. or equal.
 8. Bonding Ribbon Clamp:
 - a. Soft lead

- b. 1/16 inch thick
 - c. Bolt hole for attachment
 - d. Manufacturer:
 - i. Inwesco 12A56
 - ii. Corning Cable Systems
 - iii. Preformed Line Products.
 - iv. Or equal.
- 9. Fargo Clamp:
 - a. Cast copper, silver plated, furnished with copper bolt.
 - b. RUS Listed
 - c. Manufacturer:
 - i. Allied Bolt
 - ii. Inwesco 12A57
 - iii. Corning Cable Systems
 - iv. or equal.
- 10. Ground Inserts:
 - a. Cast Bronze w 1/4 Copper Rod.
 - b. Provide minimum one each maintenance hole or vault.
 - c. Manufacturer:
 - i. Inwesco 12H69
 - ii. or equal by vault or manhole manufacturer.
 - iii. or equal.

2.2 GROUND CONDUCTORS

- A. General purpose insulated: UL listed and code sized copper conductor, with dual rated THHN/THWN insulation, color identified green. Where continuous color-coded conductors are not commercially available, provide a minimum 4" long color band with green, non-aging, plastic tape in accordance with NEC..
- B. Bonding pigtails: Insulated copper conductor, identified green, sized per code, and provided with termination screw or lug. Provide solid conductors for #10 AWG or smaller and stranded conductors for #8 AWG or larger.

2.3 COMPRESSION CONNECTOR LUG

- A. Description
 - 1. Connector lug with compression connection to conductor.
 - 2. Copper alloy body.
 - 3. Provide lug size to match conductor being terminated.
 - 4. Provide 2 hole pattern lugs.
 - 5. Provide each lug with silicon bronze hardware, including 2 bolts, 2 split lock washers and 2 nuts.

2.4 INSULATED GROUNDING BUSHINGS

- A. Plated malleable iron or steel body with 150 degree Centigrade molded plastic insulating throat and lay-in grounding lug.

2.5 CONNECTIONS TO PIPE

- A. For cable to pipe: UL listed bolted connection complying with CEC requirements.

2.6 CONNECTIONS TO STRUCTURAL STEEL, GROUND RODS, OR SPLICES

- A. Where required by the Drawings or Specifications, grounding conductors shall be spliced together, connected to ground rods or connected to structural steel using exothermic welds or high pressure compression type connectors.
 - 1. Exothermic welds shall be used for cable-to-cable and cable-to-ground rod and for cable to structural steel surfaces. Exothermic weld kits shall be as manufactured by Cadweld, Thermoweld or equal. Each particular type of weld shall use a kit unique to that type of weld.
 - 2. High-pressure compression type connectors shall be used for cable-to-cable and cable-to-ground rod connections. Connections shall be as manufactured by Thomas & Betts #53000 series, Burndy "Hy-Ground" or equal.

2.7 EXTRA FLEXIBLE, FLAT BONDING JUMPERS

- A. Where required by the drawing or specified herein.

PART 3 - EXECUTION

3.1 GENERAL

- A. Provide Grounding and Bonding according to the most restrictive requirements of:
 - 1. ANSI-J-STD-607-A.
 - 2. California Electrical Code Article 250 and references therein.
 - 3. California Electrical Code Article 800.
- B. In the event of conflicting requirements, National Electrical Code requirements shall prevail.
- C. Point of Connection
 - 1. Under Work of this Section, make connections to Communications Ground Busbars provided under Work of Section 16060 - Grounding and Bonding
 - 2. Mechanical Connections
- D. Make connections bare metal to bare metal.
 - 1. Where required, remove paint to bare metal, make grounding or bonding connection, and touch up paint.
 - 2. Torque threaded fasteners to manufacturer's recommended values.
- E. Compression Connections
 - 1. Make compression connections with the lug or fitting manufacturer's recommended tooling, with the tooling set to the recommended force and stroke.
- F. Audiovisual Raceways and Sleeves
 - 1. Bond metallic raceway and sleeves to the Ground Busbar at the Audiovisual Systems Room that serves the related Audiovisual Systems Receptacle.
 - 2. Where a metallic raceway connects two or more Audiovisual Rooms, bond to the Ground Busbar at each.
- G. Cable Shields
 - 1. Comply with California Electrical Code Article 800.
- H. Protector Fields
 - 1. Comply with California Electrical Code Article 800.

- I. Audiovisual Cabinets and enclosures
 - 1. Bond to the Ground Busbar at the Audiovisual Systems Room.
- J. Emergency/Information Telephone enclosures
 - 1. Bond as detailed on Audiovisual Systems Drawings.

3.2 LABELING

- A. Provide labeling according to the requirements of:
 - 1. ANSI/TIA/EIA-606-A.
 - 2. Section 27 41 07 - Identification for Audiovisual Systems.

END OF SECTION 27 41 01

SECTION 27 41 02 HANGERS AND SUPPORTS FOR AUDIOVISUAL SYSTEMS

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. The work covered under this section consists of the furnishing of all necessary labor, supervision, materials, equipment, and services to completely execute the provision of communications supports and cable hook system as described in this specification, including but not limited to:
 - 1. Strut supports
 - 2. Cable Hooks (J-hooks)
 - 3. Beam clamps
 - 4. Concrete Fasteners
 - 5. Touch-Up Materials
 - 6. Conduit supports.
 - 7. Equipment supports.
 - 8. Fastening hardware.
- B. Related work: Consult all other Sections, determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to produce a complete installation.
 - 1. Section 03300 – Cast-in-place Concrete. Concrete equipment pads.
 - 2. Division 5: Miscellaneous metals. Hangers for electrical equipment.
 - 3. Section 09 51 00 – Acoustical Ceilings. Slack fixture support wires.
 - 4. Section 27 41 00 – Common Work Results for Audiovisual Systems
 - 5. Section 27 41 01 – Grounding and Bonding for Audiovisual Systems
 - 6. Section 27 41 03 – Conduits and Backboxes for Audiovisual Systems
 - 7. Section 27 41 06 – Noise and Vibration Controls for Audiovisual Systems
 - 8. Section 27 41 07 – Identification for Audiovisual Systems
 - 9. Section 27 41 08 – Audiovisual Cabinets, Racks, Frames and Enclosures
 - 10. Section 27 41 09 – Audiovisual Cable Management
 - 11. Section 27 41 16 – Integrated Audio-Video Systems and Equipment

1.2 SYSTEM DESCRIPTION

- A. Provide devices specified in this Section and related Sections for support of communications equipment specified for this Project.
- B. Provide support systems that are adequate for the weight of equipment, conduit and wiring to be supported.

1.3 REFERENCES

- A. American Society For Testing and Materials (ASTM)
 - 1. ASTM A123/A123M-02 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
 - 2. ASTM A153/A153M-04 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
 - 3. ASTM B633-98e1 Specification for Electro-deposited Coatings of Zinc on Iron and Steel.

4. ASTM A653/A653M-04a Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- B. American National Standards Institute (ANSI)
1. ANSI/TIA/EIA-568-B.1-2001, Commercial Building Telecommunications Cabling Standard – Part1: General Requirements
 2. ANSI/TIA/EIA-568-B.2-2001, Commercial Building Telecommunications Cabling Standard – Part2: Balanced Twisted Pair Cabling Components
 3. ANSI/TIA/EIA-568-B.3-2000, Optical Fiber Cabling Components Standard
 4. ANSI/ TIA/ EIA 569-B Commercial Building Standard for Telecommunications Pathways and Spaces
- C. National Fire Protection Association
1. NFPA 70, National Electrical Code

1.4 SUBMITTALS

- A. Conform with the requirements of Division 01 - Shop Drawings, Product Data and Samples and Section 27 41 00 - Common Work Results for Audiovisual Systems and the following:
1. As part of the project submittals, the contractor to provide engineered shop drawings indicating the proposed design for mounting all work of this Division weighing more than 20 pounds, inclusive of mounting systems, and for equipment mounted at the exterior, inclusive of its effective wind load under conditions the range of conditions experience
 - a. Shop drawings to be accompanied by anchorage calculations indicating that it shall remain attached to the mounting surface after experiencing forces in conformance with CCR, Title 24, Table 23P, Part II and with Section 2312 "Earthquake Regulations" of the "Uniform Building Code" for Seismic Zone 4 Area, Importance Factor of 1.25.
 - b. Structural Calculations shall be prepared and signed by a California Registered Structural Engineer. Specify proof loads for drilled-in anchors, if used.

1.5 QUALITY ASSURANCE

- A. All materials, equipment and parts comprising the units specified herein shall be new and unused, and of current manufacturer.
- B. Cable hooks shall be listed and labeled by Underwriters Laboratories (UL) as required.
- C. Cable hooks shall have the manufacturers name and part number stamped in the part itself for identification.

PART 2 - PRODUCTS

2.1 SUPPORTING DEVICES

- A. General
1. Supports to be sized to suit load and selected to match mounting conditions
- B. Manufacturers
1. Equal products by the following manufacturers will be considered providing that all features of the specified product are provided:

- a. Concrete fasteners:
 - i. Phillips "Red-Head".
 - ii. Remington.
 - iii. Ramset.
 - iv. Hilti
 - v. Simpson Strong-Tie
 - vi. or equal.
 - b. Concrete inserts and construction channel:
 - i. Unistrut Corp.
 - ii. GS Metals "Globe Strut."
 - iii. Thomas & Betts "Kindorf" Corp.
 - iv. Or equal.
 - c. Conduit straps:
 - i. O-Z/Gedney.
 - ii. Erico "Caddy" Fastening Products.
 - iii. Thomas & Betts "Kindorf" Corp.
 - iv. Or equal.
 - d. Beam Clamps
 - i. Cooper B-Line
 - ii. SuperStrut
 - iii. Unistrut
 - iv. or equal
 - e. Aircraft Cable Sway Braces
 - i. Mason Industries
 - ii. M.W. Sausse/Vibrex
 - iii. Loos & Company, Inc.
 - iv. or equal.
- C. Concrete Fasteners
- 1. Provide expansion-shield type concrete anchors.
 - 2. Provide powder driven concrete fasteners with washers. Obtain approval by University's Representative prior to use.
- D. Concrete Inserts
- 1. Provide pressed galvanized steel, concrete spot insert, with oval slot capable of accepting square or rectangular support nuts of ¼ inch to ½ inch diameter thread for rod support.
- E. Aircraft cable sway braces
- 1. Steel rope sized to meet load.
- F. Construction Channel:
- 1. Construction:
 - a. 1-5/8" square galvanized channel formed from U.S.S.G No. 12 or 0.109 inch cold formed steel with 17/32-inch diameter bolt holes, and 1-1/2 inch on center in the base of the channel.
 - b. 10 foot sections.
 - 2. All supporting materials by same manufacturer.
- G. Beam Clamps
- 1. Malleable iron electro-galvanized steel beam clamps selected to match building structural steel members.

H. Conduit Straps

1. One hole strap, steel or malleable iron, with malleable iron clamp-back spacer for surface mounted wall and ceiling applications.
 - a. Use malleable strap with spacers for exterior and wet locations.
 - b. Use steel strap without spacers for interior locations.
2. Steel channel conduit strap for support from construction channel.
3. Steel conduit hanger for pendant support with threaded rod
4. Steel wire conduit support strap for support from independent #12 gauge hanger wires.

I. Threaded rods, couplings, screws and nuts:

1. Electrolytically coated with zinc, 2 oz. zinc per square foot of surface, ASTM A123 or A153.

J. Miscellaneous Parts

1. Hot dipped galvanized after fabrication; after cutting, de-burring and hole drilling. Coated with zinc, 2 oz. zinc per square foot of surface, ASTM A123 or A153.

K. Paint/Tape for Touch-up:

1. Zinc: CRC "Zinc-It", Glyptal, Enterprise Galvanizing "Galambra", or equal.

2.2 CABLE HANGERS

A. Ceiling Hung J-Hooks

1. Drawing Reference(s):
 - a. WMJ
 - b. ACJ
2. Features/Functions/Construction
 - a. Specifically intended to carry the load of up to 50 communications cables without applying excess forces to cables at bottom of bundle.
 - b. Integral broad bottom edge to spread cable load with flat bottom and provide a minimum of 1-5/8 inch cable bearing surface.
 - c. Integral hanger rod attachment hardware at top.
 - d. Load rated for application.
 - e. Incorporates smooth 90-degree radiused edges to prevent snagging cable jackets on installation.
 - f. Designed so the mounting hardware is recessed to prevent cable damage.
 - g. Integral mechanical cable latch retainer to provide containment of cables within the hook. The retainer shall be removable and reusable.
 - h. Suitable for direct attachment to walls, hanger rods, beam flanges, purlins, strut, floor posts, etc. to meet job conditions.
 - i. Multi-tiered cable hooks to be used where required to provide separate cabling compartments, or where additional capacity is needed.
 - j. Finishes:
 - i. Cable hooks for non-corrosive areas shall be pre-galvanized steel, ASTM A653. Where additional strength is required, cable hooks shall be spring steel with a zinc-plated finish, ASTM B633, SC3.
 - ii. Cable hooks for corrosive areas shall be stainless steel, AISI Type 304.
3. Manufacturer
 - a. Cooper B-Line series BCH21, BCH32, BCH64
 - b. Caddy/Erico CableCat
 - c. or equal.

PART 3 - EXECUTION

3.1 GENERAL

- A. The University's Representative reserves the right to request additional supports where in their sole opinion said supports are required. Any additional supports shall be installed at no additional cost to the University.

3.2 EXAMINATION

- A. Thoroughly examine site conditions for acceptance of supporting device installation to verify conformance with manufacturer and specification tolerances. Do not commence with installation until all conditions are made satisfactory.

3.3 PREPARATION

- A. Coordinate size, shape and location of concrete pads required for equipment installation with Base Building General Contractor.
- B. Layout support devices to maintain headroom, neat mechanical appearance and to support the equipment loads.
- C. Where shown on the Drawings or Specifications, install freestanding communications equipment on concrete pads.

3.4 INSTALLATION

- A. Furnish and install supporting devices as noted throughout the Communications Systems work.
- B. Communications device and conduit supports shall be independent of all other system supports that are not structural elements of the building, unless otherwise noted.
- C. Fasten hanger rods, conduit clamps, outlet and junction boxes to building structure using precast inserts, expansion anchors, preset inserts or beam clamps.
- D. Use toggle bolts or hollow wall fasteners in hollow masonry, plaster or gypsum board partitions and walls.
- E. Use expansion anchors or preset inserts in solid masonry walls.
- F. Use self-drilling anchors, expansion anchor, or preset inserts on concrete surfaces.
- G. Use sheet metal screws in sheet metal studs and wood screws in wood construction.
- H. Do not fasten supports to piping, ductwork, mechanical equipment, conduit, or acoustical ceiling suspension wires.
- I. Do not drill structural steel members unless first approved in writing by the University's Representative.
- J. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.

- K. Install surface-mounted cabinets with minimum of four anchors. Provide additional support backing in stud walls prior to sheet rocking as required to adequately support cabinets and panels.
- L. Bridge studs top and bottom with channels to support flush mounted cabinets and panelboards in stud walls.

3.5 ERECTION OF METAL SUPPORTS

- A. Cut, fit, and place miscellaneous metal fabrications accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- B. Field Welding: Comply with AWS "Structural Welding Code."

3.6 WOOD SUPPORTS

- A. Cut, fit, and place wood grounds, nailers, blocking, and anchorage accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

3.7 DISTRIBUTION PATHWAY VIA CEILING HUNG CABLE HOOKS (J-HOOKS):

- A. Void, Plenum or Suspended Ceiling Exposed Cable Installation. Where drawings specifically show or permit use of exposed cable installation in voids, conform to the most restrictive requirements of Code, TIA-569-B and this Section.
- B. Provide support for all cabling. Do not place or attach directly to T-bar grid, concealed spline grid, flexible or rigid ductwork, HVAC registers, sprinkler piping or fixtures, light fixtures or building structure. Conform to the California Electric Code.
- C. Placement:
 - 1. All pathways created by ceiling hung cable hooks shall be reviewed by the University's Representative prior to installation.
 - 2. Ceiling hung cable hooks and cabling supported by same shall not obscure access to access doors, hatches, air dampers, valves, filter sections, VAV boxes, cable trays, junction boxes, pull boxes or similar areas of access required by other trades.
 - 3. All ceiling hung cable hooks shall be mounted close enough together such that upon completion of the station cable installation a minimum amount of cable droop occurs between adjacent rings. The distance between supporting rings shall not exceed 48 inches or as required by the current edition of TIA-569-B.
- D. Follow manufacturer's recommendations for allowable fill capacity for each size of cable hook.
 - 1. Cable hooks shall be capable of supporting a minimum of 30 pounds with a safety factor of 3.
 - 2. Spring steel cable hooks shall be capable of supporting a minimum of 100 pounds with a safety factor of 3 where extra strength is required.

END OF SECTION 27 41 02

SECTION 27 41 03 CONDUITS AND BACKBOXES FOR AUDIOVISUAL SYSTEMS

PART 4 - GENERAL

4.1 SCOPE OF WORK:

- A. Provide Audiovisual Systems pathways in accordance with EIA TIA/EIA-569-B, as specified in this Section and as shown on the plans. Provide system furniture pathways in accordance with UL 1286. Provision of all low voltage Audiovisual Systems Pathway, including:
 - 1. Rigid steel conduit and fittings.
 - 2. PVC insulated rigid steel conduit and fittings.
 - 3. Intermediate metal conduit and fittings.
 - 4. Electrical metallic tubing and fittings.
 - 5. Flexible metallic conduit and fittings.
 - 6. Liquidtight flexible metallic conduit and fittings.
 - 7. Miscellaneous conduit fittings and products.
 - 8. Junction Boxes
 - 9. Floor Boxes
 - 10. Hinged cover enclosures.
 - 11. Pullboxes and Terminal Cabinets.
- B. At Hazardous Occupancies, installation conforms to the requirements of California Electric Code for Class and Division rating of spaces.

4.2 RELATED WORK IN OTHER SECTIONS:

- A. Related work: Consult all other Sections, determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to produce a complete installation.
 - 1. Section 27 41 00 – Common Work Results for Audiovisual Systems.
 - 2. Section 27 41 01 – Grounding and Bonding for Audiovisual Systems
 - 3. Section 27 41 02 – Hangers and Supports for Audiovisual Systems
 - 4. Section 27 41 03 – Conduits and Backboxes for Audiovisual Systems
 - 5. Section 27 41 06 – Noise and Vibration Controls for Audiovisual Systems
 - 6. Section 27 41 16 – Integrated Audio-Video Systems and Equipment

4.3 REFERENCES

- A. Usage: In accordance with Division 01 - Regulatory Requirements
 - 1. American National Standards Institute (ANSI)
 - a. ANSI C80.1 1994 Rigid Steel Conduit - Zinc Coated
 - b. ANSI C80.3 1991 Electrical Metallic Tubing - Zinc Coated
 - 2. National Electrical Manufacturers Association (NEMA)
 - a. NEMA 250-2003 Enclosures for Electrical Equipment (1000 Volts Maximum)
 - b. NEMA FB 1 (ANSI/NEMA FB 1-2003) Fittings, Cast Metal Boxes and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable
 - c. FB 2.10 2000 Selection and Installation Guidelines For Fittings For Use With Non-Flexible Metallic Conduit Or Tubing (Rigid Metal Conduit, Intermediate Metal Conduit, And Electrical Metallic Tubing).
 - d. FB 2.20 2000 Selection and Installation Guidelines for Fittings for use with Flexible Electrical Conduit and Cable
 - e. NEMA ICS 6 1988 (Rev. 1) Enclosures for Industrial Control and Systems

- f. NEMA OS 3-2002 Selection and Installation Guidelines for Electrical Outlet Boxes.
- g. NEMA RN 1-1998 Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
- h. NEMA TC 7 2000 Smooth Wall Coilable Polyethylene Electrical Plastic Duct
- i. NEMA TC 13 2000 Electrical Nonmetallic Tubing (ENT).
- j. NEMA TC 14 1984(R 1986) Filament-Wound Reinforced Thermosetting Resin Conduit and Fittings
- 3. Underwriters Laboratories, Inc. (UL)
 - a. UL 1 2000 Flexible Metal Conduit
 - b. UL 6 2004 Electrical Rigid Metal Conduit - Steel
 - c. UL 50 (1995; R 1999, Bul. 2001) Enclosures for Electrical Equipment
 - d. UL 360 1986 (Bul. 1991) (R 1993) Liquid-Tight Flexible Steel Conduit
 - e. UL 514A 1991 (R 2004) Metallic Outlet Boxes
 - f. UL 514B 1989 (R 2004) Conduit, Tubing and Cable Fittings
 - g. UL 514C 1996 (R 2000) Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers.
 - h. UL 651 1989 (R 1989) (Bul. 1993) Schedule 40 and 80 Rigid PVC Conduit.
 - i. UL 797 1993 (R 2004) Electrical Metallic Tubing - Steel
 - j. UL 1242 1983 (R1993) (Bul. 1993) Intermediate Metal Conduit.
 - k. UL 1286(1999; R 2001, Bul. 2002) Office Furnishings
 - l. UL 1479 Fire Tests of Through Penetration Firestops
 - m. UL Fire Resistance Directories

4.4 SUBMITTALS

- A. Conform with the requirements of Division 01 - Shop Drawings, Product Data and Samples and Section 27 41 00 - Common Work Results for Audiovisual Systems.

4.5 QUALITY ASSURANCE

- A. All materials, equipment and parts comprising the units specified herein shall be new and unused, and of current manufacturer.
- B. Only products and applications listed in this Section may be used on the project unless otherwise submitted and approved by the University's Representative.

PART 5 - PRODUCTS

5.1 GENERAL

- A. Provide the following types of conduit systems listed by their commonly used generic name.

5.2 RACEWAY

- A. Manufacturers:
 - 1. Raceway:
 - a. Allied Tube and Conduit Co.
 - b. Triangle PWC, Inc.
 - c. Western Tube and Conduit Corp.
 - d. Spring City Electrical Manufacturing Co.

- e. Occidental Coating Co. (OCAL).
 - f. Alflec Corp.
 - g. American Flexible Metal Conduit Co.
 - h. Anaconda.
 - i. Or equal.
 - 2. Fittings:
 - a. Appleton Electric Co.
 - b. OZ/Gedney.
 - c. Thomas & Betts Corp.
 - d. Spring City Electrical Manufacturing Co.
 - e. Occidental Coating Co. (OCAL).
 - f. Carlon.
 - g. or equal.
- B. Rigid Steel Conduit.
- 1. Drawing and Spec Reference: RSC.
 - 2. Construction:
 - a. Conduit: Full weight, threaded, hot-dip galvanized steel, conforming to ANSI C80.1 and UL 6.
 - b. Standard threaded couplings, locknuts, bushings, and elbows: Only materials of steel or malleable iron are acceptable. Locknuts shall be bonding type with sharp edges for digging into the metal wall of an enclosure.
 - c. Three piece couplings: Electroplated, cast malleable iron.
 - d. Insulating bushings: Threaded polypropylene or thermosetting phenolic rated 150 degree C minimum.
 - e. Insulated grounding bushings: Threaded cast malleable iron body with insulated throat and steel "lay-in" ground lug with compression screw.
 - f. Insulated metallic bushings: Threaded cast malleable iron body with plastic insulated throat rated 150 degrees C.
 - g. All fittings and connectors shall be threaded.
- C. Coated Rigid Steel Conduit:
- 1. Drawing and Spec Reference: CRSC.
 - 2. Conduit: Full weight, threaded, hot-dip galvanized steel, conforming to ANSI C80.1 and NEMA RN-1 with nominal 40 mil thermoplastic vinyl coating, heat fused and bonded to the exterior of the conduit.
 - 3. Fittings:
 - a. Conduit couplings and connectors shall be as specified for galvanized rigid steel conduit and shall be factory PVC coated with an insulating jacket equivalent to that of the coated material.
 - b. Fittings over-sleeve to extend 1 conduit diameter or 1-1/2" beyond fitting, whichever is less.
 - 4. Performance:
 - a. Tensile Strength: 3500 psi.
 - 5. Approvals:
 - a. NEMA RN1 (Type 40 - 40 mils thick)
 - b. CalTrans Type 2
 - 6. Manufacturers:
 - a. Plastibond by RobRoy Industries.
 - b. Occal-40 by Occidental Coating Company.

- c. KorKap by Plastic Applicators.
 - d. Ocal-Blue
 - e. or equal.
- D. Intermediate Metal Conduit
 - 1. Drawing Reference: IMC
 - 2. Conduit: Hot dip galvanized steel meeting the requirements of CEC Article 345 and conforming to ANSI C80.6 and UL 1242.
 - 3. Fittings: Conduit couplings, connector and bushing shall be as specified for galvanized rigid steel conduit. Integral retractable type IMC couplings are also acceptable.
- E. Electrical Metallic Tubing.
 - 1. Drawing and Spec Reference: EMT.
 - 2. Conduit: Shall be formed of cold rolled strip steel, electrical resistance welded continuously along the longitudinal seam and hot dip galvanized after fabrication. Conduit shall conform to ANSI C80.3 specifications and shall meet UL classifications.
 - 3. Compression type fittings: Steel fittings with insulated throat connectors.
 - 4. Raintight couplings: Electroplate steel or cast malleable iron; UL listed raintight and concrete tight, using gland and ring compression type construction.
 - 5. Raintight connectors: Electroplated steel or cast malleable iron, UL listed raintight and concrete tight, with insulated throat, using gland and ring compression type construction.
 - 6. Maximum conduit fill: 30%.
 - 7. Minimum conduit size: 3/4".
- F. Flexible Conduit:
 - 1. Drawing Reference: FLEX
 - 2. Construction:
 - a. Flexible steel, zinc coated on both inside and outside by hot-dipping process.
 - b. Interlocking spirally wound continuous steel strip.
 - c. 3/4" minimum size.
 - 3. Fittings: Connectors shall be of the single screw clamp variety with steel or cast malleable iron bodies and threaded male hubs with insulated throats. Exception: Pressure cast screw-in connectors shall be acceptable for fixture connection in suspended ceilings and cut-in outlet boxes within existing furred walls.
 - 4. Approvals:
 - a. UL 1
- G. Liquidtight Flexible Metallic Conduit
 - 1. Drawing Reference: Liquidtight
 - 2. Conduit: Shall be fabricated in continuous lengths from galvanized steel strips, interlocking spirally wound, covered with extruded liquidtight jacket of polyvinyl chloride (PVC) and conforming to UL 360. Provide conduit with a continuous copper-bonding conductor wound spirally between the convolutions.
 - 3. Fittings: Connector body and gland nut shall be of cadmium plated steel or cast malleable iron, with tapered, male, threaded hub; insulated throat and neoprene "O" ring gasket recessed into the face of the stop nut. The clamping gland shall be of molded nylon with an integral brass push-in ferrule.

5.3 MISCELLANEOUS CONDUIT FITTINGS AND PRODUCTS

- A. General
 - 1. UL 514B.
 - 2. Listed in UL Electrical Construction Materials List.
- B. Conduit Fittings, Insulated Throat Grounding Bushings
 - 1. Description
 - a. Threaded for Rigid Steel Conduit and Intermediate Metal Conduit.
 - b. UL Listed for use with copper conductors.
 - c. Thermoplastic insulated liner for 105 degrees Celsius.
 - d. Body of malleable iron, zinc plated; or die cast zinc.
 - 2. Manufacturer
 - a. Thomas & Betts (Steel City) BG-801 Series
 - b. O-Z/Gedney
 - c. or equal.
- C. Watertight conduit entrance seals: Steel or cast malleable iron bodies and pressure clamps with PVC sleeve, neoprene sealing grommets and PVC coated steel pressure rings. Fittings shall be supplied with neoprene sealing rings between the body and PVC sleeve.
- D. Watertight cable sealing bushings: One piece, compression molded sealing ring with PVC coated steel pressure disks, stainless steel sealing screws and zinc plated cast malleable iron locking collar.
- E. Expansion fittings: Multi-piece unit comprised of a hot dip galvanized malleable iron or steel body and outside pressure bussing designed to allow a maximum of 4" conduit movement (2" in either direction). Furnish with external braid tinned copper bonding jumper. Unit shall be UL listed for wet or dry locations.
- F. Expansion/deflection couplings: Multi-piece unit comprised of a neoprene sleeve with internal flexible tinned copper braid attached to bronze end couplings with stainless steel bands. Coupling shall accommodate .75-inch deflection, expansion, or contraction in any direction, and allow 30-degree angular deflections. Flexible, corrosion-resistant, watertight, moisture and heat resistant molded rubber jacket and stainless steel jacket clamps. Unit shall comply with UL467 and UL514.
 - 1. Manufacturer:
 - a. OZ/Gedney Type DX
 - b. Steel City Type EDF
 - c. or equal.
- G. Fire rated penetration seals:
 - 1. UL classified.
 - 2. Conduit penetrations in fire rated separation shall be sealed with a UL classified assembly consisting of fill, void or cavity materials.
 - 3. The fire rated sealant material shall be the product best suited for each type of penetration, and may be a caulk, putty, composite sheet or wrap/strip.
 - 4. Penetrations of rated floors shall be sealed with an assembly having both F and T ratings at least equal to rating of the floor.
 - 5. Penetrations of rated walls shall be sealed with an assembly having an F rating at least equal to the rating of the wall.

- H. Standard products not herein specified:
 - 1. Submit for review a listing of standard electrical conduit hardware and fittings not herein specified prior to use or installation, i.e. locknuts, bushings, etc.
 - 2. Listing shall include manufacturers name, part numbers, and a written description of the item indicating type of material and construction.
 - 3. Miscellaneous components shall be equal in quality, material, and construction to similar items herein specified.
- I. Hazardous area fittings: UL listed for the application.

5.4 JUNCTION AND DEVICE BOXES

- A. Junction and Device Boxes
 - 1. Drawing References: As shown on Symbol Schedule
 - 2. Construction:
 - a. Concealed/Flush Mounted:
 - b. One or two piece welded knockout boxes.
 - c. UL 514A, cadmium or zinc-coated 1.25 oz/sq. ft., if ferrous metal.
 - d. Pressed sheet steel, for indoor locations.
 - e. UL 514C approved if non-metallic.
 - f. At hollow masonry, tile walls and plaster walls, provide with device rings as required.
 - g. Surface mounted:
 - i. Exterior - Conform to the Junction and/or PullBox construction scheduled on the Plans. Where construction not otherwise scheduled or noted on the plans, conform to the following.:
 - (1) Cast iron or aluminum with threaded hubs and mounting lugs.
 - (2) Gasketed cover with spring lid.
 - ii. Concrete floor embedded:
 - (1) Cast iron concrete pour boxes with screwed brass cover, unless otherwise noted.
 - (2) Cadmium plated screw cover attachment at least 6" on center.
 - h. If size not otherwise noted, at least 4S (4" square) by 2-1/8" deep, or Code minimum size, whichever is larger.
 - i. Wherever 4S is indicated, contractor may at their option substitute 4-11/16" square boxes while maintaining the minimum depth required by these specifications and the drawings.
 - ii. At recessed masonry wall installations, provide gangable masonry boxes.
 - i. Provide complete with approved type of connectors and required accessories, including attachment lugs or hangers. Provide raised device covers as required to accept scheduled device.
 - 3. Approvals.
 - a. UL 514A
 - 4. Manufacturers:
 - a. Interior:
 - i. Steel City.
 - ii. Bowers
 - iii. or equal.
 - b. Exterior, exposed with cover of same construction.
 - i. Appleton
 - ii. Pyle-National

- iii. or equal.
 - c. Other conditions:
 - i. Any meeting approvals and requirements.
- B. Locking Wall Boxes, 3, 4 Gang
 - 1. Drawing References: LWB3, LWB4
 - 2. Features/Functions/Construction
 - a. Locking hinged steel cover.
 - b. Accepts 3 or 4 gang plate inserts without leaving void area to either side of plate insert.
 - c. 2-1/8" minimum depth behind plate insert.
 - d. Protects contents from tampering when closed
 - e. Lid incorporates push-to-open retention latch
 - f. Lid folds down 180 degrees, out of way during use.
 - g. Size
 - i. LWB3: NEMA 3 gang capacity
 - ii. LWB4: NEMA 4 gang capacity
 - h. Finish:
 - i. Submit White or Prime options for selection by the University's Representative.
 - 3. Manufacturers
 - a. FSR Inc.
 - i. LWB3: WB-3G with 3 gang Bowers backbox
 - ii. LWB4: WB-4G with 4 gang Bowers backbox.
 - b. Custom by C.W. Cole
 - c. or equal.

5.5 CABINETS AND ENCLOSURES

- A. Terminal Cabinets:
 - 1. Drawing Reference: As Scheduled.
 - 2. Construction:
 - a. Zinc Coated Sheet Steel, code gauge with standard concentric knockouts for conduit terminations.
 - b. Interior dimensions not less than those scheduled.
 - c. Finish: Manufacturer's standard gray baked enamel finish.
 - d. Covers: Trim fitted, continuous hinged steel door, flush catch – lockable and keyed to match. Screw fastened doors not acceptable.
 - i. Door face to be not less than 95% of panel interior dimensions.
 - e. Provide with 3/4" fire retardant treated ply backboard.
 - 3. Mounting:
 - a. Flush cabinets shall be furnished with concealed trim clamps and shall be not less than 4 inches deep.
 - b. Surface cabinets shall be furnished with screw cover trim, flush hinged door and shall not be less than 6 inches deep.
 - c. Interior Applications:
 - i. NEMA 250 Type 1, unless otherwise noted. Refer to plans and schedules.
 - d. Exterior Applications:
 - i. NEMA 250 Type - As Scheduled, not less than NEMA 3R.
 - 4. Manufacturers:
 - a. B-Line Electrical Enclosures

- b. Circle AW Products.
- c. Hammond
- d. Hennessey.
- e. Hoffman.
- f. Myers Electric Products
- g. Rittal.
- h. or equal.

PART 6 - EXECUTION

6.1 CONDUIT APPLICATION

- A. General: Install the following types of conduits and fittings in the locations listed, unless otherwise noted in the drawings:
 - 1. Exterior, Exposed:
 - a. Type RSC for applications up to 8 feet AFF or to first pull box, whichever is first, applications subject to physical abuse or for applications greater than 4" diameter.
 - b. EMT acceptable in all other applications not noted above up to 4", where used in conjunction with specified Raintight (compression) couplers.
 - 2. Interior, Exposed, Wet and Damp Locations:
 - a. Type RSC.
 - b. At interior locations over 8 feet above finished floor, EMT acceptable.
 - 3. Interior, Hazardous Locations
 - a. Type RSC
 - b. Type IMC, where permitted by the CEC.
 - 4. Interior, exposed or concealed, dry locations:
 - a. RSC, if subject to physical abuse.
 - b. EMT, if not subject to physical abuse.
 - 5. Interior, concealed, damp locations, including in masonry walls.
 - a. RSC
 - 6. Embedded in Concrete
 - a. RSC or rigid non-metallic conduit.
 - b. PVC Type DB-120.
 - 7. Transition from walls to open plan furniture systems:
 - a. Liquidtight

6.2 GENERAL REQUIREMENTS

- A. Refer to the manufacturer's instructions and conform thereto.
- B. Distribution Pathway via EMT Raceway:
 - 1. The EMT conduit is to be installed meeting the NEC handbook Article 348 Installation Specifications.
 - 2. Provide escutcheon plates for all through wall conduit stubs.
 - 3. All ends of conduits shall be cut square, reamed and fitted with insulated bushing.
 - 4. All conduit which passes through fire walls shall be sealed with fire stop putty after all station wire has been installed.

6.3 MOUNTING AND INSTALLATION – DEVICE BOXES

- A. Conform to the more restrictive of NEMA OS 3-2002 and the following.

- B. Provide backboxes at all communications systems devices. Installation of device plates directly to wall surface without use of a backbox, unless specifically directed on plans, is unacceptable.
- C. The distance between pull boxes shall not exceed 150 feet or more than two 90 degree bends.
- D. Align boxes plumb with floor and surrounding construction. At door frames, locate 4" from frame. Verify placement with University's Representative details to ensure that box clears all trim, etc.
- E. Support and fasten boxes securely. At stud walls use rigid bar hangers, attached to hanger with stud and nut.
- F. At existing locations, provide cutting, patching and finishing as required to maintain or restore finishes so that resulting installation is integrated into the Architectural decor of the particular location.
- G. Mounting Height: the mounting height of a wall-mounted outlet box is defined as the height from the finished floor to the horizontal center line of the cover plate.
- H. Mount outlet boxes with the long axis vertical. Three or more gang boxes shall be mounted with the long axis horizontal.
- I. Install wiring jacks and outlet devices only in boxes which are clean; free from excess building materials, dirt, and debris.
- J. Install wiring jacks and outlet devices after wiring work is complete.

6.4 TERMINAL CABINETS, JUNCTION BOXES AND PULL BOXES

- A. General
 - 1. Thoroughly examine site conditions for acceptance of cabinets and enclosures installation to verify conformance with manufacturer and specification tolerances. Do not commence with installation until all conditions are made satisfactory.
- B. Set cabinets and enclosures plumb and symmetrical with building lines. Furnish and install all construction channel bolts, angles, etc. required to mount all equipment furnished under this Section of the Specifications.
- C. Cabinets and enclosures shall be anchored and braced to withstand seismic forces calculated in accordance with standards referenced in Section 27 41 02 – Hangers and Supports for Audiovisual Systems.
- D. "Train" interior wiring, bundle and clamp using specified plastic wire wraps. Separate power and signal wiring.
- E. Replace doors or trim exhibiting dents, bends, warps or poor fit that may impede ready access, security or integrity.
- F. Terminate conduit in cabinet with lock nut and grounding bushing.
- G. Cleaning
 - 1. Touch-up paint any marks, blemishes or other finish damage suffered during installation.

2. Vacuum clean cabinet on completion of installation.

6.5 SUPPORT

- A. Provide supports for raceways as specified in Section 27 41 02 – Hangers and Supports for Audiovisual Systems.
- B. All raceways installed in exposed dry locations shall be grouped in a like arrangement and supported by means of conduit straps, wall brackets or trapeze hangers in accordance with Code and the requirements of the this Section and Section 27 41 02 – Hangers and Supports for Audiovisual Systems. Fasten all hangers from the building structural system.
- C. Provide supports and mounting attachments per the most restrictive of Code and the following.

Raceway Size (inches)	No of cables in run	Location	Support Spacing (feet)	
			RSC	EMT
Horizontal Runs				
3/4	1-2	Flat Ceiling Wall Runs	5	5
3/4	1-2	Where access limited to building structure	7	7
3/4	3≥	Any location	7	7
1≥	1-2	Flat ceiling or wall	6	6
1≥	1-2	Where access limited to building structure	10	10
1≥	3≥	Any locations	10	10
Any	Any	Concealed	10	10
Vertical Runs				
3/4	Any	Exposed	7	7
1, 1-1/4	Any	Exposed	8	8
1-1/2≥	Any	Exposed	10	10

- D. Install no more than one coupling or device between supports.
- E. Conduit support
 1. As specified in Section 27 41 02 – Hangers and Supports for Audiovisual Systems
- F. The University's Representative reserves the right to request additional supports where in their sole opinion said supports are required. Any additional supports shall be installed at no additional cost to the University.

6.6 PENETRATIONS

- A. Gypsum Wall Board Penetrations: Provide circular penetrations maximum 1/8" inch larger than outer diameter of conduit being used. On both sides of the wall fill space between conduit and wall with joint compound, depth to match gypsum board thickness.

- B. Install UL listed fire-stop system whenever a raceway penetrates a firewall in conformance with the manufacturer's directions, the published systems assembly requirements, CBC Section 709 and 710 and CEC 300-21, whichever is the most restrictive. At cable tray penetrations, provide pillow type removable fire stop per CBC Section 709 and 710, the published systems assembly requirements and the manufacturer's directions, whichever is the most restrictive.
- C. All communications systems conduit openings in walls and floors are the responsibility of the Contractor. Install sleeves shown on the drawings when the concrete is poured. Any openings required after the concrete has set maybe core drilled.

6.7 RACEWAY INSTALLATION, GENERAL

- A. Raceway runs are shown schematically. Install concealed unless specifically shown otherwise. Supports, pull boxes, junction boxes and similar generally not indicated. Provide where designated.
 - 1. Install exposed conduit and raceway parallel and perpendicular to nearby surfaces or exposed structural members, and follow the surface contours. Level and square conduit and raceway runs.
 - 2. Raceway runs shall be mechanically and electrically continuous between all each equipment rack and utility demarcation point, receptacle and/or surface raceway strip, as applies.
 - 3. Each conduit shall enter and be securely connected to a cabinet, junction box, pull box, or outlet by means of a locknut on the outside and a bushing on the inside or by means of a liquid-tight, threaded, self-locking, cold-weld type wedge adapter.
 - 4. Bends
 - a. All bends or elbows shall have a minimum radius as follows:

Conduit Size	Min. Radius (Inches)
3/4"	8
1"	12
1-1/4"	18
2"	24
2-1/2"	24
3"	30
3-1/2"	30
4"	30
5"	36
6"	42

- b. Use factory elbows or machine bends for conduit bends 1-1/4" and larger.
 - 5. Make bends and offsets so the inside diameter is not effectively reduced. Make bends in parallel or banked runs from the same center line so that the bends are parallel.
 - 6. Install at least one (1) 3/8", 200 pound strength nylon pull cord in all empty raceways.
 - 7. Raceways crossing building expansion joints or in straight runs exceeding 100 feet shall be provided with UL listed expansion fittings.
 - 8. Install conduit seals and drains to prevent accumulated moisture in conduits from entering Communications System enclosures.

- B. Do not install conduit in concrete slabs unless specifically directed by University's Representative. Embedded conduits in concrete slab walls, and columns shall be installed in center third between upper and lower layers of reinforcing steel as directed by the University's Representative. Space conduits 8" on center except at cabinet locations where slab thickness shall be increased as directed by the University's Representative.
- C. All conduits to be kept 12" away from steam or hot water lines. Install horizontal conduit and raceway runs below water and steam piping.
- D. Conduit dropping down to equipment shall be as straight as possible without any offsets, parallel or perpendicular to walls, ceilings and other building features.
- E. Conduit installed on any equipment shall be run symmetrical with the equipment and in such a manner as to:
 - 1. not to be exposed to damage;
 - 2. not interfere with access to components of the equipment that will interfere with maintenance operation or;
 - 3. not to be in a manner that the University deems detrimental to its operation.
- F. Whenever an installation such as that listed occurs, the Contractor shall make all necessary changes at no additional cost to the University.
- G. All cut ends of conduit, scratches, tool marks, etc. on any metallic raceway installed in the ground or on the exterior of the building shall be treated with two coats of specified Touch Up Paint/Tape.
- H. Exposed conduit and metallic surface raceway installed in finished spaces shall be painted to match surrounding surfaces using paint and methods directed by the University's Representative.
- I. All raceways stubbing up into equipment or racks shall be sealed. Raceways with conductors shall be plugged with duct-seal. Spare raceways shall be capped. Prevent foreign matter from entering conduit and raceway; use temporary closure protection. Replace conduits containing concrete, varnish or other foreign material.
- J. Complete installation of conduit and raceway runs before starting installation of cables/wires within conduit and raceway.
- K. Use specified conduit and raceway fittings that are of types compatible with the associated conduit and raceway and suitable for the use and location. Join and terminate conduit and raceway with fittings designed and approved for the purpose of the conduit and raceway system and make up tight.
- L. Where chase nipples are used, align the raceway and coupling square to the box and tighten the chase nipple so no threads are exposed.
- M. Horizontal conduit or EMT runs, where required and permitted, shall be installed as close to ceiling or ceiling beams as practical.
- N. Conduit and EMT connected to wall outlets shall be run in such a manner that they will not cross water, steam or waste pipes or radiator branches.

- O. Conduit and EMT shall not be run through beams, purlins or columns except where permission is granted by University's Representative in writing.
- P. Bond installed metallic raceway in accordance with the requirements of the CEC.

6.8 HAZARDOUS LOCATIONS

- A. Use rigid steel conduit only.
- B. Install UL listed sealing fittings that prevent passage of explosive vapors in accordance with the manufacturers written instructions. Locate fittings at suitable, accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank coverplate having a finish similar to that of adjacent plates or surfaces.
- C. Install raceway sealing fittings at the following points and elsewhere as indicated:
 - 1. Where conduits enter or leave hazardous locations.

6.9 REUSE OF EXISTING CONDUIT

- A. Existing conduit is to be used as a pathway only where so shown on the drawings.
- B. Prior to beginning work involving the use of an existing conduit, the Contractor shall consult with the University's Representative in order to establish whether or not the conduit contains active service.
- C. If no active service exists within the conduit, all cable is to be removed, and work is to proceed.
- D. If active service does exist within the conduit and it has been determined that service needs to be disrupted, then work on that conduit shall not proceed until a schedule of service outage has been established by University's Representative. Once given direction to proceed, the Contractor shall within the time period of one (1) working day; remove the old cable, install, terminate and test the new cables, and notify the University's Representative the work using the specific conduit has been completed. The University's Representative shall be responsible for the disconnection and reconnecting of the active service cross-connects within the terminal closet(s).
- E. Conduit preparation procedure:
 - 1. Remove existing Wires and Cables (if any).
 - 2. Run a mandrel $\frac{1}{2}$ " smaller than the inside diameter of the conduit through the conduit receiving new wires and cables.
 - 3. If the specified size mandrel will not pass through the existing conduit, start with a smaller size mandrel and increase mandrel size until the specified sized mandrel will pass.
 - 4. Run a wire brush and clean rag with an outside diameter $\frac{1}{8}$ " larger than the inside of the conduit through the conduit receiving new wires and cables.
 - 5. Repeat above until conduit is clean and materials detrimental to the wire and cables to be installed no longer exit conduit with the clean rag.

END OF SECTION 27 41 03

SECTION 27 41 06 NOISE AND VIBRATION CONTROLS FOR AUDIOVISUAL SYSTEM

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Provisions of:
 - 1. Flexible communications raceway connections to vibrating machinery
 - 2. Sealing of communications device boxes related installed in sound rated walls.
 - 3. Coordination of airtight installation requirements at Mechanical and Electrical Rooms and/or duct enclosures.

1.2 RELATED WORK IN OTHER SECTIONS

- A. Consult all other Sections, determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to produce a complete installation.
 - 1. Division 15
 - a. Energy Management Panels mounted on vibrating equipment connected to the Audiovisual Systems Work.
 - 2. Division 27
 - a. UPS equipment connected to the Audiovisual Systems Work.
 - b. Section 27 41 03 - Conduits and Backboxes for Audiovisual Systems

1.3 REFERENCES

- A. American National Standards Institute (ANSI)
 - 1. ANSI/UL 1479-2003 Fire Tests of Through Penetration Firestops
- B. American Society for Testing and Materials (ASTM)
 - 1. ASTM E814-02 Standard Test Method for Fire Tests of Through Penetration Fire Stops.
- C. Underwriters Laboratories, Inc. (UL)
 - 1. UL Fire Resistance Directories

1.4 SUBMITTALS

- A. Comply with the requirements of Division 01 - Shop Drawings, Product Data and Samples and Section 27 41 00 – Common Work Results for Audiovisual Systems.

PART 2 - PRODUCTS

2.1 FLEXIBLE COMMUNICATIONS CONNECTIONS:

- A. Make communications connections to vibrating equipment flexible as follows:
 - 1. For conduit over 1" O.D. make communications connections to vibrating equipment via a flexible expansion/deflection conduit coupling sized as required. Coupling shall have flexible and watertight outer jacket, internal grounding strap, plastic inner sleeve to maintain smooth wireway, and end hubs with threads to fit standard threaded metal conduit.
 - 2. Manufacturers:
 - a. XD Xpansion Deflection Coupling by Crouse-Hinds of Syracuse, N.Y.

- b. Type DF Expansion and Deflection fitting by Spring City Electrical Mfg. Co.
 - c. or equal.
- 3. For conduit under 1" O.D. utilize FLEX or LIQUIDTIGHT conduit as specified in Section 27 41 03 – Conduits and Backboxes for Audiovisual Systems with slack at least 3' or 15 diameters long, whichever is the longer or provide a flexible coupling as defined above.

2.2 J-BOX MASTIC:

- A. At all electrical boxes penetrating sound isolating partitions, utilize sheet form adhesive mastic as directed elsewhere herein
- B. Manufacturers:
 - 1. Insul-Pad by Dottie Corp.
 - 2. Duct-Seal by Gardner Bender, Inc.
 - 3. Duxseal by Manville
 - 4. Outlet Pad by Lowry
 - 5. or equal.

2.3 RESILIENT PENETRATIONS:

- A. For conduit:
 - 1. Sleeves: Sleeves of appropriate gage galvanized sheet metal shall be formed to at least the thickness of the penetrated construction and 3/4" to 1" larger in each cross-sectional dimension than the penetrating element.
 - a. Manufacturers:
 - i. Century-Line Sleeves by Thunderline Corporation
 - ii. Custom by Contractor
 - iii. or equal.
 - 2. Batt: Glass fiber of batt or mineral wool, 1 to 3 lb./cu. ft. density.
 - a. Manufacturers
 - i. Certain-Teed
 - ii. Johns-Manville
 - iii. Owens-Corning
 - iv. or equal.
 - 3. Acoustical Sealant:
 - a. Manufacturers
 - i. DAP
 - ii. Pecora
 - iii. Tremco
 - iv. U.S. Gypsum
 - v. or equal.
 - 4. Firestop Sealant:
 - a. Where required, resilient firestop caulking may be used in lieu of Acoustical Sealant when installed in strict conformance with the manufacturer's directions. Fully hardened firestop caulk shall develop a Shore A hardness of no greater than 35. Refer to the requirements of Section 27 41 03 – Conduits and Backboxes for Audiovisual Systems.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS, CONNECTION TO VIBRATING EQUIPMENT

- A. The Contractor shall not install any vibrating equipment or conduit attached thereto which makes rigid contact with the "building" unless it is approved in this specification or by the University's Representative. "Building" includes, but is not limited to slabs, beams, columns, walls, partitions, ceilings, studs, ceiling framing and suspension systems.
- B. Prior to installation, the Contractor shall bring to the University's Representative's attention any conflicts between trades which will result in unavoidable rigid contact at equipment, conduit, piping, ducts, etc., as described herein, due to inadequate space or other unforeseen conditions. Corrective work necessitated by conflicts after installation shall be at the responsible contractor's expense.
- C. The Contractor shall obtain inspection and approval from the University's Representative of any installation to be covered or enclosed, prior to such closure.

3.2 INSPECTION OF CONDITIONS:

- A. Examine related Work and surfaces before starting Work of this Section. Report to the University's Representative, in writing, conditions which will prevent proper provision of this work. Beginning the Work of this Section without reporting unsuitable conditions to the University's Representative constitutes acceptance of such conditions by Contractor. Perform any required removal, repair, or replacement of this Work caused by unsuitable conditions at no additional cost to the University.
- B. Coordination
 - 1. Coordinate with the work of the Base Building Construction Contract. Coordinate Work of this Section with all other impacted trades.

3.3 INSTALLATION REQUIREMENTS, FLEXIBLE ELECTRICAL CONNECTIONS

- A. The installation of flexible electrical connections to vibration isolated equipment shall in no way impair or restrain the function of the vibration isolation installed by the work by Others.
 - 1. Using gross slack. Install flexible conduit in a grossly slack loop form or shallow "U" form. Install stranded conductors with sufficient slack to accommodate maximum possible movement.
 - 2. Using flexible coupling. The flexible coupling shall be free and not in contact with any nearby building construction and shall be installed slack, and free of strain in any direction. Install stranded conductors as above

3.4 INSTALLATION REQUIREMENTS, J-BOX MASTIC

- A. Application: All Audiovisual Systems work in sound isolating assemblies, including but not limited to residential rooms, offices, mechanical rooms, electrical rooms and related to utilize backboxes for all services, including but not limited to low voltage communication. Installation of backboxes to conform with following:
 - 1. Space outlet boxes on opposite faces of the wall by more than 24" o.c. Where daisy chained conduits indicated on the plans, connect such boxes by slack flexible conduit (2 times longer than distance between outlets).
 - 2. Cutouts for electrical boxes and penetrating piping/conduit shall be no more than

- 1/4" oversize.
3. Caulk gap between drywall and electrical boxes and/or piping/conduit airtight with Acoustical Sealant. Apply J-Box mastic to back of all penetrating electrical boxes and press firmly at joint to wallboard to provide an airtight seal.

3.5 INSTALLATION REQUIREMENTS, RESILIENT PENETRATIONS

- A. Penetrations included in this Section of the Specifications include all communications conduit connected to vibrating equipment within 30 feet of such equipment
- B. Method for round or rectangular penetrations.
 1. Cut a clean opening in the penetrated construction very nearly the size of the sleeve for each penetrating element. Provide lintels above, relief structure below and vertical framing between and to the sides, as required. Provide the above, escutcheon plates and such related construction as is necessary to make the penetrated structure as solid and massive near the penetrations as the surrounding construction.
 2. Set the metal sleeve into the penetrated construction in an airtight manner around its outer periphery, using grout, dry packing, plaster or drywall compound full depth and all around - but only to a maximum width of 1/2" - or the requirements of the above paragraph shall not have been satisfied.
 3. Pack annular opening with glass fiber between metal sleeve and penetrating element full depth, all around to a firm degree of compaction. Leave a 1/2" deep annular opening free at each end of the metal sleeve; fill this fully with sealant.

3.6 MECHANICAL AND ELECTRICAL ROOMS REQUIREMENTS

- A. All mechanical and electrical rooms, plenums, duct shafts and drywall duct enclosures and other enclosures of high noise sources shall be constructed airtight. This means that every precaution shall be taken to maintain construction completely airtight around a room so designated. Construction joints, duct penetrations, electrical boxes, frames, supports, cabinets, doors, access panels, fixtures, etc., all shall be built or installed in such a manner as to prevent sound transmission through any construction enclosing a room horizontally or vertically. Appropriate lintels, frames, blocking, escutcheons, grouting, gaskets, packing, caulking, taping, filling, etc., all shall be employed to prevent sound transmission. Refer to requirements of this Section for Resilient Penetrations.
- B. All work under this section is to comply with the above. Contractor to report to University's Representative any construction conditions which arise which might compromise compliance with this requirement.

END OF SECTION 27 41 06

SECTION 27 41 07 IDENTIFICATION FOR AUDIOVISUAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY:

- A. Provide all labor, materials, tools, and equipment required for permanent intelligible labeling on, or adjacent to, all cabling, connectors, innerduct, faceplates, jacks, receptacles, controls, fuses, circuit breakers, patching jacks, and racks.
- B. This section includes minimum requirements for the following:
 - 1. Labeling Audiovisual Systems Cabling
 - 2. Labeling Closet Hardware
 - 3. Labeling Work Stations
 - 4. Labeling Pathways, Spaces, Grounding and Bonding.
- C. Refer to detailed plans for additional requirements.
- D. Clearly and distinctly indicate the function of the item.
- E. Coordinate with Record Drawings

1.2 REFERENCES:

- A. Usage: In accordance with Division 01 - Regulatory Requirements
- B. American Society for Testing and Materials (ASTM)
 - 1. ASTM D 709(2001) Laminated Thermosetting Materials
- C. Electronic Industries Alliance (EIA)
 - 1. EIA TIA/EIA-606-A(2002) Administration Standard for Commercial Telecommunications Infrastructure (ANSI/TIA/EIA-606)
- D. Underwriters Laboratories (UL)
 - 1. UL 969 (1995; R 2001) Marking and Labeling Systems

1.3 QUALITY ASSURANCE

- A. Identification and administration work specified herein shall comply with the applicable requirements of:
 - 1. ANSI/TIA/EIA – 606-A Administration Standards.
 - 2. ANSI/TIA/EIA – 569B Pathway and Spaces
 - 3. ANSI/TIA/EIA – 568B Telecommunications Cabling Standard.
 - 4. BICSI Telecommunications Distribution Methods Manual.
 - 5. UL 969 (1995; R 2001) Marking and Labeling Systems.

1.4 SUBMITTALS

- A. Conform with the requirements of Division 01 - Shop Drawings, Product Data and Samples and Section 27 41 00 - Common Work Results for Audiovisual Systems.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Procedures: In accordance with Division 01 - Summary of Work.

1.6 SEQUENCING

- A. Not Used.

PART 2 - PRODUCTS

2.1 Audiovisual Systems CABLING LABELS, INTERIOR

- A. Shall meet the legibility, defacement, exposure and adhesion requirements of UL 969.
- B. Shall be preprinted or computer printed type. Hand written labels are not acceptable.
- C. Provide vinyl substrate with a white printing area and black print. If cable jacket is white, provide cable label with printing area that is any other color than white, preferably orange or yellow – so that the labels are easily distinguishable.
- D. Shall be flexible vinyl or other substrates to apply easy and flex as cables are bent.
- E. Shall use aggressive adhesives that stay attached even to the most difficult to adhere to jacketing.
- F. Manufacturers:
 - 1. Cable Type – Audiovisual Cabling, General Purpose
 - a. Brady TLS2200 labels – PTL-31-427, PTL-32-427
 - b. Brady Laser tab labels – LAT-18-361, LAT-53-361
 - c. Hubbell
 - d. Leviton
 - e. Panduit.
 - f. or equal.
 - 2. Cable Type – RG-6 Coax
 - a. Brady TLS2200 labels – PTL-31-427, PTL-32-427
 - b. Brady Laser tab labels –LAT-18-361, LAT-53-361
 - c. Panduit.
 - d. or equal.
 - 3. Cable Type – RG-59 Coax
 - a. Brady TLS2200 labels – PTL-31-427, PTL-32-427
 - b. Brady Laser tab labels – LAT-18-361, LAT-53-361
 - c. Panduit.
 - d. or equal.
 - 4. Cable Bundles
 - a. Brady TLS2200 labels – PTL-12-109
 - b. Panduit.
 - c. or equal.

2.2 GROUNDING AND BONDING, PATHWAY, AND SPACE LABELS

- A. Shall meet the legibility, defacement, exposure and adhesion requirements of UL 969.
- B. Shall be preprinted or computer printed type. Hand written labels are not acceptable.
- C. Manufacturers:
 - 1. Brady Corporation
 - a. TLS2200 labels
 - i. PTL-20-422, Size 2.0" x 1.0"
 - ii. PTL-22-422, Size 3.0" x 1.0"

- iii. PTL-37-422, Size 3.0" x 1.9"
- iv. PTL-23-422, Size 4.0" x 1.0"
- v. PTL-38-422, Size 4.0" x 1.0"
- b. Laser tab labels
 - i. LAT-13-747, Size 1.875" x 0.833"
 - ii. LAT-24-747, Size 1.75" x 1.0"
 - iii. LAT-32-747, Size 3.0" x 0.9 "
 - iv. LAT-33-747, Size 2.0" x 1.437"
 - v. LAT-34-747, Size 3.0" x 1.437"
- c. Continuous tape for TLS2200
 - i. PTL-8-422, Size 0.5" white polyester
 - ii. PTL-8-430, Size 0.5" clear polyester
 - iii. PTL-8-439, Size 0.5" white vinyl
 - iv. PTL-42-439, Size 1.0" white vinyl
 - v. PTL-43-439, Size 1.9" white vinyl
- 2. Panduit.
- 3. or equal.

2.3 NAMEPLATES

A. Field Fabricated Nameplates

- 1. Features/Function/Construction
 - a. Provide laminated plastic nameplates for each equipment enclosure, relay, switch, and device; as specified or as indicated on the drawings.
 - b. Comply with ASTM D 709.
 - c. Each nameplate inscription shall identify the function and, when applicable, the position.
 - d. Nameplates shall be melamine plastic, 0.125 inch thick, white with black center core.
 - e. Surface shall be matte finish.
 - f. Corners shall be square.
 - g. Accurately align lettering and engrave into the core.
 - h. Minimum size of nameplates shall be one by 2.5 inches.
 - i. Lettering shall be a minimum of 0.25 inch high normal block style

PART 3 - EXECUTION

3.1 GENERAL

- A. Apply labeling to clean surfaces free of oil, dust, solvents or loose material.
- B. Apply after Project painting in area of application is complete.
- C. Apply to locations where labeling will not be damaged, covered over or in the way of the ordinary maintenance and operation of the installed Audiovisual Systems infrastructure or system.
- D. Apply labeling right side up, parallel to major edges of surfaces to which it is applied. When no line is evident, apply parallel to floor line. Correct conditions of labeling applied out of true.
- E. Protect installed labeling from damage.

- F. Replace labeling that is defaced, illegible or peeling off of the surface to which it is applied.

3.2 IDENTIFICATION & LABELING

A. Pathways

1. Pathways shall be marked at each endpoint and at all intermediate pull or junction boxes. In the case of partitioned pathways (i.e. innerduct) each partition shall have a unique identifier.
2. Label pathways using the appropriate abbreviation and a number.
3. Use adhesive type labels.

B. Labels shall be affixed at the entry to all Audiovisual Control Rooms and spaces (Includes entrance facilities, communication equipment rooms, communication equipment spaces and work areas)

1. Use adhesive type labels for all communications space labeling,
2. Affix labels to entrance doors – coordinate location with University's Representative.

C. Cables

1. Horizontal shall be marked within 12" of each endpoint or to innerduct in which the cable is installed.
2. Except where installed in innerduct or conduit, all backbone fiber optic cable shall have affixed to the outer jacket, labels of a bright color that contain at least the legend "FIBER OPTIC CABLE." These labels must be affixed at separations no greater than 10 ft.
3. Any cable installed in conduit shall be labeled at all intermediate pull or junction boxes.
4. Label cables using the appropriate circuit ID.
5. Use adhesive type labels for all AV cable labels.
6. Affix labels to cables – marking cable is not permitted.
7. Where cable is fully encased in innerduct label the outside of the innerduct with the cable label and, where the contents are fiber optic cabling, the "FIBER OPTIC CABLE" label.

D. Grounding and Bonding

1. The TMGB(s) (telecommunications main ground bar) shall be labeled as such with an adhesive type label(s) affix label(s) to TMGB.
2. The conductor connecting the TMGB (telecommunications main ground bar) to the building ground shall be labeled at each end with an affixed label in a visible location as close as practicable to the bonding point at each end of the conductor.

E. Firestopping

1. Each firestopping location shall be labeled at each location where firestopping is installed, on each side of the penetrated fire barrier, within 12 in. of the firestopping material.

END OF SECTION 27 41 07

SECTION 27 41 08 AUDIOVISUAL CABINETS, RACKS AND ENCLOSURES

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Audiovisual racks and cabinets.
- B. Production Desks and Mobile Production Racks .

1.2 RELATED WORK IN OTHER SECTIONS

- A. Section 27 41 01 – Grounding and Bonding for Audiovisual Systems
 - 1. Bonds racks and cabinets.
- B. Section 27 41 03 – Conduits and Backboxes for Audiovisual Systems
 - 1. Signal systems raceways at Audiovisual Control Rooms

1.3 REFERENCES

- A. American National Standards Institute (ANSI)
 - 1. EIA-310-D (1992) Cabinets, Racks, Panels, and Associated Equipment (ANSI/EIA/310-D)
 - 2. ANSI-J-STD-607-A Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications (ANSI/J-STD-607-A-2002)
- B. International Conference of Building Officials (ICBO)
 - 1. AC156 ICBO ES Acceptance Criteria for Seismic Qualification Testing of Nonstructural Components (Jul. 2004)
- C. Telecordia Technologies
 - 1. Network Equipment Building System (NEBS) GR-63-CORE (Seismic Zone 4)

1.4 SUBMITTALS

- A. Conform with the requirements of Division 01 - Shop Drawings, Product Data and Samples and Section 27 41 00 - Common Work Results for Audiovisual Systems.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Procedures: In accordance with Division 01 - Summary of Work.

PART 2 - PRODUCTS

2.1 GENERAL

- A. KEYS
 - 1. Key all boxes, cabinets, enclosures, panels, controls, doors and related provided for similar usage within a system identically.

2.2 EQUIPMENT ENCLOSURE SYSTEMS

- A. General:
 - 1. Provide enclosure systems including, but not limited to enclosures, cabinets, cases and related panels and accessories as specified herein. Provide size and quantity as shown on drawings or scheduled.
 - 2. Provide color as shown on drawings. If no color is shown on drawings, submit manufacturer's standard color chips for selection.
 - 3. Provide enclosure systems conforming to the UBC/CBC, latest edition, for seismic design.

4. Equipment Enclosures: Each rack provided with frame angles tapped 10-32, ANSI/EIA 310-D Universal Spaced.
- B. Zone 4 Equipment Rack, Front, Rear and Side Access.
1. Drawing Reference: R33
 2. Construction:
 - a. Manufacturer tested Zone 4 assembly, rated for at least 900 pounds of uniformly distributed load under Zone 4 forces.
 - b. Vertical Height (Min): 44 RU
 - c. Overall Depth: 27" minimum.
 - d. Overall Width: Nominally 24"
 - e. No Front Door
 - f. Lockable wire mesh rear door.
 - g. Fully Adjustable 19" Mounting Rails, 10-32 threaded openings on EIA spacing standard
 - h. Full height receptacle strip, at least one (1) circuit, 20A, unless otherwise noted, as specified elsewhere in Section 27 41 10.
 - i. Provide each rack with the following accessory shelves:
 - i. One (1) Exhaust Fan Panel, at top or rear doors, at least 200 CFM.
 - j. Gangable. Racks have been designed such that they are suitable for installation either as a single, standalone unit, or in a row of identical racks (gangable).
 - i. Single rack installation. Provide side panels at both sides.
 - ii. Multirack installation in a row. Bolt racks together using means provided by manufacturer. Omit side panels except at ends of row of racks – provide at ends of rows of racks
 3. Manufacturers. Provide manufacturer's accessories or 3rd party accessories as specified elsewhere in this Section for other specified elements. Coordinate selected shelves, fans and similar with rack submitted for finish and mounting means.:
 - a. Middle Atlantic WRK-44SA-27LRD, MW-LVRD-44 rear door, WRK-Z4 Mounting Brackets, MW-4FT top w/ 4 fans.
 - b. APC
 - c. AFCO
 - d. Hoffmann
 - e. Lowell
 - f. Wrightline
 - g. or equal.

2.3 RACK PANELS AND ACCESSORIES

- A. Rack Mounting Screws:
1. Screws 10-32; length as required for at least 1/4" excess when fully seated; oval head with black plastic non marring cup washer or equivalent ornamental head; nickel, cadmium or black plated; Phillips, Allen Hex, Square-Tip or Torx drive. Slotted screws are not acceptable.
- B. Sliding Shelf:
1. Plan Reference: SLIDING SHELF
 2. Construction/Features:
 - a. 16 gauge minimum cold rolled steel
 - b. Powder coat finish to match rack color, unless otherwise noted

- c. 19" Wide Pull out with handhole or knob.
 - d. Solid or perforated surface
 - e. Depth: At least 20", u.o.n.
 - f. 50 pound minimum load capacity
 - 3. Manufacturers:
 - a. Atlas Sound
 - b. BGW Systems, Inc. Sliding Shelves
 - c. Chatsworth Products 32" Deep Megaframe Sliding Shelf.
 - d. Elkay SLSH series
 - e. Homaco Adjustable Pull-Out Equipment Shelves
 - f. Hubbell MCCTELSHLF
 - g. Middle Atlantic Heavy-Duty Sliding Shelf
 - h. APW SSDC30.
 - i. AFCO AS-SO-19-24.
 - j. Or equal.
- C. Fixed Shelf - 4 post rack applications
- 1. Plan Reference(s):
 - a. FIXED SHELF
 - b. SHELF
 - 2. Construction:
 - a. 16 gauge minimum cold rolled steel
 - b. Powder coat finish to match rack color, unless otherwise noted
 - c. Holds 100 lbs load
 - d. Mounts to front and rear rails, U.O.N.
 - e. Solid or Perforated bottom panel to suit equipment being mounted.
 - f. Depth to equal not less than 75% of depth of equipment rack.
 - g. Not more than 1 RU in height.
 - 3. Manufacturers:
 - a. Atlas Sound Heavy Duty Shelves, SH series.
 - b. BGW Systems, Inc. Rack Mount Trays
 - c. Elkay SSH Series
 - d. Homaco Adjustable Equipment Shelves and Fixed Dual Shelves
 - e. Lowell Rack Mounted Utility Shelves
 - f. Middle Atlantic Universal Rackshelves
 - g. Rack Innovations, Inc.
 - h. ZERO/Stantron Stationary Shelves
 - i. AFCO AS-SF-19-24
 - j. APW ESDC30.
 - k. Hubbell MCCPSHLF
 - l. Chatsworth Products 29" Deep Megaframe Fixed Shelves.
 - m. or equal
- D. Fixed Shelf - 2 post rack applications
- 1. Plan Reference(s):
 - a. FIXED SHELF
 - b. SHELF
 - 2. Construction:
 - a. 18 gauge minimum cold rolled steel
 - b. Powder coat finish to match rack color, unless otherwise noted
 - c. Holds 25 lbs load

- d. Mounts to front rails, supports load to rear of frame. U.O.N., center support shelves not acceptable.
 - e. Solid or Perforated bottom panel to suit equipment being mounted.
 - f. Not more than 1 RU in height.
- 3. Manufacturers:
 - a. Chatsworth Products, Inc.
 - b. or equal
- E. Keyboard/Mouse Shelf
 - 1. Drawing Reference: Keyboard/Mouse Shelf
 - 2. Stores fullsize keyboard and mouse inside rack.
 - 3. Upon retraction to rack front, pivots 90 degrees for operator access.
 - 4. Manufacturers
 - a. APC 19" Rotating Keyboard Drawer.
 - b. Middle Atlantic
 - c. or equal.
- F. Grommet Panel
 - 1. Features/Functions/Construction
 - a. 1 RU steel or aluminum panel with 18" wide x 1" tall smooth edged opening in face
 - b. Cable management panel protrudes below opening perpendicular to rear face.
 - 2. Manufacturers:
 - a. Middle Atlantic BR1
 - b. Custom by Contractor using Blank Panel
 - c. or equal.
- G. Blank Panels:
 - 1. Construction
 - a. 16 gauge minimum cold rolled steel
 - b. Powder coat finish to match rack color, unless otherwise noted
 - 2. Manufacturers
 - a. Middle Atlantic Products SB Series.
 - b. Atlas Sound S19 Series.
 - c. BGW Systems Inc. Flanged Steel Blank Panels
 - d. Dukane
 - e. Elkay
 - f. Lowell Series L3
 - g. Zero ZP112000 Series.
 - h. Hubbell
 - i. or equal.
- H. Vent Panels:
 - 1. Construction
 - a. 20 gauge minimum cold rolled steel
 - b. 1/8" minimum holes, at least 70% open total panel cross-section.
 - c. Powder coat finish to match rack color, unless otherwise noted
 - 2. Manufacturers
 - a. Atlas Sound SVP Series.
 - b. BGW Systems Inc. Perforated Vent Panels
 - c. House of Metal Enclosures (HOME) Series PRP.

- d. Lowell Series L5
 - e. Middle Atlantic Products VT Series.
 - f. Zero.
 - g. or equal.
- I. Drawers
- 1. Construction
 - a. 16 gauge minimum cold rolled steel
 - b. Powder coat finish to match rack color, unless otherwise noted
 - c. Suitable for mounting from face of 4 post rack
 - d. At least 14-1/2" deep.
 - e. Full extension ball bearing slides with trigger release disconnect.
 - f. Rated for at least 100 pound load.
 - g. Flush handle does not protrude from drawer face.
 - h. Provide key lock where indicated.
 - 2. Manufacturers
 - a. BGW Systems Inc. Rack Mount Drawer Systems.
 - b. Middle Atlantic Heavy Duty D or TD series.
 - c. Atlas Sound SD*-165FP Series.
 - d. Elkay SSD Series.
 - e. or equal.
- J. Vertical Lacer Strips
- 1. 44RU high vertical steel strips with points for attachment of velco cable ties at at least 6" o.c.
 - 2. Manufacturers:
 - a. Middle Atlantic LACE-44LP
 - b. APW
 - c. or equal.
- K. Horizontal Lacer Bars
- 1. EIA 19" Width steel strips or bars suitable to provide support to large cable dressed horizontally through racks
 - 2. Size to suit load and mounting width.
 - 3. Manufacturers:
 - a. Middle Atlantic LBP-1R4, LBP-1.5 and LBP-1S.
 - b. APW
 - c. or equal.
- L. Seismic Hold-down Equipment Straps
- 1. Drawing Reference: None - Provide as required to secure equipment that can not be screw fastened to mounting shelves.
 - 2. Manufacturers:
 - a. BGW Systems
 - b. Everest Electronic Equipment Lock Down Kit
 - c. Ergotron
 - d. Chatsworth Products
 - e. Middle Atlantic Products
 - f. Q-Safety, Inc.
 - g. or equal.

PART 3 - EXECUTION

3.1 MOUNTING

- A. Unless otherwise noted, all floor supported equipment racks shall be bolted to the structure in accordance with the requirements of the CBC, the UBC and the contractors approved structural engineering submittal demonstrating the method to be used to conform to these requirements.
- B. Rows of identical racks shall be bolted together, in addition to being bolted to the floor, and bonded to form a single electrical ground plane.
- C. Wall mounted equipment racks and cabinets shall similarly be bolted to structural members in accordance with the requirements of the CBC, the UBC and the contractors approved structural engineering submittal demonstrating the method to be used to conform to these requirements.

3.2 EQUIPMENT ENCLOSURE (RACK) AND EQUIPMENT BACKBOARD FABRICATION

- A. Combustible material, other than incidental trim of indicated equipment, is prohibited within equipment racks.
- B. Provide permanent labels for all equipment and devices.
- C. Floor racks to be bolted floor unless otherwise indicated.
- D. Access shall not require demounting or de-energizing of equipment. Install access covers, hinged panels, or pull-out drawers to insure complete access to terminals and interior components.
- E. Provide a permanent label on the front of each equipment rack including the rack designation, and the circuit breaker number and associated electrical distribution panel designation servicing same.
- F. Where wiring of mixed types are called for on the plans, maintain separation of wiring classifications as specified in the individual sections of the Audiovisual Systems Work. Separately dress, route and land microphone, audio line level and data cables and related on the right side of the equipment enclosure, as viewed from the rear; dress, route, and land loudspeaker level, data and control cables on the left side of the equipment enclosure, as viewed from the rear.
- G. Provide vertical wire management of cabling within the rack independent of the adjustable EIA mounting rails. Vertical wiring management provided by the contractor within the rack shall not prevent such rails from being moved as required by the University.
- H. Dress and support cabling at a minimum of 24 inch on center.
- I. Access shall not require demounting or de-energizing of equipment or cabling. Install access covers, hinged panels, or pull-out drawers to insure complete access to terminals and interior components.

- J. Fasten removable covers containing any wired component with a continuous hinge along one side, with associated wiring secured and dressed to provide an adequate service loop. Provide an appropriate stop locks to hold all hinged panels and drawers in a serviceable position.
- K. Provide permanent labels for all equipment and devices. Where possible, fasten such labels to the rack frame or to blank or vent panels which will remain in place when active equipment is removed for possible service.
- L. At audio and video jackfields, provide service loop to permit removal of jackfields from rack sufficient to conveniently access all jack contacts for routine cleaning and maintenance. Organize the service loop and harness such that reasonable reconnection of jacks and jack normals is possible without cutting apart the harness.
- M. Coordinate the design and execution of wire harnessing of multi-bay audio and video rack ensembles with conditions of delivery to installation locations at Project Site, and with the requirement herein for test of the completely wired system in the shop prior to delivery to the Project Site. Organize the wiring harnesses such that they will fold within one shippable unit without risk of damage, or provide polarized multipin connectors and related interconnect systems as specified elsewhere herein.

3.3 SIGNAL GROUNDING & BONDING PROCEDURES

- A. Comply with National Electrical Code and the California Electric Code. Bond equipment racks to ground in accordance with the California Electric Code and ANSI/ EIA/ TIA 607 and Section 27 41 01 – Grounding and Bonding for Audiovisual Systems.
- B. Unless otherwise noted maintain a unipoint ground scheme.
- C. Equipment enclosures shall not be permitted to touch each other unless bolted together and electrically bonded.

SECTION END OF SECTION 27 41 08

SECTION 27 41 09 AUDIOVISUAL CABLE MANAGEMENT

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Section includes provision of cable management for cabling installed under the work of this Project as well as for University furnished patch cords at equipment racks
- B. Scope includes:
 - 1. Innerduct
 - 2. Cable End Spillway
- C. Backboard Cable Management
- D. Patch Panel Cable Management at racks and cabinets

1.2 RELATED WORK IN OTHER SECTIONS

- 1. Section 27 41 03 – Conduits and Backboxes for Audiovisual Systems
- 2. Section 27 41 07 – Identification for Audiovisual Systems
- 3. Section 27 41 08 – Audiovisual Cabinets, Racks, Frames and Enclosures

1.3 REFERENCES

- A. American Society For Testing and Materials (ASTM)
 - 1. ASTM D2239-03 Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter
- B. Underwriters Laboratories (UL)
 - 1. UL 910 Test for Flame-Propagation and Smoke-Density Values for Electrical and Optical-Fiber Cables used in Spaces Transporting Environmental Air (Nov. 1998)

1.4 SUBMITTALS

- A. Conform with the requirements of Division 01 - Shop Drawings, Product Data and Samples and Section 27 41 00 - Common Work Results for Audiovisual Systems.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Procedures: In accordance with Division 01 - Summary of Work.

PART 2 - PRODUCTS

2.1 Innerduct

- A. Innerduct, Single Chamber
 - 1. Drawing and spec reference(s):
 - a. ID*, Innerduct ("*" denotes cross sectional area of innerduct referenced to standard conduit trade size).
 - b. IDP*, Innerduct, Plenum ("*" denotes cross sectional area of innerduct referenced to standard conduit trade size).
 - 2. Construction:
 - a. Selected product suitable for:

- i. underground installation in ductbank,
 - ii. plenum (IDP)
 - iii. exposed, in interior utility rooms where indicated.
 - b. High density polyethylene.
 - c. Ribbed or similar exterior construction to resist crushing surface to promote fiber cable installation.
 - d. Provides an interior chamber with a capacity equal to a trade size conduit referenced above.
 - 3. Approvals:
 - a. ASTM D2239(1985) Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.
 - b. IDP - UL Standard Test Method 2024 of UL 910.
 - 4. Manufacturers, ID in underground ductbanks:
 - a. Carlon Optic-Gard/PE.
 - b. Arnco.
 - c. Vikimatic.
 - d. or equal.
 - 5. Manufacturers, ID in interior, non-plenum applications:
 - a. Carlon Optic-Gard/PVC.
 - b. Arnco.
 - c. Vikimatic.
 - d. or equal.
 - 6. Manufacturers, IDP:
 - a. Carlon Plenum-Gard.
 - b. Arnco.
 - c. Vikimatic.
 - d. or equal.
- B. Innerduct, Multi-Chamber:
- 1. Drawing and spec reference: #ID*, Innerduct ("#" denotes number of chambers, "*" denotes cross sectional area of each chamber referenced to standard conduit trade size).
 - 2. Construction:
 - a. Multi-Chamber Innerduct shall be installed within an outer diameter CRSC or PVC Conduit per manufacturer's recommendation, and as described elsewhere herein.
 - b. Shall provide independent interior chambers each with a capacity equal to a trade size conduit referenced above.
 - 3. Approvals:
 - a. ASTM D2239(1985) Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.
 - 4. Manufacturers, MultiChamber Innerduct:
 - a. AMP OptiDuct (Design Basis) Provide in combinations to meet scheduled requirement.
 - i. 3ID1 - Provide one (1) Three Cell innerduct in one-half of a 4" diameter PVC conduit. Each cell to have 1" cross-sectional area.
 - ii. 1ID3 - Provide one (1) Single Cell innerduct in one-half of a 4" diameter PVC conduit, with 3" cross-sectional area.
 - iii. 2ID1.25 - Provide one (1) Two cell innerduct in one-half of a 4" diameter PVC conduit. Each cell to have 1.25" cross-sectional area.
 - b. Carlon Multi-Gard

- c. North Supply Multi-Guard Multi-Cell Conduit.
 - d. Tamaqua.
 - e. or equal
- 5. Manufacturers - Independent InnerDuct runs in overall PVC conduit - Multiple runs of single chamber inner duct may be provided in lieu of single, multiple chamber innerduct provided above. Contractor bears burden of selected innerduct quantity to provide an exact match of cross-sectional area of each chamber of multi-chamber assembly and to re-size overall PVC conduit to accommodate this use.
 - a. Carlon.
 - b. American Plastics
 - c. Vikimatic
 - d. Or equal
- 6. Manufacturers, for direct burial or boring:
 - a. Tamaqua
 - b. Carlon
 - c. Or equal
- C. Innerduct, UV Rated
 - 1. Drawing Reference: ID, UV Rated*, where "*" denotes cross sectional area of each chamber referenced to standard conduit trade size).
 - 2. Approvals:
 - a. ASTM D2239(1985) Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.
 - 3. Construction.
 - a. Listed for UV exposure.
 - 4. Manufacturers:
 - a. Tamaqua Plus II Series Telecom Duct.
 - b. Allwire Black AllDuct.
 - c. or equal.
- D. Woven Mesh Innerduct
 - 1. Drawing Reference: MID, WMID
 - 2. Features/Functions
 - a. Three inch wide woven mesh assembly contains at least three continuous pullable sleeves, each can accommodate a cable of at least 1" diameter.
 - b. Systems providing fewer than 3 integrally woven sleeves per WMID assembly not acceptable.
 - c. Includes color coded pull tape in each sleeve.
 - d. Pre-Lubricated for cable pulling
 - e. Non-Hydroscopic
 - f. 2500 Pound Tensile Strength
 - g. 480 degree F melting point.
 - h. At least 5 years prior field use including at least 25 million feet of product in use.
 - i. Provide plenum rated assembly at plenum locations as defined by the California Electric Code.
 - 3. Manufacturers:
 - a. Maxcell/TVC 3" 3-cell in three unique colors per duct.
 - b. or equal (No known equal with identical 3 sleeves woven into a single assembly nor equal industry usage).

2.2 Conduit Cable Management

- A. Conduit End Waterfall Spillway
 - 1. Drawing Reference: CEW
 - 2. Features/Functions
 - a. Spillway fastens to end of EMT conduit, provides radius sweep, open on top, solid from below
 - b. Maintains proper bend radii for fiber/cable
 - c. Provides tie points for fire pillow retention
 - d. Supports up to 100 lbs. of hanging fiber/cable
 - e. Clamp for securing to EMT
 - f. Self-fastening tie down system for supporting cabling
 - 3. Construction:
 - a. Fire Retardant ABS
 - 4. Manufacturers:
 - a. Bejed BJ-2049 Spillway.
 - b. or equal (no known equal).

PART 3 - EXECUTION

3.1 INNERDUCT INSTALLATION

- A. Schedule of Application
 - 1. At plenum tray conditions, provide IDP.
 - 2. At 4" and larger interior conduits, provide WMID. Provide plenum rated WMID at plenum ceiling conditions.

3.2 CONDUIT END WATERFALL

- A. Fasten securely to conduit end wherever cabling will exit conduit 18" or more above the cable tray to prevent damage due to cabling due to weight of cable bearing on a conduit end.
- B. Secure cabling with integral cable restraint system.

END OF SECTION 27 41 09

SECTION 27 41 16 INTEGRATED AUDIO-VIDEO SYSTEMS AND EQUIPMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Provide all labor, materials, transportation and equipment to complete the furnishing, installation, assembly, set up, and testing of the Sound and Audiovisual System work indicated on the drawings and specified herein. Notwithstanding any detailed information in this Section, provide complete, working systems.
- B. Design, engineer and provide complete, all means of support, suspension, attachment, fastening, bracing, and restraint (hereinafter "support") of the Work of this Section. Provide engineering of such support by parties licensed to perform work of this type in the Project jurisdiction.
- C. At Conference Rooms , provide:
 - 1. Projection Systems
 - a. High quality, very high light output LCD or DLP projector with inputs of:
 - i. 1024x768 Non-interlaced XGA video
 - ii. DVI Video
 - iii. Y/C Interlaced (S-Video) video
 - iv. Composite video (CVideo)
 - 2. Projector Support:
 - a. Dual Chamber projector support mount.
 - 3. A/V Program sources:
 - a. Computer (RGBHV) and stereo audio program source inserted at WPIPC panel mounted in existing floor box.
 - 4. Program Audio Playback
 - a. Wall mounted, two-way program audio loudspeakers.
 - 5. Projection Screens
 - a. Motorized 16:9 format, flush in ceiling, high definition grey finish.
 - 6. Control System
 - a. Interfaces:
 - i. Wall mounted, 12-button panel, programmable control buttons.
 - b. A/V System Control Functions:
 - i. Arrange in scenes ("Project DVD", "Project Television"), not by device (i.e. "Select Input, Select Output").
 - ii. Provide for the functions as detailed on drawings, subject to University Representative's direction at Construction phase conference.
 - iii. Button function: System On
 - iv. Turns on projector
 - v. Selects RGBHV video input
 - vi. Recalls video preset memory
 - vii. Lowers screen,
 - viii. Selects stereo audio input.
 - ix. Button function: Volume Up
 - x. Raises system volume

- xi. Button function: Volume Down
 - (1) Lowers system volume
 - xii. Button function: Mute
 - (1) Mutes system volume
 - xiii. Button function: System Off
 - (1) Turns off projector
 - (2) Raises screen(s)
- D. At Ballrooms 1401A, 1401B and 1401C, provide:
1. Projection Systems
 - a. High quality, very high light output LCD or DLP projector with inputs of:
 - i. 1024x768 Non-interlaced XGA video
 - ii. DVI Video
 - iii. Component video
 - iv. Composite video (CVideo)
 2. Projector Support:
 - a. Shelf support mount.
 3. A/V Program sources:
 - a. Combination Digital Video Disk (DVD) and VHS VCR mounted in Rack R33, Room 1311, plays DVD format disks and VHS tapes.
 - b. Blu-ray Digital Video Disk (HDDVD) mounted in Rack R33, Room 1311, plays standard and high definition DVD format disks.
 - c. OFE Computer (RGBHV), Component or Composite Video Source inserted at WPIC panels mounted in Rack R33, Room 1311.
 - d. OFE Computer (RGBHV), Component or Composite Video Source inserted at WPIC panel in FC4 and FC6 floorboxes.
 - e. OFE Computer (RGBHV), Component or Composite Video Source inserted at WPIC panel in MP* media wall panels.
 - f. Stereo audio program associated with any of the above video sources.
 - g. iPod dock mounted in Rack R33, Room 1311, enables docking and playback of iPod players.
 - h. Wall mounted wired microphone jacks.
 - i. Wireless lavalier and handheld microphones provide reproduction of speech to Rooms 1401A, 1401B and 1401C, separately or combined in response to user selection of automatic microphone mixing linking using control system.
 4. A/V Program outputs:
 - a. Computer (RGBHV), Component or Composite Video outputs at MP* media wall panels.
 - b. Stereo audio program associated with any of the above video sources.
 - c. Mic/Line level outputs at MP* media wall panels.
 5. Switcher/Processor
 - a. Switcher delivers above to projectors/displays over pair of Category 5e cables or A/V Control wires through matching Category decoder unit installed at projector.
 6. Program Audio Playback
 - a. Wall mounted, two-way program audio loudspeakers.
 7. Projection Screens
 - a. Motorized 16:9 format, flush in ceiling, high definition grey finish.
 8. Speech and Music Reinforcement System
 - a. DSP based audio processing system, A/V control system, multi-channel amplification system and distributed loudspeakers provide multi-zone speech

and audio reinforcement as follows:

- i. Through A/V control system button panels, can select which rooms are to function as a combined rooms. If no specific room combination is selected, the rooms are to function as independent rooms.
 - b. In independent room operation, the following are the locations of the front of room:
 - i. Room 1401B - South Wall
 - c. In combined operation, the following are the locations of the front of room:
 - i. Rooms 1401A, B & C - East Wall
 - d. Automatic microphone mixing:
 - i. Provide for automatic microphone mixing, including correction for NOM (number of open microphones) for all of the microphone receptacles in each room, if operating independently, or the combined rooms, if operating in combination.
 - e. Level control, speaker delay mapping and muting:
 - i. Provide overall level control through the A/V control system, as well as dynamic delay mapping and level attenuation for at least the two scenarios stated above.
 - ii. Volume control at control panel only controls level its own room if operating independently. When combined, all wall controls function to control overall level.
 - iii. Level within speaker zones as indicated on the plans to be automatically adjusted to reduce levels in the vicinity of the selected front of room to permit the sound system function with reinforced speech levels of at least 80 dBA in the seating area at +4' AFF without feedback with the supplied microphone installed at four and five feet above the floor anywhere within 8 feet of the front wall (except at doorways and room corners), while stand mounted and facing toward the wall (away from the seating area).
 - iv. Signals to each speaker zone to be automatically delayed in response to the front of room seating location such that the sound of acoustical sound sources (talkers) located at the front of room zone arrives at least 5 milliseconds prior to the arrival of electro-acoustically reinforced sound from the overhead system, as measured + 4' above the floor.
 - f. Assistive Listening System (ALS) provides ADA compliant reproduction of sound to Rooms 1401A, 1401B and 1401C, separately or combined in response to user selection of automatic microphone mixing linking using control system.
9. Control System
- a. Interfaces:
 - i. Wall mounted control panels with touchpanel menus and programmable buttons
 - b. A/V System Control Functions:
 - i. Arrange in scenes ("Project DVD", "Project Television"), not by device (i.e. "Select Input, Select Output").
 - ii. Provide for the functions as detailed on drawings, subject to University's direction at Construction phase conference and at least the following:
 - iii. Main Menu Screen
 - (1) Ballroom 1401B
 - (2) Combined Mode
 - iv. Ballroom 1401B Sub Menus

- (1) Floor box (FC4) Computer Input
 - (2) Floor box (FC4) Component Input
 - (3) Floor box (FC4) Composite Input
 - (4) Other inputs
 - (a) MP1401B-1 Computer Input
 - (b) MP1401B-1 Component Input
 - (c) MP1401B-1 Composite Input
 - (d) MP1401B-2 Computer Input
 - (e) MP1401B-2 Component Input
 - (f) MP1401B-2 Composite Input
 - (5) Wired Microphones
 - (6) Wireless Microphones
 - (7) DVD/VCR
 - (8) HD DVD
 - (9) iPod Dock
 - (10) Advanced I/O Matrix
 - (a) Provide a full matrix to enable routing of any Ballroom 1401B input to any Ballroom 1401B output. Primary screen to list input selections by wall or floor media panel and secondary screen to list output selections by wall media panel.
 - (2) In addition, provide "Main Menu" return button on each screen.
 - ii. Combined Mode Sub Menus
 - (1) Floor box (FC6) Computer Input
 - (2) Floor box (FC6) Component Input
 - (3) Floor box (FC6) Composite Input
 - (4) Other inputs
 - (a) [Provide list of all wall and floor box media panel inputs by room and media panel #]
 - (5) DVD/VCR
 - (6) HD DVD
 - (7) iPod Dock
 - (8) Advanced I/O Matrix
 - (a) Provide a full matrix to enable routing of any Ballroom input to any Ballroom output. Primary screen to list input selections by room and wall or floor media panel and secondary screen to list output selections by room and wall or floor media panel.
 - ii. In addition, provide "Main Menu" return button on each screen.
- B. At AV Room 1311, provide:
1. Switcher/Processor
 - a. Switcher delivers all Ballroom input stated above to all Ballroom outputs stated above over pair of Category 5e cables or A/V Control wires through matching Category decoder unit installed at projector. The system switching and processing hardware enables any Ballroom input to be routed to any Ballroom output.
 2. Control System
 - a. Interfaces:
 - i. Rack mounted touchpanel control with programmable interface buttons
 - b. A/V System Control Functions:
 - i. Arrange in scenes ("Project DVD", "Project Television"), not by device (i.e. "Select Input, Select Output").

- ii. Provide identical functions as listed above for Ballroom touchpanel controls, subject to University Representative's direction at Construction phase conference.

1.2 Reference Standards

- A. Conform to the applicable portions of the current standards published by these organizations:
 - 1. SMPTE Society of Motion Picture and Television Engineers.
 - 2. NAB National Association of Broadcasters.
 - 3. EIA Electrical Industries Association of America.
 - 4. UL Underwriters Laboratories.
 - 5. AES Audio Engineering Society.
 - 6. NEC National Electrical Code.
 - 7. UBC Uniform Building Code.
 - 8. NFPA National Fire Protection Association.
 - 9. EIAJ Electrical Industries Association of Japan.
 - 10. IEC International Electrotechnical Commission.
 - 11. FCC Federal Communications Commission.
 - 12. NTC Network Transmission Committee of the Video Transmission Engineering Advisory Committee.
 - 13. NCTA National Cable Television Association.
 - 14. BTSC Broadcast Television Stereo Committee.
 - 15. TASO Television Allocation Study Organization.
- B. Conform additionally to the following specific standards:
 - 1. American National Standards Institute (ANSI)
 - a. ANSI S1.4-1983 (R2001) American National Standard Specification for Sound Level Meters
 - b. ANSI S1.11-1986 (R2001) American National Standard Specification for Octave-Band and Fractional Octave-Band Analog and Digital Filters
 - c. ANSI S1.42-1986 (R2001) American National Standard Design Response of Weighting Networks for Acoustical Measurements
 - d. ANSI IT 7.214-89 Audio-visual Systems - Front Projection Screens (Tripod/Free-Standing) - Methods for Testing and Reporting Performance Characteristics.
 - 2. Audio Engineering Society Incorporated (AES)
 - a. AES2-1984 (r1997) AES Recommended Practice Specification of Loudspeaker Components Used in Professional Audio and Sound Reinforcement
 - b. AES5-1998 (Revision of AES5-1984) AER recommended practice for professional digital audio – Preferred sampling frequencies for applications employing pulse-code modulation
 - c. AES14-1992 (r1998) AES standard for professional audio equipment – Application of connectors, part 1, XLR-type polarity and gender
 - d. AES20-1996 AES recommended practice for professional audio – Subjective evaluation of loudspeakers
 - e. AES26-2001 Revision of AES26-1995 AES recommended practice for professional audio interconnections – Conservation of the polarity of audio signals
 - f. AES-R2-1998 AES project report for articles on professional audio and for equipment specifications – Notations for expressing levels

3. Electronic Industries Association of America (EIA)
 - a. EIA-160 Sound Systems
 - b. EIA-310-E Racks, Panels and Associated Equipment
 - c. EIA-101-A Amplifiers for Sound Equipment
 - d. SE-103 Speakers for Sound Equipment
 - e. SE-104 Engineering Specifications for Amplifiers for Sound Equipment
4. International Electrotechnical Commission (IEC)
 - a. IEC 268-3 (1988) Sound system equipment – Part 3: Amplifiers
 - b. IEC 268-5 (1989) Sound system equipment – Part 5: Loudspeakers
 - c. IEC 268-12 (1987) Sound system equipment – Part 12: Application of Connectors for Broadcast and Similar Use
 - d. IEC 651 (1979) Sound level meters
5. International Organization for Standardization (ISO)
 - a. ISO 1996-1 Acoustics – Description and measurement of environmental noise – Part 1: Basic quantities and – Composite Analog Video Signal – NTSC for Studio Applications
6. Federal Specifications (FS)
 - a. GG-S-00172D Screen, Projection. Federal Supply Classification (FSC) 670.
7. Federal Standards (Fed-Std)
 - a. 191A Textile Test Methods.
 - i. 5760 Mildew Resistance of Textile Materials; Mixed Culture Method.
 - ii. 5903.1 Flame Resistance of Cloth; Vertical.
8. NFPA
 - a. 255 Method of Testing Surface Burning Characteristics of Building Materials.
 - b. 701 Methods of Fire Tests for Flame-Resistant Textiles and Films.
9. Society of Motion Picture Engineers (SMPTE).
 - a. SMPT 196M-86 Motion Picture - Screen Luminance and Viewing Conditions - Indoor Theater Projection Guide.
 - b. SMPTE 202M-1998 Motion Pictures – B Chain Electroacoustic Response – Dubbing Theaters, Review Rooms and Indoor Theaters
 - c. SMPTE RP167-1995 Alignment of NTSC Color Picture Monitors
 - d. SMPTE EG1-1990 Alignment Color Bar Test Signal for Television Picture Monitors
 - e. SMPTE EG27-1994 Supplemental Information for ANSI/SMPTE 170M and Background on the Development of NTSC Color Standards (R1999)
 - f. RP 94 Recommended Practice for Gain Determination of Front Projection Screens.
 - g. SMPTE RP 95 Recommended Practice for Installation of Gain Screens.
 - h. SMPTE RP 98 Recommended Practice for Measurement of Screen Luminance in Theatres.
10. Underwriters Laboratories Incorporated (UL)
 - a. UL 813 Commercial Audio Equipment 1996
 - b. UL 1419 Professional Video and Audio Equipment 1997
 - c. UL 1492 Audio-Video products and Accessories 1996
 - d. UL 6500 Audio/Video and Musical Instrument Apparatus for Household, Commercial and Similar General Use 1999

1.3 Related Work in Other Sections

- A. Division 26 - Power for all equipment

- B. Section 26 55 00 – Dimming Control System
 - C. Section 27 41 01 – Grounding and Bonding for Audiovisual Systems
 - D. Section 27 41 02 – Hangers and Supports for Audiovisual Systems
 - E. Section 27 41 03 – Conduits and Backboxes for Audiovisual Systems
 - 1. Empty raceway system for work of this Project, including floorboxes.
 - F. Section 27 41 06 – Noise and Vibration Controls for Audiovisual Systems
 - 1. Outlet box pads for the work of this Project.
 - G. Section 27 41 07 – Identification for Audiovisual Systems
 - H. Section 27 41 08 – Audiovisual Cabinets, Racks, Frames
 - 1. Floor Mounted and Casework Equipment Racks for the work of this Section.
 - I. Section 27 41 09 – Audiovisual Cable Management
- 1.4 Quality Assurance
- A. Test Equipment - Refer to 27 41 00:
 - 1. Sound Systems:
 - a. Wide band oscilloscope, 50 MHz, analog. (Example: Tektronix TAS-250 or 2212).
 - b. True RMS audio digital volt-ohm-millimeter (Example: Fluke 8060A).
 - c. Integrated audio test set (Example: Audio Precision or Neutrik A1 or A2 System).
 - d. Acoustic polarity tester (Example: BSS Audio Ltd. Phasecheck System AR 130).
 - e. Pink Noise generator (Example: Ivie IE-20B).
 - f. Calibrated microphone and pre-amplifier assembly (Example: Ivie IE-2P preamplifier/power supply with Ivie/ACCO, Bruel & Kjaer, or Larson-Davis microphone capsule).
 - g. Real time audio spectrum analyzer, one-third octave (Example: Ivie IE-30A or JBL Smaart system).
 - h. Frequency/time audio analyzer (Example: Crown TEF system or JBL Smaart system).
 - B. Baseband Video Systems:
 - 1. Wide band oscilloscope, 50 MHz, analog. (Example: Tektronix TAS-250 or 2212).
 - 2. Analog composite test generator (Example: Tektronix TSG 170A or TSG 100 Opt. 01).
 - 3. Analog composite waveform/vector monitor (Example: Tektronix 1740A or WFM 90.)
 - C. RGBHV Wideband Component Analog Video Systems:
 - 1. Wide band oscilloscope, 200 MHz, analog. (Example: Tektronix TAS-485).
 - 2. RGBHV test generator (Example: Extron VTG 100).
 - D. Projection Systems:
 - 1. Luminance meter. (Example: Tektronix J17/J18 with J1803 8 degree luminance head.).

2. Grey scale chart.
3. Precision optical comparator. (Example: Phillips or Tektronix J17/J18 with J1810/J1820 chromaticity head.).

E. Any other items of equipment or materials required to demonstrate conformance with the Contract Documents.

1.5 Submittals

- A. Conform with Division 01 - Shop Drawings, Product Data and Samples and Section 27 41 00 - Common Work Results for Audiovisual Systems

1.6 Conflicts

- A. Present any conflicts between codes, regulations, specifications and/or requirements at least thirty (30) days prior to the commencement of the scheduled work.

1.7 System Performance Requirements, Audio-visual System

- A. Using the listed test equipment, document that the installed systems meet or exceed the performance standards below.

B. Audio Playback and Sound Reinforcement Systems:

1. Electrical Performance; Source Input to Power Amplifier Output:
 - a. Frequency Response (Equalizer flat): +0.5 dB 30 Hz to 15 kHz.
 - b. Total Harmonic Distortion (THD): Less than 0.5%, 30 Hz to 15 kHz, +4 dBm line level.
 - c. Signal to Noise: At least 70 dB, 30 Hz to 15 kHz, referenced to input of +4 dBm.
 - d. Crosstalk: At least -60 dB, 30 Hz to 15 kHz.
2. Electro/Acoustic Performance:
 - a. Uniformity of Coverage:
 - i. ± 7 dBA, 5 feet above the floor.
 - b. Minimum Sound Pressure Level at Center of Target - at indicated aiming point, down centerline of device.
 - i. 85 dBA, 5 feet above the floor.
3. Equipment: Specified individually.
4. Audio Signal Path: Shall not degrade performance of connected equipment.

C. Video Systems:

1. Video Signal System: NTSC to EIA RS-170A, except as noted.
2. Video Signal Path: To EIA RS-250B short haul where equalized, otherwise to the performance limit of the specified video cable.

D. RGBS Video Systems:

1. Video Signal: Pass 300 Hz to 120 MHz sine wave from any input to any output with losses of less than 1 dB over cable loss at cable manufacturer specified performance points without amplification.

E. Projection and Display Systems:

1. Consistent with performance of specified displays, projectors and screens.
2. Brightness, convergence per ANSI standard procedures for device.

F. Controls Systems

1. The Contractor is to meet with the University's representative to learn the

University's requirements for the Audiovisual Controls Systems.

2. General Touchpanel Programming Requirements
 - a. General Requirements that the Contractor will need to conform with include the following:
 - i. At control panels in the classroom spaces, providing a close match of the user interface used in the existing classrooms elsewhere in this building.
 - ii. Organize user interface in terms of integrated scenes ("Project Computer Video"). It is not acceptable to expect the user to individually have to select screen lower, projector on, input select, dim lights, input select and similar. A single button should achieve all of these functions. A present one or more submenus providing the operator and/or instructor with relevant options related to the scene (i.e. Transport control, level set)
 - iii. A single button should provide the means of returning the user to the master menu screen.

1.8 Training

- A. Conduct training on completed system at reasonable convenience of the Agency during normal business hours.
- B. Operator Training: Sixteen (16) hours.
- C. Initial Use Support: Provide standby trainer/system engineer during two (2) system uses, each not to exceed four (4) hours of training.

1.9 Definitions

- A. Definitions of Terms: The following definitions and conditions apply to each of the respective parameters and the measurements of those parameters, unless specifically stated otherwise:
 1. Frequency Response: The minimum acceptable frequency band over which the amplitude response is within 3 dB (or any specified range), or the specified limits of the response relative to the reference frequency (1 kHz for audio, 1.0 MHz for video) under design load conditions, at any operating level up to and including the specified maximum output while fully in compliance with all other performance specifications.
 2. Maximum Output Level: The minimum acceptable maximum signal output level (voltage, current or power) attained under design load conditions attained while fully in compliance with all other performance specifications.
 3. Harmonic Distortion: The maximum acceptable harmonic distortion measured at any operating level, up to and including the specified maximum output, with an applied sine wave signal of any frequency in the range of the specified frequency response.
 4. Audio Intermodulation Distortion: The maximum acceptable intermodulation distortion resulting from the introduction of 60 Hz and 7 kHz signals in a ratio of 4:1 under design load conditions at any operating level up to and including the specified maximum output level.
 5. Signal to Noise Ratio: The minimum acceptable ratio of signal to noise levels derived from broadband measurements under design load at maximum output over the entire range of the specified frequency response.
 6. Clipping Level: The minimum acceptable maximum level of signal applied to the

device under design load conditions while fully in compliance with all other performance specifications.

7. Sensitivity: The maximum acceptable level of input signal applied to the device that is necessary to provide the maximum output under design load conditions.
8. Design Load: The load (in ohms) specified by usage of the particular device input or output.
9. Composite Triple Beat Ratio: The ratio of visual carrier level to composite third order distortion products.
10. Cross Modulation Ratio: The ratio of visual carrier level to coherent spurious signal level (i.e. intermodulation products).
11. Carrier to Noise Ratio: The ratio of visual carrier to noise levels derived from broadband measurements under design load at maximum output over the entire range of the specified frequency response.

B. Signal Levels: The following voltage levels shall be considered the standard operating levels for the particular circuitry, unless specifically noted otherwise (0.775 Volt = 0 dBu = 0 dbm for a 600 ohms terminated circuit):

1. Microphone Circuits: -30 dBu or less.
2. Audio Line Level Circuits: -30 dBu to +24 dBu; equivalent to -30 dBm to +24 dBm for a 600 ohms terminated circuit.
3. Loudspeaker Level Circuits: More than +24 dBu.
4. Video Line Level Circuits: 1.0 Volt, peak to peak composite signal.
5. Radio Frequency (RF), Television (MATV) Circuits: +6 to +72 dBmV (0 dBmV = 1,000 microvolts).

C. Characteristic Impedances: The following operating impedances shall be considered to be the standard operating impedances for the particular circuitry, unless specifically noted otherwise:

1. Microphone Circuits: 50-250 ohms source, 150-1500 ohms terminating, electrostatically and electromagnetically balanced to ground.
2. Audio Line Level Circuits: 600 ohms maximum source, 600 ohms minimum terminating, line to line, electrostatically and electromagnetically balanced to ground.
3. Video Line Level Circuits: 75 ohms maximum source, 75 ohms minimum terminating to shield and signal ground, with Vertical Standing Wave Ratio (VSWR) not to exceed 1.2.
4. Radio Frequency (RF) Television Circuits: 75 ohms nominal to shield and signal ground, with Vertical Standing Wave Ratio (VSWR) not to exceed 1.2.

1.10 SOFTWARE LICENSING

- A. Provide licensing for project specific software programming at programmable devices.
- B. Provide licensing and original software copies for each device provided under Work of this Section that uses software for operation, configuration or control.
 1. Provide licensing for required workstation operating systems, and required third party software.
 2. For the Control System, provide a complete copy of the source code, including the device interface driver code modules.
- C. Upgrade each software package to the release in effect at the end of the Warranty Period.

PART 2 - PRODUCTS

2.1 GENERAL

A. Loudspeaker Substitutions

1. In addition to the procedures of Division 01 - Product Options and Substitutions, for loudspeakers, the University's Representative may require a subjective evaluation test generally conforming with AES20-1996.
2. Perform the subjective evaluation test at the convenience of the University's Representative, at a location reasonably proximate to the Project site as agreed by the University's Representative.
3. Loudspeaker substitutions shall provide sound pressure level equal to the specified product at the target ear plane, seated or standing as applies. If the substitute loudspeaker is less sensitive than the specified loudspeaker, pursuant to Division 01 - Product Options and Substitutions,, the Contractor is responsible to provide greater amplifier power in the ratio of the inverse of the sensitivity difference.

2.2 Packaged Loudspeaker Assemblies and Related

A. Two-Way, Surface, Line Source Loudspeaker

1. Drawing Reference: SL
2. Two-way packaged vertical line array loudspeaker system, including:
 - a. Low frequency vertical line array, 2 segments spaced above and below the high frequency element, the low frequency ensemble consisting of 10 each 4 inch cone drivers, with high frequency element, centered in the low frequency line array, consisting of ribbon radiator device, or;
 - b. Low frequency vertical line array, continuous, consisting of 8 each 6.5 inch cone drivers, with high frequency element consisting of a vertical line array of ribbon radiator devices.
 - c. Passive crossover network with frequency shading.
 - d. Voice-coil impedance.
3. Electroacoustic Performance
 - a. Frequency response, on axis, 100Hz to 10kHz, plus and minus 4 dB.
 - b. Directivity in the vertical plane approximately 25 degrees at 375 Hertz and above.
 - c. Directivity in the horizontal plane approximately 120 degrees at 600 Hertz and above.
 - d. Axial sensitivity not less than 95dB at 1Watt, 1 meter at low impedance, in half space mounting.
 - e. Power Handling at least 200 Watts by AES method.
4. Construction
 - a. Enclosure of formed steel, or; Medium density fiberboard (MDF), or; hardwood (baltic) plywood painted enclosure.
 - b. Powder coated or painted perforated steel grille
 - c. Color White.
 - d. Integral fastening points for mounting hardware.
 - e. Maximum dimensions, 56 inches high, 12 inches wide, 12 inches deep.
 - f. Maximum weight, 110 pounds.
5. Mounting bracket
 - a. Adjustable mount generally concealed from view by the visual mass of the loudspeaker.
 - b. Positive locking in position.

6. Manufacturer
 - a. Innovox Audio SLA-10.1 line array speaker, white, with Omnimount Series 30 mount.
 - b. SLS Audio LS8695 White.
 - c. EAW
 - d. Renkus-Heinz
 - e. JBL
 - f. Or equal
- B. Compact Two-Way Loudspeaker:
1. Drawing Reference: SP.
 2. Two-way speaker system, including:
 - a. Point source time-coherent driver system, or
 - b. 6-1/2" Woofer and 1" Softdome HF driver
 3. Functions/Features/Performance:
 - a. Frequency Response, on axis: 80Hz to 16kHz + 2.5dB
 - b. Power Handling Capacity: At least 25 watts rms, as per EIA RS-426-A.
 - c. Pressure Sensitivity: Not less than 88 dB at 1M with 1 watt from 100Hz to 10kHz.
 - d. Nominal Impedance: 4-8 ohms
 - e. Dispersion: At least 90° horizontal, 90° vertical nominal 6dB down at 2 kHz.
 4. Construction:
 - a. Maximum Dimensions: 9" (H) x 7.5" (W) x 6" (D)
 - b. Maximum Weight: 6 lbs.
 - c. Integral anchorage for mounting hardware
 - d. All direction adjustable anchorage - secure with tamper proof fasteners.
 - e. Black or White Plastic enclosure, black or white painted grill. - Color selected by Architect. Finish and construction suitable for viewing by public in interior space.
 5. Manufacturers, Speakers:
 - a. Tannoy Di5AW with Di5AW Yoke, color white.
 - b. JBL Control 25-WH with MTC-28/25CM.
 - c. Renkus-Heinz
 - d. Or equal
 6. Manufacturers, Wall Mount:
 - a. JBL Invisiball Mounting System
 - b. Omnimount
 - c. Allen Products
 - d. equal by loudspeaker manufacturer
 - e. or equal.

2.3 DISTRIBUTED Loudspeaker Assemblies and Related

- A. Loudspeaker, Flush, Acoustical Ceiling, (High Ceiling)
1. Drawing Symbol: SE
 2. Construction
 - a. UL 94V-0 fire rated ABS baffle/bezel assembly,
 - b. Zinc plated steel rear enclosure, with integral toggle anchors
 - c. Paintable powder coated grille with safety tether
 - d. 70V Transformer with 8 ohm bypass
 - e. Waveguide loaded 8-inch polypropylene low frequency transducer with coaxially-mounted waveguide coupled 1-inch titanium dome tweeter.

3. Both the low frequency and high frequency drivers shall be waveguide coupled to provide dispersion control over the specified frequency range.
 - a. 75 degree conical coverage typical from 1.2 kHz to 10 kHz.
4. Performance
 - a. Power rating: 100 watts (EIA RS-426A pink noise, 6 dB crest factor), 400 watts peak.
 - b. Frequency response: Uniform from 50 Hz to 20 Hz. (- 10 dB down)
 - c. Minimum pressure sensitivity: 93 dB SPL at 1 meter (3.3 feet) on axis with one watt of pink noise (ref. 20 μ Pa).
 - d. Minimum direct coupled impedance: 6.0 ohms, 8 ohm nominal.
 - e. 70V transformer taps at 7.5, 15, 30 and 60 watts.
5. Maximum size: 15 inch in diameter and 13 inch deep.
6. Not more than 14 lb.
7. Manufacturers:
 - a. Electro-Voice® model EVID C8.2HC.
 - b. JBL Control Contractor 328CT with JBL MTC-300BB8 backbox and JBL MTC-300RG8 grill
 - c. Or equal

2.4 POWER AMPLIFIERS AND RELATED

A. Power Amplifiers, General

1. Drawing Symbol: PA[number].
2. Provide the following functions and/or features
 - a. Employ solid state devices (integrated circuits and/or transistors) throughout and employ positive protection of circuit components.
 - b. With amplifier input driven 10 dB beyond input level required to produce full rated output, amplifier shall withstand for at least 15 seconds any of the following load conditions without instability or operation of main over current protection (i.e. no blown fuses or circuit breakers).
 - i. "Short" circuit of 0.1 ohm.
 - ii. Open circuit (no load).
 - iii. Standard Reactive Load: 5.4 ohms in series with the parallel combination of 12.5 microhenrys; 800 microfarads and 18.3 ohms resistive.
 - c. Peak voltage of turn-on and/or turn-off transients not greater than 20 dB below maximum rated amplifier output.
 - i. Time duration of transients not to exceed 3 seconds.
 - d. Input level controls for each output channel to be calibrated, stepped attenuators with at least 50 dB range.
 - i. For 0 to 34 dB of attenuation, steps not to be greater than 2.0 dB.
 - ii. Attenuators to track calibration within 0.5 dB.
 - iii. Stepped attenuators are not required at Power Amplifiers where the connected driving source device includes a precision attenuator under digital control with precision not less than that specified herein.
 - e. Input Connectors: XLR connector or tip sleeve (standard) phone jack or barrier strip.
 - f. Output Connectors: Standard 0.75 inch spacing "5-way" binding posts, or barrier strip.
 - g. Where integral cooling fans are provided, such fans shall have a minimum life rating of 50,000 hours at 25 degree Centigrade ambient temperature.
 - h. Where indicated, provide balanced input, differential or transformer. Provide

matching accessory to implement if not a standard feature of the product provided.

- i. Listed by a Nationally Recognized Testing Laboratory.
3. Minimum performance requirements with all channels driven
 - a. Power Output Per Channel: As scheduled on Drawings as Minimum Amplifier (Min Amp) and specified below; continuous average sine wave power into 70 Volt line over a bandwidth of 40 Hz to 20 kHz.
 - i. Frequency Response: plus 0 dB, minus 0.5 dB, 40 Hz to 20 kHz at rated output.
 - ii. Total Harmonic Distortion: Less than 0.25 percent at rated output, 40 Hz to 20 kHz.
 - iii. Intermodulation Distortion: Less than 0.04 percent at rated output using frequencies of 60 Hz and 7 kHz, mixed in a ratio of 4:1.
 - iv. Input Impedance: 15,000 ohms minimum; unbalanced, or balanced as shown on drawings.
 - v. Hum & Noise: At least 94 dB signal-to-noise ratio.
 - vi. Channel Separation: At least 75 dB at 1 kHz.
 - vii. Phase Shift: Less than plus 20 degrees from 20 Hz to 20 kHz.
 - viii. D.C. Offset: Less than 10 millivolts.

B. Power Amplifiers, 2 Channel, Low Impedance

1. Drawing Symbols
 - a. PA 25
 - b. PA100
 - c. PA200
 - d. PA300
2. Comply with Power Amplifiers, General, in this Section.
3. Power Output Per Channel, continuous average sine wave power into 8 ohm voice coil impedance, not less than:
 - a. PA25, 25 Watts
 - b. PA100, 100 Watts
 - c. PA200, 200 Watts
 - d. PA300, 275 Watts
4. Dimensions
 - a. PA 25, not to exceed 1 rack unit for 2 channels.
 - b. PA100, PA200 and PA300, not to exceed 3 rack units for 2 channels.
5. Manufacturer, PA25
 - a. Crown D-45
 - b. QSC
 - c. Or equal
6. Manufacturer, PA100
 - a. Crown CL1
 - b. Crown Cdi in low impedance mode.
 - c. QSC
 - d. Or equal
7. Manufacturer, PA200
 - a. Crown CL1
 - b. Crown Cdi in low impedance mode.
 - c. QSC
 - d. Or equal
8. Manufacturer, PA300

- a. Crown CL1
 - b. Crown Cdi in low impedance mode.
 - c. QSC
 - d. Or equal
- C. Power Amplifiers, 2 Channel, 70 Volt
 - 1. Drawing Symbol
 - a. PA25-70
 - b. PA100-70
 - c. PA200-70
 - d. PA300-70
 - e. PA600-70
 - 2. Comply with Power Amplifiers, General, in this Section.
 - 3. Power Output Per Channel, continuous average sine wave power into 70 Volt line impedance, not less than.
 - a. PA25-70, 25 Watts
 - b. PA100-70, 100 Watts
 - c. PA200-70, 200 Watts
 - d. PA300-70, 300 Watts
 - e. PA600-70, 600 Watts
 - 4. Dimensions: Not to exceed 3 rack units for 2 channels.
 - a. Manufacturer, PA25-70
 - i. Crown
 - ii. QSC
 - iii. Or equal
 - b. Manufacturer, PA100-70
 - i. Crown CH-1
 - ii. QSC
 - iii. Or equal
 - c. Manufacturer, PA200-70
 - i. Crown CH-1
 - ii. QSC
 - iii. Or equal
 - d. Manufacturer, PA300-70
 - i. Crown CH-1
 - ii. QSC
 - iii. Or equal
 - e. Manufacturer, PA600-70
 - i. Crown CH-2
 - ii. QSC
 - iii. Or equal

2.5 AUDIO MIXING, CONTROL, PROCESSING AND RELATED

- A. Digital Signal Processing (DSP) System
 - 1. Drawing Symbol(s): DSP System
 - 2. Function/Features:
 - a. Implement functions shown on Drawings using Digital Signal Processing (DSP) hardware and software.
 - b. System configuration software can implements at least the following functions as are identified on the plans and in the pre-construction requirements conference:

- i. Echo Cancellation at each Microphone Input at Rooms 140 and 170.
 - (1) In distance learning mode, cancellation compares input signal with content of outbound audio programming and digitally removes content arising from reproduction of sound that has already been sent to far side Codec, or which has been received from far side Codec. For BMI mics, responds to Control Systems input as to whether microphone user has selected microphone before gating open input.
 - (2) In both distance learning and non-distance learning mode, functions as Automatic mic mixer input for active mics.
 - ii. AMIX10 - 10 channel automatic microphone mixer. Provides overall Automatic Microphone mix of overall input levels to keep signal levels from rising due to number of open microphones (NOM Control) and the levels in each. Requires minimum audio threshold with fast attack to recognize microphone inputs not equipped with interface buttons as they are used.
 - iii. LINE INPUTS as indicated
 - iv. REMOTE - Remote power on/off, gain control, auxiliary mixer select, System Mode - controlled through interface to Control System specified elsewhere in this Section.
 - v. DELAY - multi-channel delay, output quantity as indicated with 0-100 ms delay assignable to each output on selection of delay mode operation.
 - vi. LEVEL - Gain control under control of REMOTE
 - vii. X02WAY 24dB - Crossover network, 2 port, 24 dB/octave
 - viii. HP - High Pass Filter
 - ix. LIM - Limiter
 - x. SHELF - Shelving Filter
 - xi. FBX - Automatic Feedback Suppressor
 - xii. PEQ* - Parametric Equalizer, where * indicates bands provided
 - xiii. MIX* - Mixer, where * indicates channel count
 - xiv. LP - Low pass filter
 - c. Field reconfigurable functions and parameters.
 - d. Performance:
 - i. Sample at 48 kHz or greater.
 - ii. At least 20 bit input/output quantization.
 - iii. Noise performance within 3 dB of theoretical limit.
 - iv. Minimum of 24 bit internal processing.
 - v. Provide control with true status feedback.
- 3. Manufacturer - DSP System
 - a. Symetrix Symnet
 - b. Biamp Systems
 - i. AudioFLEX AEC-2HD input board for each microphone input in Rooms 140 and 170.
 - ii. AudiaFLEX configured with Audia IP2 input boards, Audia OP2 output boards and AudiaEXPO output expander as required.
 - iii. AudioFLEX Control 8 and Volume 8 Controls
 - iv. Connecting cables.
 - c. ClearOne Converge Series
 - d. Or equal

2.6 AUDIO SIGNAL SOURCE AND STORAGE:

A. Radio Frequency Receiver/Wireless Microphone System:

1. Drawing Reference(s):
 - a. WREC
 - b. WMIC - Wireless Mic, Handheld
 - c. WMIC LAV - Wireless Mic, Lavalier
 - d. Wireless microphone symbol.
2. Provide quantity of complete systems to match quantity of WMIC and WMIC LAV microphone symbols shown.
 - a. Coordinate operating frequency with other UHF local sources, including but not limited to current television operating frequencies and DTV frequency allocations and/or local public safety operating frequencies to eliminate any interference from outside RF sources.
 - b. Provide Receiver unit configured for diversity reception.
 - c. Allows the expansion of wireless microphone systems by splitting one pair of antennas to multiple receivers. It also amplifies RF signals to compensate for insertion loss that results from splitting signal power to multiple outputs. A single system can support up to four wireless receivers.
3. Function/Features/Performance:
 - a. WREC/WMIC
 - i. Operating Range Under Typical Conditions: 100m (300 ft.) Note: actual range depends on RF signal absorption, reflection, and interference.
 - ii. Audio Frequency Response (+/- 2 dB): Minimum: 45 Hz; Maximum: 15 kHz
 - iii. Total Harmonic Distortion (ref. +/- 38 kHz deviation, 1 kHz tone): 0.5%, typical
 - iv. Dynamic Range: >100 dB A-weighted
 - v. Operating Temperature Range: -18°C (0°F) to +57°C (+135°F)
Note: battery characteristics may limit this range
 - vi. Transmitter Audio Polarity: Positive pressure on microphone diaphragm (or positive voltage applied to tip of WA302 phone plug) produces positive voltage on pin 2 (with respect to pin 3 of low impedance output) and the tip of the high impedance 1/4-inch output.
4. Manufacturer, WMIC System:
 - a. Shure SLX24/SM58 with carrying case and SLX4 Diversity Receiver
 - b. Telex
 - c. Audio Technica
 - d. Sennheiser
 - e. Or equal
5. Manufacturer, WMIC LAV System:
 - a. Shure SLX14/85 Lavalier Wireless System and SLX1 Body Pack with carrying case and SLX4 Diversity Receiver
 - b. Telex
 - c. Audio Technica
 - d. Sennheiser
 - e. Or equal

2.7 ASSISTIVE LISTENING SYSTEM (ALS):

A. General

1. Provide Radio Frequency Type, Frequency Modulated

2. 72 MHz Assistive Listening band.
 3. Provide for simultaneous operation of at least 5 separate systems.
- B. ALS Transmitter
1. Drawing Symbol: ALS-TX
 2. Features
 - a. Balanced bridging line input.
 - b. Rack mounted.
 - c. Connector for remote-mounted antenna.
 - d. Selectable transmitting frequency.
 3. Manufacturer
 - a. Listen Technologies LT-800-072 Stationary Transmitter with LA-326 Rack Mounting Kit
 - b. Phonic Ear
 - c. Williams Sound Corp
 - d. Or equal.
- C. ALS Remote Transmitting Antenna
1. Drawing Symbol: A
 2. Features
 - a. Antenna system with hardware to mount on electrical box.
 3. Manufacturer
 - a. Listen Technologies LA-122 Universal Antenna Kit
 - b. Phonic Ear
 - c. Williams Sound Corp
 - d. Or equal.
- D. Receivers and Accessories
1. Receiver
 - a. Battery powered, rechargeable.
 - b. Volume control.
 - c. Receptacle for earphone/accessory.
 - d. Rechargeable battery.
 - e. Tuneable to channel in use by the user.
 - f. Quantity: As Scheduled on the plans
 2. Earphone
 - a. Ear hung, not inserted in the ear canal.
 3. Manufacturer
 - a. Listen Technologies LR-500-072-0-M-C
 - b. Phonic Ear
 - c. Williams Sound Corp
 - d. Or equal.
- E. Battery Charger/Storage/Carry Case
1. Features
 - a. Store and charge up to 16 Receivers and related accessories.
 - b. Cover, latches and carrying handles.
 - c. Removable lid.
 2. Quantity: To simultaneously recharge each received as scheduled on the plans
- Manufacturer
- a. Listen Technologies LA-325
 - b. Phonic Ear

- c. Williams Sound Corp
- d. Or equal.

2.8 Control System and Related

A. General

1. Products provide under this Section shall be made by manufacturers regularly engaged in the production of programmable commercial audio-visual control systems. Such manufacturers shall have at least 5 years prior production experience in the manufacture of such goods.
2. Provide control system to perform functions scheduled on drawings and herein.
 - a. System to be field programmable.
 - b. Provide programming allowance to implement system as defined in Part 1 and as modified by University prior to first use. Provide an additional \$2,000 to implement system operation enhancements determined by University following first use.

B. Control Processor

1. Drawing Reference: Control3
2. Features/Functions/Performance:
 - a. Control System shall utilize a processor at no less that of sufficient capacity to provide the indicated control functions without degradation due to system overload.
 - b. I/O Ports:
 - i. At least 3 RS-232/422/485 Ports.
 - ii. At least 8 IR/Serial Ports.
 - iii. At least 8 Isolated Relay Ports
 - iv. At least 8 I/O Ports.
 - v. At least 1 Port for the control system manufacturer's proprietary A/V network.
 - vi. At least 1 TCP/IP Ethernet Network connection via an RJ-45 connector.
 - c. Control System shall be fully compatible with the control system manufacturer's projector and A/V equipment status monitoring and
 - d. management software.
 - e. Control System shall include a 10/100 BaseT Ethernet Port that supports
 - f. all of the following features:
 - i. TCP/IP Communications
 - ii. DHCP and DNS Support
 - iii. IEEE 802.11b and Bluetooth Compatibility
 - iv. Native Email Client
 - v. Remote Diagnostics
 - vi. Remote Program Loading and Administration
 - vii. Built-In Web Server
 - viii. FAT32 File System for easy data management
 - ix. SSL security plug-in
 - x. PDA Integration and Control, XPanel PDA - Pocket PC 2002
 - xi. WebTablet Integration and Control – Microsoft Tablet PC
 - xii. Self Generating Executable GUI, XPanel EXE – Microsoft Family of Operating Systems
 - xiii. Self Generating ActiveX powered Microsoft Internet Explorer Integration and Control, XPanel Microsoft Internet Explorer.
 - xiv. Self Generating Java powered Web Integration and Control

- g. Control System Processor shall utilize a real time, event driven, multitasking, multi-threaded operating system with a dual bus architecture.
 - h. High speed processor shall communicate directly with Ethernet, control
 - i. ports and proprietary control network utilizing high-speed, parallel bus
 - j. infrastructure. Control processors that communicate via a serial bus shall
 - k. not be accepted.
 - l. Control processor shall contain sufficient memory for the applications indicated.
 - m. Control System processor shall utilize a FAT32 file structure.
 - n. Control System shall support internal communications speed via two, independent communications busses. First control bus speed shall be at least 40 mb/s, second control bus speed shall be at least 300 mb/s.
 - o. Full API (Applications Interface) directly to control system via TCP/IP for integration with Visual Basic, C++, Java, etc. applications. API support through included control system manufacturer's ActiveX modules and/or their Dynamic Link Library (.DLL) file.
 - p. Control system manufacturer's to continuously monitor the integrity of the A/V control network for wiring faults, marginal communication performance, network errors – all information is viewable.
 - q. System Support RS-485 token passing network with data communication for a minimum distance of 5000 feet.
 - r. Allow proprietary A/V Network network expansion via Ethernet or RS-232 ports, which can allow for high-speed network acceleration.
 - s. Support a minimum of 253 proprietary network devices simultaneously.
 - t. Control system shall support object-oriented logic based programming language and a C-like language programming language. Both programming types are supported to run simultaneously and integral to each other.
 - u. Control system manufacture shall supply Windows-based graphical programming software for drag and drop object oriented programming for the control system operation.
 - v. Control system manufacture shall provide Windows-based graphical programming software, which is self-documenting in that it generates a symbolic flow diagram printout from the system program.
 - w. The control system shall support a variety of wireless communication modes, including one-way and two-way radio frequency and infrared transmission.
3. Manufacturers:
- a. Crestron CP2E
 - b. AMX
 - c. Extron
 - d. or equal.
- C. Audio/Video Switcher, Category Media and Related
1. Drawing References:
- a. CMAO - Category Media Stereo Audio Output
 - b. CMPO - Category Media Projector Output with Audio Amplification
 - c. CMPONA - Category Media Projector Output without Audio Amplification
 - d. WPIC - Wall or Floor Box Panel Input w/ Component Video Input
 - e. WPIPC - Wall or Floor Box Panel Input, RGBHV and Audio Input only
 - f. CMIN - Category Media Input Device
 - g. CMPONP - Category Media Receiver with Audio

- h. CNT BLOCK - Control Termination Block
- i. Control PS: Control System Power Supply
- 2. Functions/Features:
 - a. WPIC
 - i. Connectors – Front Panel
 - (1) Component Y, PB, PR (3) RCA female, component video input; formats: YpbPr; Input Impedance: 75 ohms; maximum input: 1 Vp-p; includes signal sensing
 - (2) Component L,R (2) RCA female; unbalanced stereo line-level audio input; input impedance: 10k ohms; maximum input level: 2 Vrms
 - (3) VIDEO (1) RCA female; Composite video input; 75 ohms terminated; Maximum input: 1V p-p; Video sync detection
 - (4) VIDEO AUDIO (2) RCA female; Unbalanced stereo line-level audio input; Maximum input level: 2 Vrms; Input impedance: 10K ohms
 - (5) COMPUTER (1) DB15HD female; RGBHV (VGA) input; 75 ohms terminated (R/G/B); Maximum input voltage: 1V p-p; Maximum H and V Sync: 5.0V p-p into 620 ohms; Video sync detection on H-SYNC
 - (6) COMPUTER AUDIO (1) 3.5mm TRS mini phone jack; Unbalanced stereo line-level audio input; Maximum input level: 1 Vrms; Input impedance: 10K ohms
 - (7) MONITOR (1) DB15HD female; Buffered RGBHV pass-thru
 - ii. Connectors – Rear Panel
 - (1) Category Media (1) 8-wire RJ45 female; Category Media output port; Connects via CAT6/6 to Category Media input port of another Category Media device
 - (2) A/V Net (2) 4-pin 3.5mm detachable terminal blocks; (2) A/V Net ports, paralleled; Connect to A/V Net control network
 - iii. LED Indicators
 - (1) PWR Indicates 24 Volts DC power supplied from A/V Net control network
 - (2) NET Indicates communication with A/V Net system
 - (3) SETUP Used for touch-settable ID (TSID)
 - (4) COMP Indicates presence of a signal at the COMPUTER input
 - (5) VIDEO Indicates presence of a valid signal at the VIDEO input
 - (6) YPBPR Indicates presence of a valid signal at the COMPONENT input
 - iv. Controls
 - (1) SETUP Used for touch-settable ID (TSID)
 - v. Video
 - (1) Gain 0dB (75 ohm termination)
 - (2) Bandwidth 100MHz (-3dB) at unity gain
 - vi. RGB
 - (1) Gain (R/G/B) 0dB (75 ohm termination)
 - (2) Maximum resolution/refresh rate 1600x1200 @ 60Hz (at unity gain); With cable length of 100 meters and maximum compensation at receiver
 - vii. 3X1 Stereo Audio Switcher
 - (1) A-D Conversion Burr Brown 24-bit, 48 kHz
 - (2) Frequency response 20Hz to 20kHz
 - b. WPIPC

- i. Connectors - Front Panel
 - (1) COMPUTER (1) DB15HD female; RGBHV (VGA) input; 75 ohms terminated (R/G/B); Maximum input voltage: 1V p-p; Maximum H and V Sync: 5.0V p-p into 620 ohms; Video sync detection on H-SYNC
 - (2) COMPUTER AUDIO (1) 3.5mm TRS mini phone jack; Unbalanced stereo line-level audio input; Maximum input level: 1 Vrms; Input impedance: 10K ohms
- ii. Connectors – Rear Panel
 - (1) Category Media (1) 8-wire RJ45 female; Category Media output port; Connects via CAT6/6 to Category Media input port of another Category Media device
 - (2) A/V Net (2) 4-pin 3.5mm detachable terminal blocks; (2) A/V Net ports, paralleled; Connect to A/V Net control network
- iii. LED Indicators
 - (1) PWR Indicates 24 Volts DC power supplied from A/V Net control network
 - (2) NET Indicates communication with A/V Net system
- iv. RGB
 - (1) Gain (R/G/B) 0dB (75 ohm termination)
 - (2) Maximum resolution/refresh rate 1600x1200 @ 60Hz (at unity gain); With cable length of 100 meters and maximum compensation at receiver
- c. CMPO
 - i. Network Interface
 - (1) 10/100BaseT, static IP or DHCP/DNS, SSL, auto-negotiating, full/half duplex TCP/IP, UDP/IP, SMTP, built-in Web server and e-mail client;
 - ii. Connectors
 - (1) S-VIDEO (1) 4-pin mini DIN female; Y/C S-Video output; Nominal output voltage: 1.0V p-p with 75 ohm termination
 - (2) Composite Video (1) BNC female; Composite video output; Nominal output voltage: 1.0V p-p with 75 ohm termination
 - (3) RGBHV (1) DB15HD female; RGBHV video output; Nominal output voltage: 1.0V p-p with 75 ohm termination; Nominal H and V Sync: 5.0V p-p
 - (4) Line level Audio Output
 - (a) (1) 9-pin 3.5mm detachable terminal block comprising (3) balanced line-level audio outputs;
 - (b) Maximum Output per Channel: 4VRMS (balanced), 2VRMS (unbalanced);
 - (c) Output Impedance: 200 ohms (balanced), 100 ohms (unbalanced)
 - (5) INPUT (1) 5-pin 3.5mm detachable terminal block; (4) Digital input ports (referenced to GND); Rated for 0-24VDC; Input impedance: 20K ohms; Logic threshold: 2.5VDC nominal
 - (6) IR (1) 2-pin 3.5mm detachable terminal blocks; IR/Serial port; IR output up to 1.2 MHz; 1-way serial TTL/RS-232 (0-5V) up to 9600 baud;

- (7) COM A - B (2) DB9 male; (2) Bidirectional RS-232 ports; Up to 115.2k baud; Hardware and software handshaking support; Com port B also serves as the computer console port
- (8) Category Media (1) 8-wire RJ45 female; input port; Connects via CAT6/6 to Category Media output port of another device Category Media. Provides up to 22 ns delay skew, adjustable per the cabling type used.
- (9) A/V NET (2) 4-pin 3.5mm detachable terminal blocks; (2) A/V Net ports (paralleled), Master/Slave selectable
- (10) 24VDC (1) 24 Volt DC power jack (power supply included); Passes through to NET ports to power A/V Network devices
- (11) LAN (1) 8-wire RJ45 with 2 LED indicators; 10/100BaseT Ethernet port; Green LED indicates link status; Yellow LED indicates Ethernet activity
- (12) SPEAKER (2) 2-pin 5mm detachable terminal blocks; (2) Amplified speaker-level audio outputs; Output power: 10W per channel into 4 or 8 ohms @ 1% THD maximum
- (13) Closure Output. Two programmable relay control ports.
- iii. LED Indicators
 - (1) PWR, ACT, COM A, COM B, IR, INPUT, NET
 - (2) Reset Buttons
 - (a) HW-R Hardware reset (reboots the control system)
 - (b) SW-R Software reset (restarts the program)
- iv. Video
 - (1) Gain 0dB (75 ohm termination)
 - (2) Bandwidth >40MHz (-3dB) at unity gain
- v. RGB
 - (1) Gain (R/G/B) 0dB (75 ohm termination)
 - (2) Maximum resolution/refresh rate 1600x1200 @ 60Hz (at unity gain);
 - (3) With cable length of 100 meters and compensation for CAT6/6 cable delay skew up to 15ns per 100 meters
 - (4) Bandwidth compensation (Peak) Digital control, 10-bit D/A
 - (5) Low frequency compensation (Boost) Digital control, 10-bit D/A
 - (6) Propagation delay compensation (Skew) Digitally controlled delay line, 4-bit, 0-15 ns (independently for R, G, and B)
- vi. 4X3 Audio Matrix Mixer and 3-Channel Signal Processor
 - (1) D-A Conversion Burr Brown 24-bit, 48 kHz
 - (2) Output volume range -80dB to +20dB, 0.1dB steps plus mute
 - (3) Input volume range -80dB to 0dB, 0.1dB steps
 - (4) Input compensation ± 10 dB
- vii. Microphone input EQ 4-band GEQ per input, ± 12 dB, 0.1 dB steps from DMT; ± 10 dB, 0.1 dB steps from programmable control
- viii. Speech output delay 0 to 40 mS
- ix. Bass/Treble gain range ± 15 dB, 0.5dB steps
- x. Output Equalization Modes 10-band graphic plus 2-band parametric; Selectable 5-band graphic plus 7-band parametric; speech optimized 5-band graphic plus 7-band parametric; 3-band graphic plus 9-band parametric; or 12-band parametric
 - (1) PEQ filter gain ± 12 dB, 0.01 dB steps from DMT
 - (2) PEQ filter bandwidth .02 to 2.0 octaves (1.0 to 3.0 for shelving) from DMT

- (3) PEQ filter center frequency 25Hz to 19.9kHz from DMT
 - (4) PEQ filter types low pass, high pass, EQ filter (peaking/notching), bass shelf, and treble shelf
 - (5) GEQ filter gain ± 12 dB, 0.1dB steps from DMT; ± 10 dB, 0.1dB steps
- xi. Frequency response 20Hz to 20kHz ± 0.5 dB
- xii. S/N ratio 94dB (line), 90dB (amplified) 20Hz to 20kHz A-weighted
- xiii. THD+N 0.05% (line), 0.7% (amplified) 20Hz to 20kHz
- d. CMPONA
 - i. Features/Functions:
 - (1) As for CMPO without audio, AV NET or Control Closure functionality.
- e. CMPONP
 - i. Features/Functions:
 - (1) As for CMPO without control processor.
- f. CMAO
 - i. Audio
 - (1) Features: 4X3 Audio Matrix Mixer, 3-Channel Signal Processor, Auto Compensation with Self-Peaking
 - (2) D-A Conversion: Burr Brown 24-bit, 48 kHz
 - (3) Output Volume Range: -80dB to +20dB, 0.1dB steps plus mute
 - (4) Input Volume Range: -80dB to 0dB, 0.1dB steps
 - (5) Input Compensation: ± 10 dB
 - (6) Microphone Input EQ: 4-band GEQ per input, ± 12 dB, 0.1 dB steps from DMT; ± 10 dB, 0.1 dB steps from programmable control.
 - (7) Speech Output Delay: 0 to 40 mS
 - (8) Bass/Treble Gain Range: ± 15 dB, 0.5dB steps from programmable control
 - (9) Output Equalization Modes 10-band graphic plus 2-band parametric; Selectable 5-band graphic plus 7-band parametric; speech optimized 5-band graphic plus 7-band parametric; 3-band graphic plus 9-band parametric; or 12-band parametric
 - (10) PEQ Filter Gain: ± 12 dB, 0.01 dB steps from DMT
 - (11) PEQ Filter Bandwidth: .02 to 2.0 octaves (1.0 to 3.0 for shelving) from DMT
 - (12) PEQ Filter Center Frequency: 25Hz to 19.9kHz from DMT
 - (13) PEQ Filter Types: low pass, high pass, EQ filter (peaking/notching), bass shelf, and treble shelf
 - (14) GEQ Filter Gain: ± 12 dB, 0.1dB steps from DMT; ± 10 dB, 0.1dB steps from programmable control
 - (15) Frequency Response: 20Hz to 20kHz ± 0.5 dB
 - (16) S/N Ratio: 94dB (line), 90dB (speaker) 20Hz to 20kHz A-weighted
 - (17) THD+N: 0.05% (line), 0.7% (speaker) 20Hz to 20kHz
 - ii. Video/RGB
 - (1) Provides unbuffered, unprocessed pass-thru of video/RGB portion of QM signal; does not effect delay skew, bandwidth, or gain
 - iii. Connectors
 - (1) LINE OUT SPCH:
 - (a) (1) 3-pin 3.5mm detachable terminal block;
 - (b) Speech-channel balanced line-level audio output;
 - (c) Maximum output: 4Vrms balanced, 2Vrms unbalanced;
 - (d) Output impedance: 200 ohms balanced, 100 ohms unbalanced

- (2) LINE OUT L – R
 - (a) (2) 5-pin 3.5mm detachable terminal blocks;
 - (b) Stereo program-channel balanced line-level audio output;
 - (c) Maximum output: 4Vrms balanced, 2Vrms unbalanced (per channel);
 - (d) Output impedance: 200 ohms balanced, 100 ohms unbalanced
 - (3) QM IN
 - (a) (1) 8-wire RJ45 female, Category Media input port;
 - (b) Connects to Category Media output port of another Category Media device via Category Media.
 - (4) QM OUT
 - (a) (1) 8-wire RJ45 female, Category Media output port;
 - (b) Connects to Category Media input port of another Category Media device via Category Media
 - (5) NET
 - (a) (2) 4-pin 3.5mm detachable terminal blocks;
 - (b) A/V Net slave ports, paralleled, connect to A/V Net control network
 - (6) G
 - (a) (1) 6-32 screw, chassis ground lug
 - iv. LED Indicators
 - (1) PWR (green) Indicates 24 Volts DC power supplied from A/V Net control network
 - (2) NET (yellow) Indicates communication with A/V Net system
 - (3) SETUP (rear) (red) Used for touch-settable ID (TSID)
 - v. Controls
 - (1) SETUP (1) Button for touch-settable ID (TSID)
 - vi. Environmental
 - (1) Temperature 41° to 104°F (5° to 40°C)
 - (2) Humidity 10% to 90% RH (non-condensing)

g. CMIN

 - i. Video
 - (1) Signal Types: RGB and composite, S-Video, or component video
 - (2) Video/HDTV Formats: NTSC or PAL, HDTV up to 1080i/1080p
 - (3) RGB Formats: RGBHV, RGBS, or RGsB
 - (4) Gain: 0dB (75 ohms terminated)
 - (5) Maximum Resolution: 1920 x 1200 @ 60Hz (at unity gain) with maximum cable length of 450 feet and maximum compensation at receiver
 - ii. Audio
 - (1) A-D Conversion : 24-bit, 48 kHz
 - (2) Frequency Response : 20Hz to 20kHz
 - iii. Connectors
 - (1) R/C/Pr, G/Y/Y, B/COMP/Pb, H, V: (5) BNC female, Multi-format RGB/Video input;
 - (2) Formats: RGBHV, RGBS, RGsB, YPbPr, S-Video (Y/C), composite;
 - (3) Input Impedance: 75 ohms;
 - (4) H/V Sync Impedance: 620 ohms;
 - (5) Maximum Input Level: 0.7 Vp-p for RGB and C of S-Video; 1 Vp-p for composite and Y of S-Video;
 - (6) Maximum H/V Sync Level: 5 Vp-p;

- (7) Signal sensing on G/Y/Y, B/COMP/Pb, and H
 - (8) G: (1) 6-32 screw, chassis ground lug
 - iv. AUDIO:
 - (1) (1) 5-pin 3.5mm detachable terminal block;
 - (2) Balanced/unbalanced stereo line-level audio input;
 - (3) Maximum Input Level: 4 Vrms balanced, 2 Vrms unbalanced;
 - (4) Input Impedance: 10k ohms balanced, 5k ohms unbalanced
 - v. QM OUT : (1) 8-wire RJ45 female, QuickMedia output port;
 - (1) Connects to QM input port of any QuickMedia device via CresCAT-QM or CresCAT-IM cable*
 - vi. NET:
 - (1) (2) 4-pin 3.5mm detachable terminal blocks; Cresnet slave ports, paralleled;
 - (2) Connect to Cresnet control network via CresCAT-QM or Cresnet cable
 - vii. Buttons & LED Indicators
 - (1) PWR : (1) green LED, indicates 24 Volts DC power supplied from Cresnet control network
 - (2) NET: (1) yellow LED, indicates communication with Cresnet system
 - (3) VIDEO ACT : (1) red LED, indicates signal at the G/Y/Y, B/COMP/PB, or H connectors
 - (4) SETUP (rear) : (1) miniature pushbutton and red LED, used for touch-settable ID (TSID)
3. Manufacturer:
- a. Crestron
 - i. WPIC: QM-WMC-VCC
 - ii. WPIPC: QM-WCC-1
 - iii. CMPO: QM-RMCRX-BA
 - iv. CMPONA: QM-RX
 - v. CMPONP: QM-RX1-2G
 - vi. CMAO: QM-AE with ST-RMK rack mount
 - vii. CMIN: QM-TX with ST-RMK rack mount
 - viii. CNT BLOCK: CNHBLOCK
 - ix. Control PS: CNPWS-75 (Quantity as required)
 - b. Extron
 - c. AMX
 - d. Or equal.
- D. Control Panels, Hardwired, 12 Control Buttons:
- 1. Drawing References: CPSBW
 - 2. Features:
 - a. Hardwired, data line.
 - b. Wall or lectern mountable
 - c. 12 backlit buttons, each with status LED
 - d. Tally back function to panel in display.
 - e. Color to be selected by Architect.
 - 3. Manufacturer:
 - a. Crestron CNX-B12 Series
 - b. Extron
 - c. AMX
 - d. Or equal.

- E. Control Panels, Hardwired, 10 Control Buttons & Touchpanel:
 - 1. Drawing References: CPB
 - 2. Features:
 - a. Hardwired, data line.
 - b. Touchscreen Display
 - i. Display Type At least passive matrix grayscale LCD
 - ii. Minimum Size 3.8 inch (9.6 cm) diagonal
 - iii. Resolution 240 x 320 pixels
 - iv. Illumination White LED backlit
 - v. Minimum Viewing Angle $\pm 40^\circ$ horizontal, $+50^\circ/-30^\circ$ vertical
 - vi. Touchscreen Resistive membrane
 - c. Memory, at least 1 MB flash
 - d. Graphic Engine: At least four shades of grayscale
 - e. Audio
 - i. WAV file 8-bit PCM, mono, 8 kHz sampling rate, ~90 seconds capacity
 - ii. Amplification 0.5 Watt for built-in speaker
 - f. Connectors
 - i. NET (1) 4-pin 3.5mm detachable terminal block;
 - ii. Connects to A/V Net control network
 - g. Buttons
 - i. (10) Replaceable engravable buttons, programmable
 - h. Light Sensor
 - i. Programmable photosensor for backlight dimming and/or grayscale shade inversion
 - i. Environmental
 - i. Temperature 50° to 113°F (10° to 45°C)
 - ii. Humidity 10% to 90% RH (non-condensing)
 - j. Enclosure
 - i. Ventilated steel backbox
 - ii. Manufacturer:
 - k. Crestron TPS-4L Series with BB4L backbox.
 - l. AMX
 - m. or equal
- F. Touchscreen Panel, 12" Diagonal
 - 1. Drawing Reference: CPW12
 - 2. Minimum Features/Functions:
 - a. Touchscreen Display
 - b. Display Type: TFT Active matrix color LCD
 - c. Minimum Size: 12 inch diagonal
 - d. Aspect Ratio: 4:3 SVGA
 - e. Resolution: 800 x 600 pixels
 - f. Brightness: 400 nits (cd/m²)
 - g. Contrast: 300:1
 - h. Color Depth: 18-bit, 256k colors
 - i. Illumination: Backlit fluorescent
 - j. Viewing Angle: $\pm 70^\circ$ horizontal, $+45^\circ/-55^\circ$ vertical
 - k. Touchscreen: Resistive membrane
 - l. Processor
 - m. CPU: 32-bit Freescale ColdFire® Microprocessor

- n. Processing Speed: 410 MIPS (Dhrystone 2.1 benchmark)
- 3. Manufacturers:
 - a. Crestron TPS12B
 - b. Extron
 - c. AMX
 - d. Or equal.
- G. Control Panel, Touchscreen, Medium Size, Wireless Control
 - 1. Drawing Reference(s): CTWM, CRF Gateway
 - 2. Features/Functions:
 - a. Touchscreen Display
 - i. Display Type Active matrix color LCD
 - ii. Minimum Size 3.8 inch (9.65 cm) diagonal
 - iii. Aspect Ratio 4:3 QVGA
 - iv. Minimum Resolution 320 x 240 pixels
 - v. Color Depth At least 16-bit, 64k colors
 - vi. Illumination Backlit fluorescent with movement sensor
 - vii. Touchscreen Resistive membrane
 - b. Buttons, Minimum Requirement
 - i. VOL, CH (2) programmable up/down toggle function buttons
 - ii. MUTE, INFO, MENU, EXIT (4) programmable function buttons
 - iii. Thumbpad 5-way programmable for onscreen menu navigation (Up/Down, Left/Right, and Select)
 - iv. Forward/Backward (2) buttons, step forward or backward through touchpanel page list, or programmable
 - v. MAIN (1) button, reverts to first touchpanel page, or programmable
 - vi. All buttons backlit
 - c. Communications
 - i. Provide IR or RF to suit building conditions, including electrical noise and University's security requirements.
 - d. RF Wireless
 - i. RF Transmitter 418 MHz 1-way or 2 -way RF
 - ii. Minimum Range 50 – 100 feet
 - e. IR Wireless
 - i. IR Transmitter 38 kHz IR
 - ii. Format RC5
 - iii. IR Range 15 to 25 feet (typical)
 - f. Graphic Engine
 - i. At least 16-bit non-palette graphics; 65,536 colors; integrated image rendering algorithm
 - g. Audio
 - i. WAV File 8 & 16 bit PCM, mono & stereo, 8 – 22 kHz sampling rates
 - h. Connectors
 - i. Programming Port (1) USB port
 - ii. Connects to PC for loading screen files
 - i. Battery
 - i. Lithium Ion rechargeable battery pack (included)
 - ii. Minimum Usage per Charge 4 hours with display and backlight on full continuous; up to 7 days inactive
 - j. Environmental

- i. Temperature 41° to 104°F (5° to 40°C)
 - ii. Humidity 10% to 90% RH (non-condensing)
 - k. Enclosure
 - i. Construction High impact black/silver injection-molded case
 - l. Nominal Dimensions
 - i. Height 1.23 in (3.12 cm)
 - ii. Width 7.15 in (18.16 cm)
 - iii. Depth 4.74 in (12.04 cm)
 - 3. Manufacturers:
 - a. Crestron
 - i. CTWM: MT-1000C
 - ii. CRFGATEWAY: CNRFGWA-418 or MC2W RF or CNXRMIRD
 - b. AMX
 - c. or equal.
- H. Category Media Switcher, 16x16
- 1. Drawing References: CMRS 16x16
 - 2. Minimum Performance/Function/Features:
 - a. Video
 - i. 16x16 crosspoint matrix; routes any of (16) Category media input signals to any of (16) Category Media outputs
 - ii. Gain: 0dB
 - iii. Crosstalk: -60dB
 - b. Audio
 - i. 16x16 crosspoint matrix; routes any of (16) Category media input signals to any of (16) Category Media outputs
 - ii. Gain: 0dB
 - c. Connectors
 - i. IN 1 - 16, 8-wire RJ45 female and 4 4-pin 3.5mm detachable terminal blocks comprising Category media input ports with AV Networking ; connect to Av Network and Category Media output ports of other Category Media devices via Category Media cabling
 - ii. Out 1 - 16, 8-wire RJ45 female and 4 4-pin 3.5mm detachable terminal blocks comprising Category media output ports with AV Networking; connect to AV Network and Category Media output ports of other Category Media devices via Category Media cabling
 - iii. 24/G (2) 2-pin 5mm detachable terminal blocks providing (1) power connector per every (4) Category Media ports; Receive 24 Volts DC from external Category Media power supplies; Maximum Load: 75 watts each
 - iv. NET (1) 4-pin 5mm detachable terminal block;
 - v. Category Media slave port; connects to Category Media control network
 - vi. Ground (1) 6-32 screw, chassis ground lug
 - d. Buttons & Indicators, 4x4
 - i. PWR (1) green LED, indicates 24 Volts DC power supplied from A/V Control network
 - ii. NET (1) yellow LED, indicates communication with A/V Control system
 - iii. AUDIO BREAK (1) recessed pushbutton & red LED, enables audio breakaway in local mode, indicates audio breakaway in system mode

- iv. A (1) pushbutton & red LED, selects audio routing in local mode when audio breakaway is enabled, selects audio routing view in system mode
- v. V (1) pushbutton & red LED, selects video routing in local mode when audio breakaway is enabled, selects video routing view in system mode
- vi. SYS (1) pushbutton & red LED, activates Cresnet system control mode
- vii. LOCAL (1) recessed pushbutton & red LED, activates local front panel control mode
- viii. ENTER (1) pushbutton & red LED, implements routing set by IN and OUT buttons in local mode
- ix. IN 1 - 16 (16) pushbuttons & red LEDs, select inputs to be routed in local mode, select routing view for a given input in system mode
- x. OUT 1 - 16 (16) pushbuttons & red LEDs, select output destination(s) in local mode, select routing view for a given output in system mode
- xi. SETUP (rear) (1) miniature pushbutton & red LED, used for touch-settable ID (TSID)
- e. Minimum Environmentals
 - i. Temperature 41° to 104°F (5° to 40°C)
 - ii. Humidity 10% to 90% RH (non-condensing)
- 3. Manufacturers:
 - a. Crestron QM-MD16x16
 - b. AMX
 - c. Extron
 - d. or equal.

2.9 Video Receivers, Monitors and Related

- A. DVD/VHS Recorder/Player:
 - 1. Drawing Reference: DVD/VCR
 - 2. Function/Features/Performance:
 - a. Playback in Component HD Analog - as indicated on the plans - Single output for both DVD and VCR player elements.
 - b. VCR
 - i. Record/Playback in VHS video tape formats in conformance with JVC standards under control of Control system.
 - ii. Video signal format: NTSC composite and SVideo Inputs
 - iii. If VCR does not provide integral, user selectable closed caption decoding, provide external unit and integrate into system.
 - iv. Tuner: FCC and Cable channels.
 - v. Audio tracks: Total four; Two linear.
 - vi. Audio input/output: IHF Standard.
 - c. DVD Player
 - i. Plays DVD disks and audio CD under control of Control system
 - ii. Front loading.
 - d. Video input/output level: 1.0 V p-p, 75 ohms.
 - e. Unbalanced inputs and outputs
 - f. Infrared or serial remote control.
 - 3. Manufacturers:
 - a. Toshiba
 - b. Panasonic
 - c. Mitsubishi

- d. Sony
- e. Marantz
- f. or equal.

B. Blu-ray DVD Player:

1. Drawing Reference: HDDVD
2. Function/Features/Performance:
 - a. Playback in Component HD Analog and HDMI format
 - b. Plays high definition Blu-Ray disc and standard definition DVD discs and audio CD under control of Control system.
 - c. Front loading.
 - d. Video input/output level: 1.0 V p-p, 75 ohms.
 - e. Unbalanced inputs and outputs
 - f. Serial remote control.
 - g. Rack-mountable.
3. Manufacturers:
 - a. Pioneer BDP-V6000
 - b. or equal (no known equal).

2.10 Video Terminal Equipment

A. Video Projectors, HD

1. Drawing Reference: VPROJ1
2. Minimum Features/Functions/Performance:
 - a. Display Method: DLP TM chip x1, DLP TM system
 - b. Native Resolution: 1920 x 1200 pixels, 1,024,000 total pixels
 - c. Brightness: 6,000 lumens
 - d. Contrast Ratio: 2000:1
 - e. Lamp Type: 300W UHM dual lamp system
 - f. YPbPr Compatibility: 525i (480i), 625 (576i), 525p (480p), 625 (576p), 750 (720)/50p, 1035/60i, 125 (1080)/60i, 1125 (1080)/50i, 1080/24p, 1080/25p, 1080/30p, 1080/24sF, 1080/60p, 1080/50p
 - g. Optical Axis Shift: +50% vertical, +/-10% horizontal
 - h. Lens: Powered zoom/focus (1.8-2.4:1), F 1.7-2.0, f25.6 – 33.8mm
 - i. Inputs:
 - i. S-Video: Mini DIN 4-pin x1
 - ii. Composite Video: BNC-5
 - iii. DVI-D: DVI-D 24-pin
 - iv. RGB 1/YPbPr: BNC-5
 - v. RGB 2/YPbPr: D-sub HD 15-pin
 - j. Serial: D-sub 9-pin x1 (RS-232C)
 - k. Power Supply: 120 VAC, 60 Hz
 - l. Power Consumption: >820W
 - m. RGB: Horizontal: 15-91 kHz, Vertical: 50-85 Hz
 - n. S-Video: Horizontal: 15.75/15.63 kHz, Vertical: 50/60 Hz
 - o. Keystone correction: +/- 30 degrees
 - p. Supports ceiling mount configuration
 - q. Operating Temperature: 0-45 Degrees C.
 - r. Remote In/Out: M3 jack, D-sub 9-pin
 - s. LAN: RJ-45 network connection, 10Base-T/100Base-TX
 - t. Maximum dimensions: 20"W x 7"H x 17"D
 - u. Maximum weight: 40 lbs

3. Manufacturers
 - a. Panasonic PT-DZ6700U
 - b. Christie
 - c. Or Equal.
 4. Provide long throw (telephoto) lenses to adapt projector throw to indicated installation location and screen size.
 - a. Manufacturers:
 - i. By projector manufacturer.
 - ii. Buhl
 - iii. or equal.
- B. Video Projectors, high output
1. Drawing Reference: VPROJ2
 2. Minimum Features/Functions/Performance:
 - a. Vertical and horizontal lens shift and a complete line of optional bayonet style lenses,
 - b. Wired and wireless network projector, Built-in HTTP page
 - c. Video Processing,
 - d. 3D reform with geometry correction,
 - e. Lamp saver technologies with heat sensor and reserve power to keep cooling fan running even after disconnected
 - f. Optical
 - i. Display Technology
 - (1) 0.74" LCD w/ MLA
 - ii. Resolution
 - (1) Native WXGA 1280 x 800
 - (2) Maximum UXGA 1600x1200
 - g. Light Output (lumens)
 - i. 4000 normal
 - h. Contrast Ratio
 - i. 500:1
 - i. Lamp Type 330W AC
 - j. Lamp Life: 2000 hours normal/3000 hours eco-mode
 - k. Screen Size (diagonal): 25-500 in, 635-12700 mm
 - l. Throw Ratio 1.5 - 2.0
 - m. Projection Distance: 2.5 to 68.5 ft, .74m to 20.9m
 - n. Projector Angle: 10.3 to 10.8° tele, 13.7 to 14.5° wide
 - o. Lens
 - i. Zoom 1 to 1.33
 - ii. Focus Manual
 - iii. F-number, f-number F=1.7 to 2.2, f=24.4 to 32.5mm
 - iv. Shift Manual, 50 % Vertical, 10% Horizontal
 - p. Keystone Correction: Vertical +/-40 degrees, horizontal +/-35 degrees
 - q. Signal Compatibility/Connectivity
 - i. Scan Rate
 - (1) Horizontal 15 to 108 kHz
 - (2) Vertical 48 to 120 Hz
 - r. Supported Video Standards NTSC, NTSC4.43, PAL, PAL-60, PAL-M, PAL-N, SECAM
 - s. SD/HD Video Signal Compatibility: 1080i, 720p, 576p, 576i, 480p, 480i
 - t. PC Signal Compatibility VGA, SVGA, XGA, SXGA, SXGA+, UXGA

- u. Macintosh Compatibility Yes
- v. Input/Output Terminals
 - i. RGB 1 (analog) 15 pin
 - ii. RGB 2 (analog) 5 BNC
 - iii. RGB 3 (digital) DVI-D w/ HDCP
 - iv. Video 1 RCA
 - v. Video 2 S-Video
 - vi. Video 3 Component
 - vii. HD Video 1
 - viii. HD Video 2
 - ix. Audio (2) L/R RCA, (3) mini stereo
 - x. Monitor out Yes
 - xi. Audio out mini (Variable Audio Out)
- w. Audio 2 x 5W Stereo Speakers
- x. External Control RS232, LAN, IR
- y. Sync Compatibility Separate Sync/Composite Sync/Sync on G
- z. Networking: Wired LAN using integrated RJ45
- aa. Electrical: Power Consumption 490W
- bb. Mechanical
 - i. Installation Orientation: Floor/Front, Floor/Rear, Ceiling/Front, Ceiling/Rear
- cc. Maximum Net Weight 18 lbs
- dd. Maximum Fan Noise 38dBA normal/31dBA eco-mode at 3 feet
- ee. Listings: USA UL 1950 FCC Class B,
- ff. Environmentals
 - i. Operational Temp. 41° to 104°F / 5° to 40°C
 - ii. Humidity 20-80% (non-condensing)
 - iii. Storage 14° to 122°F / -10° to 50°C
- gg. Automatic keystone correction
- hh. Built-in Wall Color Correction Presets provide for adaptive color tone correction to display properly on non-white surfaces.
- ii. Advanced Synchronization: Ensures detailed images when non-native resolution sources are connected to the projector.
- jj. Kensington Lock Slot Enables security cable to be attached to projector.
- kk. Eco-Mode Technology: Extends lamp life, lowers audible noise and reduces total cost
- 3. Manufacturers
 - a. NEC NP3250W
 - b. Sharp
 - c. Epson
 - d. or equal.
- 4. Provide long throw (telephoto) lenses to adapt projector throw to indicated installation location and screen size.
 - a. Manufacturers:
 - i. By projector manufacturer.
 - ii. Buhl
 - iii. or equal.
- C. Video Projector Mount, Fixed, Ceiling
 - 1. Construction
 - a. Pipe column or multiple joined runs of electrical support strut with vanity

- cover.
- b. Channel and plate to mount to ceiling or wall as required.
- c. Seismic restraint diagonal bracing as required.
- d. Provide mount manufacturer's bottom plate to match projectors provided under Work of This Section.
- e. Mount rated load capacity not less than 50 pounds.
- f. Allows safe adjustment of pitch, roll and yaw at least plus minus 5 degrees after installation of the mount and projector.
- g. Allows for locking of pitch, roll and yaw settings after adjustment.
- h. Allows removal and replacement of the projector without loss of the specific adjustment of pitch, roll and yaw.
- i. Solid Steel Construction Optimal strength in a lightweight design
- j. Integrated Cable Management Allows routing of cables through top of mount without additional accessories.
- k. Secure Universal Mounting Interface: All mounting points secured for high-risk environments
- l. Quick Projector Connect/Disconnect With convenient lamp and filter access.
 - i. Always maintains registration
 - ii. Disconnecting doesn't affect pre-set adjustments
- m. Low-Profile, Aesthetic Design
- 2. Manufacturer, Video Projector Mount to CMU Wall
 - a. Chief Manufacturing RPAA1 Series Inverted LCD/DLP Projector Ceiling Mount with
 - i. WMA-300 Wall Mount Accessory Arm
 - ii. CMA-nnn Series Extension Column as required.
 - iii. CMA-640 Finishing Ring - Chrome.
 - b. Westbrook Engineering, Inc. Promount Series.
 - c. Monger Mount.
 - d. Or equal.
- 3. Manufacturer, Video Projector Mount to Structure Above
 - a. Chief Manufacturing RPAA1 Series Inverted LCD/DLP Projector Ceiling Mount with
 - i. CMA-110 Ceiling Plate 8" x 8" with 1 ½" NPT fitting.
 - ii. CMA-nnn Series Extension Column as required.
 - iii. CMA-640 Finishing Ring - Chrome.
 - iv. Lateral bracing per Architectural detail.
 - b. Westbrook Engineering, Inc. Promount Series.
 - c. Monger Mount.
 - d. Or equal.

2.11 Projection Screens

- A. Projection Screen, Ceiling Mount, Motorized, Tab Tension, HDTV Format
 - 1. Drawing Reference(s): SHC*, where * indicates the screen size
 - 2. Size:

Drawing Reference	Viewable Screen Diagonal	Viewable Screen Height and Width
SHC1	92"	45" X 80"
SHC2	106"	52" X 92"
SHC3	119"	58" X 104"
SHC4	133"	65" X 116"

SHC5	161"	79" X 140"
SHC6	184"	90" X 160"
SHC7	220"	108" X 192"
SHC8	240"	118" X 210"
SHC10	293"	144" X 256"

3. Features/Functions:
 - a. 16:9 aspect ratio.
 - b. Seamless viewing area.
 - c. Greenguard certified.
 - d. Electrical: 120 volts, single phase, 60 hertz.
 - e. Fabric: Flame and mildew resistant surface with black masking borders and black drop above the viewing surface. High contrast grey finish suitable for use with high output LCD or DLP projection.
 - f. Extra drop provide to drop screen within 4' above finished floor, unless otherwise indicated on the drawings.
 - g. Motorized operation with automatic travel stops.
 - h. Motor and roller: Reversible motor with permanent seal ball bearings, automatic thermal overload cut-out. Stressed truss roller minimum 5 inches (127 mm) diameter, mounted on steel brackets with heavy duty bearings.
 - i. Cable tensioning system at edges to ensure flatness.
 - j. UL listed.
 - k. Flat black edge finish.
 - l. Sizes SHC1 through SHC6.
 - i. Housing recessed in ceiling. Housing can be delivered to site and rough-in prior to placement of screen to protect screen from damage.
 - m. Provision screen with all necessary screen manufacturer options to use indicated low voltage, closure operation. Receipt of serial control or contact closure from Audio-visual control system shall be sufficient to unroll screen for viewing, re-roll screen or to stop screen at intermediate point. Field adjustable down limit switch shall automatically stop screen in full down position.
4. Performance:
 - a. 0.9 gain on-axis gain. $\pm .2$.
5. Manufacturers
 - a. Drawing Reference: SHC1 through SHC6.
 - i. Draper Access Series V with Hi Def screen.
 - ii. Vutech Prelude II with grey high definition, high contrast screen.
 - iii. Stewart Filmscreen
 - iv. or equal.
 - b. Drawing Reference: SHC7 through SHC10.
 - i. Dalite Tensioned Professional Electrol
 - ii. Stewart Filmscreen Model B ElectriScreen.
 - iii. or equal (no known equal)

2.12 Sound Cables and Related

A. General

1. Provide cable with electrical conductors of soft drawn annealed copper, bare or tinned, solid or concentric stranded as applies, conductivity not less than 98

- percent of pure copper.
 - 2. Comply with applicable Code for insulation, jacket, marking and listing for applicable use.
 - a. Refer to California Electrical Code, Table 725-61. Cable Uses and Permitted Substitutions.
 - 3. Manufacturer part number specified is for a Listed Type CM construction to indicate intended cable construction and quality.
 - a. Code requirements take precedence.
 - b. Provide type required by Code at no additional cost to the University.
- B. Cable, Microphone and Line Level, General Purpose
- 1. Drawing Symbol(s): SP, 2A.
 - 2. Description: Shielded, single twisted pair, with #20 AWG color coded stranded conductors and foil shield with drain wire.
 - 3. Performance/Construction
 - a. Conductors AWG #20.
 - b. Conductors Stranding: 7 by 28.
 - c. D.C. Resistance Per 1000 feet 15 ohms maximum.
 - d. Shield: Aluminum polyester foil with #20 AWG stranded tinned copper drain wire.
 - e. Diameter 0.24 inch maximum.
 - 4. Where 2A indicated, provide 2 each SP
 - 5. Manufacturer
 - a. Belden 8762
 - b. West Penn.
 - c. Or equal.
- C. Cable, Microphone and Line Level, Miniature
- 1. Drawing Symbol: SP, 2A
 - 2. Restriction: For use within fixed equipment racks only.
 - 3. Description: Shielded, single twisted pair, with #22 AWG color coded stranded conductors and foil shield with drain wire.
 - 4. Performance/Construction:
 - a. Conductors AWG #22.
 - b. Conductors Stranding: 7 by 30.
 - c. D.C. Resistance Per 1000 feet: 20 ohms maximum.
 - d. Shield: Aluminum polyester foil with #24 stranded tinned copper drain wire.
 - e. Diameter 0.15 inch maximum.
 - 5. Where 2A indicated, provide 2 each SP
 - 6. Manufacturer
 - a. Belden 8451, 9451, 1266A.
 - b. Alpha.
 - c. West Penn.
 - d. Or equal.
- D. Cable, Antenna, Assistive Listening System and Wireless Microphone System
- 1. Description
 - a. Nominal 50 ohms (actual 51 or 52 ohms) coaxial cable.
 - 2. Minimum 97 percent shield coverage.
 - 3. Joint Army Navy (JAN) or Military (MIL) Construction
 - a. RG-8/U to JAN-C-17A
 - b. RG-8 A/U to MIL-C-17D

- c. RG-9/U to JAN-C-17A.
- 4. Manufacturer
 - a. Belden 8237, 9251 or 8242.
 - b. CommScope.
 - c. Or equal.
- E. Cable, Loudspeaker and D.C. Power
 - 1. Drawing Symbol(s)
 - a. #18TP
 - b. #16TP
 - c. #14TP
 - d. #12TP
 - 2. Description
 - a. Twisted pair, jacketed, unshielded cables, #12, #14, #16, or #18, as shown on Drawings.
 - 3. Plenum rated where installed in open plenum return voids.
 - 4. Performance/Construction
 - a. Conductor, AWG: #12, #14, #16, and #18, as noted.
 - b. Maximum diameter
 - i. 0.384 inch (#12)
 - ii. 0.332 inch (#14)
 - iii. 0.256 inch (#16)
 - iv. 0.224 inch (#18).
 - 5. Manufacturer
 - a. Belden.
 - i. #12TP, Belden 8477
 - ii. #14TP, Belden 8473
 - iii. #16TP, Belden 8471
 - iv. #18TP, Belden 9740
 - v. West Penn.
 - vi. Or equal.

2.13 Video Cables, Copper Coax and Related

- A. General
 - 1. Provide cable with electrical conductors of soft drawn annealed copper, bare or tinned, solid or concentric stranded as applies, conductivity not less than 98 percent of pure copper.
 - 2. Comply with applicable Code for insulation, jacket, marking and listing for applicable use.
 - a. Refer to California Electrical Code, Table 725-61. Cable Uses and Permitted Substitutions.
 - b. Manufacturer part number specified is for a Listed Type CM construction to indicate intended cable construction and quality.
 - 3. Code requirements take precedence.
 - a. Provide type required by Code at no additional cost to the University.
- B. Cable, Precision Video
 - 1. Drawing Symbol(s): P-VID, V.
 - 2. Description: 100 percent sweep tested from 0.01 to 100 MHz, double braided shield solid center conductor 75 ohms coaxial precision video cable.
 - 3. Performance

- a. Cable Type: Coaxial precision video.
 - b. Center Conductor AWG: Twenty (20) bare copper.
 - c. Insulation: Polyethylene.
 - d. Shield: Tinned copper double braid, minimum 98 percent coverage.
 - e. Nominal Impedance: 75 ohms.
 - f. Velocity of Propagation: 66 percent.
 - g. Attenuation Per 100 feet:
 - i. 1.0 MHz: 0.25 dB
 - ii. 4.5 MHz: 0.45 dB
 - iii. 10.0 MHz: 0.78 dB.
 - h. Jacket: Polyethylene.
 - i. Diameter: 0.305 inch maximum.
 - 4. Manufacturer
 - a. Belden 8281A or 8281B.
 - b. Canare
 - c. Gepco
 - d. Or equal.
- C. Cable, Miniature Precision Video
 - 1. Drawing Symbol: Miniature Precision Video.
 - 2. Description: 100 percent sweep tested from 0.01 to 100 MHz, braided shield plus foil shield, stranded center conductor 75 ohms coaxial miniature precision video cable.
 - 3. Performance
 - a. Cable Type: Coaxial precision video.
 - b. Center Conductor AWG: 22 or 23 bare copper.
 - c. Center Conductor Stranding: 7 by 30 or 7 by 32.
 - d. D.C. Resistance Per 1000 feet: 15 ohms maximum.
 - e. Insulation: Cellular Polyethylene.
 - f. Shield: 100 percent foil plus trimmed copper braid, 95 percent coverage.
 - g. Nominal Impedance: 75 ohms.
 - h. Velocity of Propagation: 66 percent.
 - i. Attenuation Per 100 feet:
 - i. 1.0 MHz: 0.15 dB
 - ii. 10.0 MHz: 1.3 dB
 - iii. 100 MHz: 5.0 dB.
 - j. Jacket: Polyethylene.
 - k. Diameter: 0.240 inch maximum.
 - 4. Manufacturer
 - a. Belden 9209A.
 - b. Canare LV-61S.
 - c. Or equal.
- D. Cable Set, Audio Video, Manufactured
 - 1. Provide signal type as indicated on Drawings.
 - 2. Manufacturer
 - a. Liberty Wire & Cable Interflex Z-200 and Z-300 Series
 - b. Markertek
 - c. Or equal.
- E. Cable, SVideo
 - 1. Plan Reference(s): SV, SVideo

2. Construction
 - a. 2 miniature precision coax cables in an overall shielded overall jacket to transmit NTSC analog component video based on the separation of chrominance and luminance transmission method.
 - b. Jacket: Code approved equal for application.
 - c. Overall two sub cable assembly diameter: 0.33" maximum in raceway applications.
 3. Performance:
 - a. Conductor DC Resistance: 41 Ohms / 1000ft. max
 - b. Capacitance: 16.7 pf/ft
 - c. Impedance: 75 Ohm -5 +2 Ohms
 - d. Time Delay: 1.22ns/ft
 - e. Velocity of Propagation: 83%
 - f. Attenuation
 - i. 1.22 dB/100 ft: 5 MHz
 - ii. 3 dB/100 ft: 30 MHz
 - iii. 5.34 dB/100 ft: 90 MHz.
 - g. Construction: Two precision video cables in one overall jacket.
 4. Manufacturer:
 - a. Altinex CB5620PL in plenum spaces, riser rated elsewhere.
 - b. Belden
 - c. West Penn
 - d. Extron
 - e. or equal.
- F. Cable, Data Monitor Precision Video
1. Plan Reference(s):
 - a. D5
 - b. 5DVideo
 2. Construction
 - a. 5 miniature high resolution coax cables in an overall shielded overall jacket to transmit analog component video based on the Red-Green-Blue-Horizontal Sync-Vertical Sync (RGBHV) transmission method.
 - b. Sub cables are color coded Red, Green, Blue, Black, Grey; or approved alternate color coding scheme.
 - c. Jacket: Code approved equal for application.
 - d. Overall five sub cable assembly diameter: 0.56" maximum in raceway applications.
 - e. Center Conductor AWG: Twenty two (22) ga Silver Plated Copper.
 - f. Insulation: Foamed Teflon.
 - g. Shield:
 - i. Each subcable is double shielded
 - ii. Overall cable has 100% tape shield.
 3. Approval/Rating:
 - a. UL: Recognized Type CL2P (Article 725 of NEC) for plenum application, riser rated elsewhere.
 4. Performance - each sub-cable:
 - a. Resistance: 0.0162 ohms/ft nominal @ 20C
 - b. Impedance: 75 ohm nominal
 - c. Capacitance: 17.5 pf/ft nominal
 - d. Velocity of Propagation: 80% nominal

- e. Time Delay: 1.19ns/ft nominal
 - f. Maximum Attenuation Per 100':
 - i. 10 MHz: 0.8 dB/100 ft.
 - ii. 50 MHz: 2.5 dB/100 ft.
 - iii. 100 MHz: 3.5 dB/100 ft.
 - iv. 200 MHz: 4.6 dB/100 ft.
 - v. 300 MHz: 5.0 dB/100 ft.
 - vi. 400 MHz: 7.2 dB/100 ft.
 - vii. 1000 MHz: 14.6 dB/100 ft.
 - 5. Manufacturers:
 - a. Altinex CB5100PL in plenum spaces, riser rated elsewhere.
 - b. Extron
 - c. Belden
 - d. Gepco.
 - e. or equal.
- G. DVI Cabling
- 1. Drawing Reference: DVI
 - 2. Features/Functions
 - a. The plans indicate the required distances for HDMI format transmission. Contractor to provide a transmission system appropriate to the indicated lengths. Contractor engineered solutions may consist of:
 - i. Passive HDMI cabling, where the indicated length is within the service distance of such systems.
 - ii. Copper HDMI cabling and active HDMI repeaters
 - iii. Fiber Optic Cabling and HDMI transceivers.
 - b. Contractor to select and provide the method of transmission appropriate to the length and operating parameters of the selected transmission system as defined by the manufacturers of the cabling systems, the repeaters and/or transceivers and the HDMI transmission standard as defined at www.hdmi.com.
 - 3. Manufacturers, copper cabling and extenders:
 - a. Liberty Cable
 - b. Extron
 - c. Altinex
 - d. or equal.
 - 4. Manufacturers, fiber optic cabling
 - a. As specified in Sections 27 41 00 - submit.

2.14 Control Media Cabling

- A. General
 - 1. Provide cable with electrical conductors of soft drawn annealed copper, bare or tinned, solid or concentric stranded as applies, conductivity not less than 98 percent of pure copper.
 - 2. Comply with applicable Code for insulation, jacket, marking and listing for applicable use.
 - a. Refer to California Electrical Code, Table 725-61. Cable Uses and Permitted Substitutions.
 - b. Manufacturer part number specified is for a Listed Type CM construction to indicate intended cable construction and quality.
 - 3. Code requirements take precedence.

- a. Provide type required by Code at no additional cost to the University.
- B. Category Media Cabling
 - 1. Drawing Reference(s):
 - a. Category Media
 - b. CATMEDIA
 - 2. Features/Functions:
 - a. Siamese Cable (two cable assemblies in one jacket) containing:
 - i. 1 cable equivalent to a Category 5e or Category 5e UTP cable.
 - ii. 1 cable equivalent to an 2 pair, 18 gauge cable suitable for RS-485 (A/V Net) signaling and remote device powering.
 - 3. Manufacturers:
 - a. Crestron CresCAT series
 - b. Liberty Wire & Cabling
 - c. AMX
 - d. Extron
 - e. equivalent using two UTP5e-4P.
 - f. or equal.
- C. Category Media Cabling
 - 1. Drawing Reference(s):
 - a. AV Net
 - 2. Features/Functions:
 - a. 1 cable equivalent to an 2 pair, 18 gauge cable suitable for RS-485 (A/V Net) signaling and remote device powering.
 - 3. Manufacturers:
 - a. Crestron CresNET series
 - b. Liberty Wire & Cabling
 - c. AMX
 - d. Extron
 - e. equivalent using one UTP5e-4P.
 - f. or equal.

2.15 Miscellaneous Products

- A. Cable Termination Devices and Related:
 - 1. Screw-type or Tubular Clamp Barrier Blocks:
 - a. Buchanan 125, 0625 Series.
 - b. Electrovert equivalent.
 - c. TRW-Cinch 140, 141, 142 Series.
 - d. Weidmuller equivalent.
 - e. Pass & Seymour/Legrand equivalent.
 - f. Phoenix equivalent.
 - 2. Tubular Clamp Barrier Blocks, High Density, Switch Block Section
 - a. Drawing Reference: TB15.
 - b. Features/Functions
 - i. Paired screw terminals on opposite sides of insulating base.
 - ii. TB15 Base mounts to DIN rail, providing space beneath TB15 to dress field and source cabling.
 - iii. Terminates range of wire gages used by project – at least 30 gage to 10 gage.
 - iv. High density:

- (1) At least 33 pairs of connections per foot for 12 and smaller gage terminations,
 - (2) At least 16 pairs of connections per foot for 10 gage terminations.
 - v. Switch Block Section permits load, such as field devices, to be separated from monitoring panel for testing independent of source then restored without disturbing field wiring terminations.
 - vi. Rated at least fifteen (15) amperes at 300V AC/DC
 - c. Approvals
 - i. UL
 - d. Manufacturers:
 - i. Allen Bradley Isolation Switch Blocks,
 - (1) 1492-H7 for 30 to 12 gage
 - (2) 1492-CE9 for 10 gage.
 - ii. Tyco Buchanan 0135 Series.
 - iii. WECO Electrical Connectors
 - iv. Altech
 - v. Curtis Industries
 - vi. Electrovert
 - vii. Weidmuller
 - viii. Pass & Seymour/Legrand
 - ix. Phoenix
 - x. or equal.
 - 3. Low Level Audio Cable Termination, Insulation Displacement Products
 - a. Coordinate with wire size, type and insulation
 - b. Manufacturer
 - i. ADC "Dense Patch".
 - ii. Siemon Model S66M450 with D10 Designation Strip.
 - iii. Or equal.
- B. Audio and Control Connectors and Related:
- 1. Circular Audio Connector, Cord, 3 through 5 contacts, gold plated contacts, captive cable clamp strain relief, matte black chrome finish over nickel metal shell
 - a. Neutrik C-Series, X-Series.
 - b. Switchcraft.
 - c. Or equal.
 - 2. Circular Audio Connector, Panel mount, male and female devices to fit same panel cutout including fasteners, 3 through 5 contacts, gold plated contacts, matte black chrome finish over nickel metal shell, female receptacles locking type:
 - a. Neutrik D Series Version L.
 - b. Switchcraft
 - c. Or equal.
 - 3. Loudspeaker Connector, Panel mount, female devices to fit same panel cutout including fasteners as other panel mount receptacles, 4 contacts, matte black finish Polyamid/graphite shell, female receptacles locking type. UL Component Recognized:
 - a. Neutrik NL4MP.
 - b. Switchcraft
 - c. Or equal.
- C. Video Connectors and Related

1. Video Connector, BNC type, 75 ohms, Panel, recessed, flush with panel face, insulated from panel, double female
 - a. Manufacturer
 - i. Canare BCJ-JRU.
 - ii. Tec Nec
 - iii. Liberty Wire & Cable/Panelcraft
 - iv. or equal.
2. Video Connector, BNC type, 75 ohms, Panel, recessed, flush with panel face, insulated from panel, single female to solder pin
 - a. Manufacturer
 - i. Canare BCJ-RU.
 - ii. Tec Nec
 - iii. Liberty Wire & Cable/Panelcraft
 - iv. or equal.
3. Video connector, BNC type, 75 ohms, cord, crimp applied. Coordinate with cable.
 - a. Manufacturer
 - i. Amp.
 - ii. Amphenol.
 - iii. Augat/LRC Products
 - iv. Canare.
 - v. Kings.
 - vi. Liberty Wire & Cable/Panelcraft
 - vii. RFI/Celltronics.
 - viii. Trompeter.
 - ix. or equal.
4. Video Precision 75 ohms Terminator, BNC:
 - a. Manufacturer
 - i. Canare BCP-TA
 - ii. Trompeter TNAL-1-75.
 - iii. or equal.
5. XGA Connectors, DB15
 - a. Drawing Reference HD15
 - b. Manufacturer
 - i. Amp.
 - ii. Amphenol.
 - iii. Canare.
 - iv. Kings.
 - v. Liberty Wire & Cable/Panelcraft
 - vi. RFI/Celltronics.
 - vii. or equal.

D. Custom Facility Panels and Rackmount Auxiliary Panels

1. Drawing Reference(s):
 - a. MP* - Media Panels, where * is a number indicating the panel type.
 - b. FP* - Facility Panels, where * is a number indicating the panel type.
 - c. Aux Panel
2. Provide connector types and plate finish as shown. If none shown, provide:
 - a. Rack mount panels:
 - i. 16 gauge minimum, cold rolled steel or 1/8" minimum aluminum, finish to match rack finish.

- ii. At contractor's option, fabricate using rack mount panels with Decora/Decorator openings and steel plates with specified connectors. Match insert color to panel color provided. Refer to Rack Panel with Decora Openings below.
- b. Wall Panels: 16 gauge minimum cold rolled steel, finish to match surrounding electrical and other low voltage panels.
- 3. Manufacturers, Rack Mount Panels
 - a. BGW Systems Inc.
 - b. Conquest
 - c. Middle Atlantic Products Universal Connector Panel
 - d. Middle Atlantic Products Universal Connector Panel, Modular Custom Connector Panel Systems
 - e. ProCo Sound, Inc.
 - f. Ultimate Plates and Panels
 - g. or equal.
- 4. Manufacturers, Wall Panels
 - a. PanelCrafters Division of Liberty Wire & Cable, Classic Series
 - b. FSR
 - c. RCI Systems
 - d. Middle Atlantic
 - e. Ultimate Plates and Panels
 - f. Whirlwind
 - g. Or equal.
- 5. Manufacturers, Decora/Decorator connector inserts:
 - a. Connector Plates by Radio Design Labs. Provide specified connectors rear mounted in D-Blank insert for connector combinations not available from RDL.
 - b. Grey by Pathway Connectivity Solutions. Provide specified connectors rear mounted in 5100 insert for connector combinations not available from Pathway Connectivity Solutions.
 - c. or equal.
- 6. Manufacturers, Rack Mount Decora Panel Openings
 - a. Lowell Manufacturing LD8-RMP with Lowell DBB-4 blank Decora plates at openings not fitted with equipment.
 - b. Middle Atlantic DECP Series
 - c. or equal.

2.16 Power Distribution Equipment:

- A. Power Sequencer System
 - 1. Drawing References
 - a. Power Sequencer
 - b. Solid State Relay (SSR) SSR1 through SSR7
 - 2. Features
 - a. Power sequencing system.
 - b. Solid state switching, zero crossing.
 - c. Sequencing on power up and power down.
 - d. Front panel button and external closure activation.
 - e. Alarm terminal to sequence the system down when tripped.
 - f. UL Listed.
 - 3. Manufacturer
 - a. FSR Inc. Power Products Group SPC-20 Power Sequencer and SPC-20X

- Solid State Relay
 - b. Furman
 - c. Or equal.
- B. UPS, Rack Mounted, 750 VA
 - 1. Drawing Reference: UPS
 - 2. Features/Functions/Performance:
 - a. Provide continuous, no-break power with sine wave output.
 - b. Size to carry connected load at least 10 minutes following loss of power, after at least two hours of charge time.
 - c. Provide Transient Over-Voltage (TOV) Surge Suppression; comply with ANSI/IEEE C62.41-1980, Category A and Category B.
 - d. Provide complete isolation from Line.
 - e. Provide output voltage regulation to ANSI C84.1 for computing equipment.
 - f. SNMP manageable and status reporting to University's Management console. Provide output KVA, switch-mode power supply rated, not less than 150% of connected load indicated.
 - g. Rack Mounted
 - 3. Manufacturer:
 - a. SmartUPS 1400 RM series by American Power Conversion (APC)
 - b. Trip-Lite
 - c. Or equal.
- C. Power Supplies and Related:
 - 1. Drawing Reference: PS24.
 - 2. Relay and Lamp Power Supply:
 - 3. 24 VDC, regulated within 5%. Ripple not greater than 1.5%. Output current rating at least 150% of maximum possible load. Circuit breaker or intrinsic over current protection. UL Recognized or UL Listed.
- D. Power Panel:
 - 1. Drawing Reference: POWER.
 - 2. Functions/Features:
 - a. Front face of panel shall provide two electrical power outlets and a switch. An indicator lamp shall show the presence of AC power when on. The front face of panel shall have a black finish. The rear face shall provide a minimum of at least four receptacles. The panel shall be racked mounted in a maximum of two rack units. The panel shall be Code approved and UL rated for this application.
 - 3. Manufacturers:
 - a. Hubbell MCCPSS19TS
 - b. Geist SP124-1020
 - c. Or equal.

PART 3 - EXECUTION

3.1 General

- A. Perform the Work of this Section in accordance with acknowledged industry and professional standards and practices, and the procedures specified herein.
- B. Furnish and install (herein, "provide") all materials, devices, components, and equipment required for complete, operational systems.

- C. Refer to Section 27 15 00 for additional execution requirements that apply to the work of this Section.

3.2 PRECONSTRUCTION PROGRAMMING MEETING

- A. Not less than 90 days prior to the scheduled completion of the project, Contractor to initiate a request of the University's Representative to schedule an Audiovisual Systems programming meeting.
 - 1. The University's Representative will schedule the meeting at the reasonable mutual convenience of the Contractor and the University's technical systems representatives.
 - 2. The purpose of the meeting is for the University's Representative to indicate to the contractor how the programmable interfaces of the audiovisual systems are to be implemented, including:
 - a. Button assignments and labels for physical button panels
 - b. Touchscreen menu hierarchy, scene arrangement, button and background colors, text size, logos
 - c. When multiple panels control the same systems, which screens appear on which touchpanels.
 - d. Whether authorization codes or passwords will be required to access special functions/menus.
 - 3. Contractor to document the information received from the University's Representatives at this meeting.
 - 4. Contractor to submit the documentation of the requirements meeting, along with their proposed response to the University's programming requirements in the form of screen shots and system menu flow diagrams as required under Section 27 41 00 – Common Work Results for Audiovisual Systems, 1.4 D Submittals.

3.3 Wiring Classification and Related

- A. Audio Signal Wiring Classification:
 - 1. Type A-1: Microphone level wiring less than -30 dB μ , 20 Hz to 20 kHz.
 - 2. Type A-2: Line level wiring -30 dB μ to +24 dB μ , 20 Hz to 20 kHz.
 - 3. Type A-3: Loudspeaker level or circuit wiring greater than +24 dB μ , from 20 Hz to 20 kHz.
- B. Video and Related Signal Wiring Classification:
 - 1. Type V-1: Baseband and composite video wiring 1 volt peak-to-peak into 75 ohms, 0 to 10.0 MHz.
 - 2. Type V-2: Synchronization and switching pulse wiring 4 volts peak-to-peak into 75 ohms, 15.62 to 15.75 kHz.
 - 3. Type V-3: Color subcarrier wiring 0 to 4 volts peak-to-peak into 75 ohms, 3.57 to 4.43 MHz.
 - 4. Type V-4: MATV system wiring 0.1 to 1000 μ V peak-to-peak into 50 or 75 ohms, 47 to 890 MHz.
- C. Control Signal Wiring Classifications:
 - 1. Type C-1: DC control wiring 0 to 50 volts.
 - 2. Type C-2: Synchronous control or data wiring 0 to 40 volts, peak-to-peak.
 - 3. Type C-3: AC control wiring 0 to 48 volts, 60 Hz.
- D. Additional Wiring Classifications:
 - 1. Type M-1: DC power wiring 0 to 48 volts.

2. Type M-2: AC power wiring greater than 50 volts, 60 Hz.

E. Wiring Combinations:

1. Except as indicated herein, conduit, wireways and cable bundles shall contain only wiring of a single classification. The following combinations are acceptable in conduit, or cable harnesses. Additional acceptable combinations may be indicated on the Contract Drawings.
 - a. Types A-1, C-1, and M-1.
 - b. Types A-2, C-1, C-2, and M-1, runs less than twenty (20) feet.
 - c. Types A-2, C-1, and M-1.
 - d. Types A-3, C-1, C-2, and M-1.
 - e. Types A-2, V-1, and V-3.
 - f. Types V-1, V-2, V-3, and C-1.
 - g. Types M-2 and C-3.

3.4 Wire and Cable Installation

- A. Provide permanent identification of run destination at all raceway terminations.
- B. All wire and cable shall be continuous and splice-free for the entire length of run between designated connections or terminations.
- C. All shielded cables shall be insulated. Do not permit shields to contact conduit, raceway, boxes, panels or equipment enclosures.
- D. Within buildings, make splices only in designated terminal cabinets and/or on designated equipment backboards. Outside buildings, make splices only in designated manholes and/or handholes. Protect splices outside of buildings with splicing kits equivalent to Scotchcast Re-enterable. Make splices only with connectors or terminal devices specified herein. Document all splices on Record Drawings.
- E. Verify that all raceway has been de-burred and properly joined, coupled, and terminated prior to installation of cables. Verify that all raceway is clear of foreign matter and substances prior to installation of wire or cable.
- F. Inspect all conduit bends to verify proper radius. Comply with Code for minimum permissible radius and maximum permissible deformation.
- G. Apply a chemically inert lubricant to all wire and cable prior to pulling in conduit. Do not subject wire and cable to tension greater than that recommended by the manufacturer. Use multi-spool rollers where cable is pulled in place around bends. Do not pull reverse bends.
- H. Provide a box loop for all wire and cable routed through junction boxes or distribution panels. Provide tool formed thermal expansion loops at cable at manholes, handholes and at both sides of all fixed mounted equipment. Cable loops and bends shall not be bent at a radius greater than that recommended by the manufacturer.
- I. Secure all wire and cable run vertically for continuous distances greater than thirty (30) feet. Secure robust non-coaxial cables with screw-flange nylon cable ties or similar devices appropriate to weight of cable. For all other cables, provide symmetrical conforming nonmetallic bushings or woven cable grips appropriate to weight of cable.

3.5 Signal Polarity Convention

- A. Maintain consistent absolute signal polarity at all connectors, patch points and connection points accessible in the system. Comply with AES26-2001. Where applicable, a positive polarity electrical signal shall yield positive acoustic pressure from the loudspeakers.

- B. Audio signal connector convention: Comply with AES 14-1992 (r1998)

Signal	Connector	Wire
Signal Phase	Pin 2	Red or White
Signal Anti-Phase	Pin 3	Black
Signal Ground	Pin 1	Drain Wire

- C. Video and RF/MATV Connector Convention:

Signal	Connector	Wire
Signal Phase	Center Pin	Center conductor
Signal Anti-Phase	Shell	Shield
Signal Ground	Shell	Shield

3.6 Wiring Practice

- A. Land all non-coaxial field wiring entering each equipment rack at specified terminal devices prior to connection to any equipment or devices within racks. At Contractor's option, such terminals may be located in the equipment racks or in the terminal cabinets provided. Coordinate such selection with Project construction sequence and test procedures specified herein.
- B. Identify all wire and cable clearly with permanent labels wrapped about the full circumference within one (1) inch of each connection. Indicate the number designated on the associated field or shop drawing or run sheet, as applies. Assign wire or cable designations consistently throughout a given system. Each wire or cable shall carry the same labeled designation over its entire run, regardless of intermediate terminations. Conform with the requirements of Section 27 41 00.
- C. Apply all crimp connectors only with manufacturer's recommended ratchet type tooling and correct crimp dies for connector and wire size. Plier type crimp tooling shall not be acceptable.
- D. Coordinate insulation displacement (quick connect) terminal devices with wire size and type. Comply with manufacturer's recommendations. Make connections with automatic impact type tooling set to recommended force.
- E. Make all connections to screw-type barrier blocks with insulated crimp-type spade lugs. Lugs are not required at captive compression terminal type blocks. Provide permanent designation strips designed for use with the terminal blocks provided. Make neat, intelligible markings with indelible markers equivalent to "Sharpie".
- F. Tin terminated shield drain wires and insulate with heat shrinkable tubing.
- G. Use only rosin core 60/40 tin/lead solder for all solder connections.

- H. Dress, lace or harness all wire and cable to prevent mechanical stress on electrical connections. No wire or cable shall be supported by a connection point. Provide service loops where harnesses of different classes cross, or where hinged panels are to be interconnected.
- I. Termination and buildout resistors and related circuit correction components shall be visible. Do not install in connector shells or internally modify equipment. Show locations on Record Drawings.
- J. Correct any and all of the following unacceptable wiring conditions:
 - 1. Deformed, brittle or cracked insulation.
 - 2. Insulation shrunken or stripped further than 1/8" away from the actual point of connection within a connector, or on a punch block.
 - 3. Cold solder joints.
 - 4. Flux joints.
 - 5. Solder splatter.
 - 6. Ungrommited, unbushed, or uninsulated wire or cable entries.
 - 7. Deformation or improper radius of wire or cable.

3.7 Signal Grounding Procedures

- A. Comply with National Electrical Code.
- B. Unless otherwise noted maintain a unipoint ground scheme.
- C. Signal and electrical system grounds shall be isolated except at the Project ground field connection.
- D. Equipment enclosures shall not be permitted to touch each other unless bolted together and electrically bonded.
- E. Ground and bond equipment racks and similar equipment enclosures containing powered equipment exclusively via the ground conductors provided under Division 27.
- F. At each rack, provide an ground bus within the rack. At each rack, provide a lug bonded to the rack frame with a #12 TW stranded wire to the rack Ground bus.
- G. At each ensemble of racks, provide a single labeled Ground tubular-clamp bus bar terminal strip to land the individual rack Isolated Ground bus ground conductors. Connect the main Isolated Ground conductor from the Technical Power panelboard at this point.
- H. Equipment signal ground shall be to the Ground System via the green wire of the equipment power cord. Where equipment uses two (2) wire power cord, provide #12 green bond wire to rack ground bus bar. At equipment, provide crimp lug and suitable hardware for bonding.
- I. Shielded cables of this section shall be grounded exclusively to Isolated Ground by a single path. Shield shall be tied to Ground at one end only, i.e., at the low potential (receiving) end of run, unless otherwise noted.

- J. Unless otherwise noted, at audio jackfields, tie source shield at jackbay frame. Float shields at connections to output jacks. Bus each row of jack frames and run individual #12 green ground wire for each row to rack IG bus bar.
- K. Signal Ground provisions shall realize less than 0.15 ohms to the primary ground connection.

3.8 Finishes

- A. Finishes and materials for contractor fabricated assemblies such as racks, custom control panels, brackets, blank panels, equipment mounting in furniture or casework, speaker baffles, speaker grille material and in general any item or component herein which is visible shall adhere to the following:
 - 1. Finish shall be as directed by the University's Representative.
 - 2. In the event that the University's Representative provides no direction as to finish, finish shall match exactly the surrounding and adjacent surfaces.
 - 3. Wooden speaker back boxes and baffles shall be painted flat black if not otherwise finished or stained.

3.9 Equipment Enclosure (Rack) and Equipment Backboard Fabrication

- A. Combustible material, other than incidental trim of indicated equipment, is prohibited within equipment racks.
- B. Within each equipment enclosure, provide a full-height multi-circuit ground outlet strip with branch circuit count as shown on drawings; locate on the left side of the equipment enclosure, as viewed from the rear. In each enclosure provide number of receptacles required by present and future equipment indicated on drawings, plus at least two spare receptacles. Provide flexible steel raceway and junction box for connection of power service. Bond internal raceway to rack frame.
- C. Provide a permanent label on the front of each equipment rack including the rack designation, and the circuit breaker number and associated electrical distribution panel designation servicing same.
- D. Maintain separation of wiring classifications as specified herein. Separately dress, route and land microphone and line level cables and related on the right side of the equipment enclosure, as viewed from the rear; dress, route, and land loudspeaker level and control cables on the left side of the equipment enclosure, as viewed from the rear.
- E. Access shall not require demounting or de-energizing of equipment. Install access covers, hinged panels, or pull-out drawers to insure complete access to terminals and interior components.
- F. Fasten removable covers containing any wired component with a continuous hinge along one side, with associated wiring secured and dressed to provide an adequate service loop. Provide an appropriate stop locks to hold all hinged panels and drawers in a serviceable position.
- G. Provide permanent labels for all equipment and devices. Where possible, fasten such labels to the rack frame or to blank or vent panels which will remain in place when active equipment is removed for possible service.

- H. At jackfields, provide service loop to permit removal of jackfields from rack sufficient to conveniently access all jack contacts for routine cleaning and maintenance. Organize the service loop and harness such that reasonable reconnection of jacks and jack normals is possible without cutting apart the harness.
- I. Coordinate the design and execution of wire harnessing of multi-bay rack ensembles with conditions of delivery to installation locations at Project Site, and with the requirement herein for test of the completely wired system in the shop prior to delivery to the Project Site. Organize the wiring harnesses such that they will fold within one shippable unit without risk of damage, or provide polarized multipin connectors and related interconnect systems as specified elsewhere herein.
- J. At each equipment backboard, provide UL Listed surge suppressing multioutlet assembly with at least six (6) receptacles.

3.10 Equipment Rack and Equipment Backboard Testing and Adjusting Procedures

- A. Conduct procedures in fabrication shop. Verify safe and proper operation of all components, devices, or equipment, establish nominal signal levels within the systems and verify the absence of extraneous or degrading signals. Make all preliminary adjustments and document the setting of all controls, parameters of all corrective networks, voltages at key system interconnection points, gains and losses, as applicable. Submit test report. Request and coordinate verification of submitted test data by the University's Representative. Correct all non-conforming conditions prior to shipment to Project Site. Perform at least the following procedures:
- B. Preliminary: Verify:
 - 1. Grounding of devices and equipment. Integrity of signal and electrical system ground connections.
 - 2. Proper provision of power to devices and equipment.
 - 3. Integrity of all insulation, shield terminations and connections.
 - 4. Integrity of soldered connections. Absence of solder splatter, solder bridges.
 - 5. Absence of debris of any kind, tools, etc.
 - 6. Routing and dressing of wire and cable.
 - 7. All wiring, including polarity and continuity, including conformance with wire designations on running sheets, field and shop drawings.
 - 8. Mechanical integrity of all support provisions.
- C. Rig temporary power and grounding. Comply with all applicable Codes, regulations and ordinances.
- D. Determine the proper sequence of energizing systems to minimize the risk of damage. Energize. Burn in for at least 168 hours.
- E. Sound Systems:
 - 1. Gain control settings: Establish tentative normal settings for all gain controls. Set all equalizers flat. Set all automatic gain control devices to bypass. Terminate power amplifier outputs with power load resistors with resistance value within 10% the nominal output impedance of the respective amplifier. Adjust all gain controls on equipment for optimum signal-to-noise ratio and signal balance and, unless they are sub-panel mounted, cap them to prevent tampering. Unless specified or directed otherwise, adjust gains such that in a given system the "front end" operates at unity gain and maintains 10 dB of clip margin referenced to the

first onset of clipping of the associated power amplifier(s). Measure and document system gains at 1 kHz. Settings may require further adjustment by the Contractor, a result of testing by the University's Representative.

2. Freedom from parasitic oscillation and radio frequency pickup: Maintain previous setup. Set up for each mode of operation specified in the functional requirements; verify that all systems are free from spurious oscillation and radio-frequency pickup using broadband oscilloscope. Correct any such defects.
3. Hum and noise level/signal to noise level/signal to crosstalk level: Maintain previous setup. Terminate microphone and line-level inputs with shielded resistors of 150 and 600 ohms, respectively. Set available variable gain controls such that full power amplifier output would be achieved with -40 dBm input level at a microphone input and +12 dBm at a line-level input. Measure and document the specified parameters of the system overall for each microphone input channel and line-level input channel. Compare with nominal signal level.
4. Total Harmonic Distortion: Maintain previous setup. Measure at reference operating level at least at 63 Hz, 125 Hz, 1 kHz, 10 kHz.

F. Baseband Video Systems:

1. Picture Monitors:
 - a. Apply crosshatch. Verify linearity.
 - b. Apply red field. Adjust purity.
 - c. Apply SMPTE bars and PLUGE. Adjust to standards.
2. Video Path Test: Use manufacturer's procedures. Use full field or line signals.

G. Data/Graphics Systems:

1. Projector:
 - a. Apply crosshatch. Converge at design distance. Verify linearity.
 - b. Apply red, green and blue field. Adjust purity.
2. Wideband Component Analog Video Path Test: Use manufacturer's procedures.

H. Control System:

1. Demonstrate complete operation.

3.11 Projection Screen Installation

A. Inspection

1. General: Examine surfaces and rough framing to determine suitability to install screen and mount. Do not start work until unsatisfactory conditions are corrected.

B. Installation

1. Install screen and projector mount horizontal and plumb for proper operation per manufacturer's recommendations. Securely anchor to supporting structure to withstand all loading conditions and strain of service.

C. Adjustment

1. Adjust units as required for smooth operation and alignment as required.
2. Just prior to final acceptance of project, clean the screen surface according to the manufacturer's instructions.
3. Protect completed work from damage until acceptance by the University's Representative.

3.12 Loudspeaker Assembly Installation

- A. Loudspeakers:
 - 1. Verify proper installation of loudspeaker enclosures and related support.
 - 2. Verify that no loudspeaker assembly is subjected to stresses or loading effects in any way contributing to possible extraordinary failure.

3.13 Video Projector Assembly Installation

- A. Design, engineer and provide complete, all means of support, suspension, attachment, fastening, bracing, and restraint (hereinafter "support") of such equipment. Provide engineering of such support by parties licensed to perform work of this type in the Project jurisdiction. Submit in timely manner.
- B. Comply with applicable Code and the requirements of the Authorities having jurisdiction.
- C. Provide safety factor greater than six (6) or as required by Code, whichever is greater.
- D. Mountings shall:
 - 1. Permit the Video Projector to be lowered at least 36" from retracted, above ceiling storage position.
 - 2. Operation of mount from start to finish shall not take more than 30 seconds.
 - 3. Operation shall give rise to acoustic noise greater than 40 dBA when measured using the ANSI "slow" scale at any position in the room below the projector.
 - 4. Permit Video Projector to be re-oriented at least plus or minus 30° from angles shown on the Contract Drawings for optimum picture.
 - 5. Maintain precise location and orientation of Video Projector after such adjustment when subject to normal building motion and Code defined seismic induced building motion.
- E. Do not apply any load to building structure without first obtaining written approval of the University's Representative. Obtain per Project procedures.
- F. During Acceptance Testing, adjust orientation of Video Projector as directed to achieve optimum picture. Provide workers and ladders as required. Perform such adjustment with no claim for additional cost or time.

3.14 Systems Performance Testing and Adjusting Procedures

- A. Upon completion of the installation of all equipment in an area, perform the following tests and record results. Verify safe and proper operation of all components, devices, or equipment, establish nominal signal levels within the systems and verify the absence of extraneous or degrading signals. Make all preliminary adjustments and document the setting of all controls, parameters of all corrective networks, voltages at key system interconnection points, gains and losses, as applicable. Submit test report. Correct all non-conforming conditions prior to requesting Acceptance Review and Testing. Perform at least the following procedures:
 - 1. Mechanical: Verify:
 - a. Integrity of all support provisions.
 - b. Absence of debris of any kind, tools, etc.
 - 2. Power and Isolated Ground: Verify:
 - a. Isolation of Isolated Ground system from raceway and related ground.
 - b. Grounding of devices and equipment. Integrity of signal and technical power

- system ground connections.
 - c. Proper provision of power to devices and equipment.
 - 3. Signal Wiring: Verify:
 - a. Integrity of all insulation, shield terminations and connections.
 - b. Integrity of soldered connections. Absence of solder splatter, solder bridges.
 - c. Routing and dressing of wire and cable.
 - d. Continuity, including conformance with wire designations on running sheets, field and shop drawings.
 - e. Absence of ground faults.
 - f. Polarity.
 - 4. Use the proper sequence of energizing systems to minimize the risk of damage. Energize.
 - 5. Sound Systems, Electronic Tests; confirm:
 - a. Gain at 1 kHz.
 - b. Maximum output.
 - c. Input clipping level.
 - d. Frequency response.
 - e. Total harmonic distortion.
 - f. Signal to noise ration.
 - g. Signal to crosstalk ratio.
 - 6. Electro/Acoustic Tests:
 - a. Uniformity of coverage.
 - b. Electronic and acoustic frequency response/one-third octave equalization. Measure at ear level. Comply with applicable portions of ANSI (SMPTE) PH22.202M-1984, "B chain electro-acoustic response - control rooms and indoor theaters." Adjust to "curve X of B chain characteristic". University's Representative will direct final adjustment.
 - c. Maximum continuous sound pressure level (in the reverberant field). Drive systems with broadband pink noise. Sustain for at least five (5) minutes with no system damage. Measure for "A" and "C" weightings at ear level on loudspeaker axis. Turn off noise.
 - d. Acoustic signal-to-noise ratio referenced to the specified maximum continuous sound pressure level in the reverberant field. Measure for "A" and "C" weightings at ear level on loudspeaker axis with mechanical systems operating. Present comparison with previous measurement.
 - 7. Video Systems:
 - a. Picture Monitors:
 - i. Apply crosshatch. Verify linearity.
 - ii. Apply red field. Adjust purity.
 - iii. Apply SMPTE bars and PLUGE. Adjust to standards.
 - b. Video Path Test: Use NTC Report No. 7 procedures. Use full field or line signals.
 - i. Insertion Gain.
 - ii. Gain/Frequency Distortion.
 - 8. Control System: Demonstrate complete operation.

3.15 Labeling

- A. Conform with the requirements of Section 27 41 07 – Identification for Audiovisual Systems.

- B. Provide permanent "wedge" type labels on all controls, as applies, to indicate correct settings after systems performance testing and adjustment procedures have been successfully completed.

END OF SECTION 27 41 16

3. Price Sheet

Please quote your **fixed price** necessary to deliver, F.O.B Destination, the Audio Visual System, as specified, to the University of California, Architects & Engineering Department, Davis, CA 95616-5720, in new condition, complete and ready for operation. The successful **BIDDER** must assume all costs, responsibilities, and risk of loss incident to delivery.

BIDDER to provide unit price break down, per room, including the quantities, make and model of all materials and assemblies to be provided on this project under their bid for the work the Project. **BIDDER** to provide separate line items for engineering, installation, testing, training and record documents. Notwithstanding provision of the unit price break down by the **BIDDER** the **BIDDER** agrees and understands that the **BIDDER** is responsible for providing the complete work of the project as defined by the specifications listed above and contract documents, regardless of any errors or omissions represented in the unit price breakdown provided herewith.

PAYMENT TERM

Generally, the University will pay invoices, net 30 Days upon **Final Acceptance**.

Invoice prompt payment discounts will be considered in making award if offered for a period of 20 days or more.

No payment will be made in advance of work performed, or product delivery.

DELIVERY

Please state delivery time ARO (after receipt of order): _____

If bidder quotes a delivery period that is considered unreasonable by the University then bid will be rejected.

WARRANTY

Please indicate nature and length of your warranty for each product category:

Parts _____, Labor _____

Who will be responsible for shipping charges on warranty returns?

4. GENERAL INFORMATION/TERMS AND CONDITIONS

4.1 ISSUING OFFICE

This RFP is issued by the **UNIVERSITY** of California, Davis, Purchasing Department.

4.2 PURPOSE

This RFP provides prospective **BIDDERS** with sufficient information to enable them to prepare and submit a proposal.

In this RFP, the term "**UNIVERSITY**" or "UC Davis" shall be understood to mean "**UNIVERSITY** of California, Davis". The term "**BIDDER**", "Vendor and/or "Contractor", as used herein, shall be understood to mean the individual, company, corporation or firm whose product is selected for purchase after successfully bidding in response to this RFP. Until a purchase is recommended and approved, the term shall be understood to mean the individual, company, corporation or firm formally submitting a response to this RFP. The term "response," as used herein, shall be understood to mean a written offer to provide goods and/or services in accordance with the general conditions, instructions and specifications stated herein with exceptions clearly stated.

4.3 SCOPE

This RFP contains the instructions governing the proposals to be submitted and the material to be included therein. Mandatory requirements within must be met to be eligible for consideration.

PROJECTED SCHEDULE OF ACTIVITIES

- RFP mailed to prospective **BIDDERS: October 29, 2009.**
- Mandatory Pre-bid walk thru: **November 10, 2009, 2:00pm PST.**
- RFP response submission deadline: **November 30, 2009, 3:00 p.m. PST.**
- Evaluations completed and purchase recommendation made **December 12, 2009 (estimated.)**

PRE-BID WALK-THRU

A mandatory Pre-Bid Walk-Thru shall be held at the University on Date and Time specified above. The walk-thru is for the benefit of the potential Bidders to understand the magnitude of the project and to address questions and clarifications concerning the equipment and services to be provided under this project. If you have immediate questions or concerns regarding this RFQ, please hold those until the Pre-Bid Walk-Thru. Due to the importance of all Bidders having a clear understanding of the scope of this project and requirements for this solicitation, **ATTENDANCE IS MANDATORY**. Proposals shall be accepted only from those Bidders who are represented at the Pre-Bid Walk-Thru. Attendance at the meeting shall be evidenced by the representative's signature on the attendance roster.

Please contact Stephanie, Associate Director of Event Services, Campus Union at (530) 752-4486, Email: smeich@ucdavis.edu to confirm your attendance and obtain directions to the meeting site.

INVITATION TO BID/RESPOND AND RESPONSIBILITIES OF BIDDERS

The **UNIVERSITY** is hereby contacting prospective **BIDDERS** who have an interest or are known to do business relevant to this RFP. All interested individuals/firms who were not contacted are invited to submit a proposal in accordance with the policies, procedures and dates as set forth herein. In the event of "no bid," please sign bid, indicating, "no bid" and return.

4.4 INQUIRIES

Prospective **BIDDERS** may make written inquiries by e-mail concerning this RFP to obtain clarification of requirements. Inquiries must be directed to the UC Davis Purchasing department as indicated below.

Inquiries must be directed (via e-mail) to:

Alex Martin
Buyer Supervisor
University of California, Davis
Materiel Management
Purchasing Department
E-mail: aamartin@ucdavis.edu

4.5 ADDENDUM OR SUPPLEMENT TO RFP

The **UNIVERSITY** may modify the RFP prior to the date set for its receipt of proposal, by issuance of amendments, sent by facsimile, overnight courier or certified mail with return receipt requested to all vendors who receive a copy of this RFP from the **UNIVERSITY**. Amendments will be clearly marked as such. Each amendment will be numbered consecutively and will become part of this RFP.

Any vendor who fails to receive such amendments shall not be relieved of any obligation under this proposal as submitted.

No oral or written statements made by **UNIVERSITY** personnel shall be considered an amendment to this RFP unless the statements are contained in a written document identified as a written amendment to this RFP.

4.6 PROPOSAL SUBMISSION/REQUIRED SUBMITTALS

The **BIDDER** shall include a complete project management plan including deliverables, implementation approach, and testing/validation procedure. .

The **BIDDER** is required to submit one signed paper original (original in paper and CD version, signature on CD not necessary), and three (3) copies of paper versions and three (3) CD versions of the full response to this RFP. The "official copy" containing the required original signatures shall be identified by a sealed envelope marked and addressed as required.

The remaining copies may be boxed for convenience. Each copy must include a complete request for proposal and any other required information for **UNIVERSITY** evaluation.

- The proposal package must be received on or before **November 30, 2009, 3:00 p.m. PST**, at the address given below:

Mailing and Express Package Address:

Alex Martin
Buyer Supervisor
University of California, Davis
Materiel Management
Purchasing Department
202 Cousteau Place, Suite 205
Davis, CA 95618-7761
RFP #: 01-014170426AM

Proposals received after the RFP closing date and time indicated shall stand rejected unless the delay is due to negligence of the **UNIVERSITY**. It is the **BIDDER'S** sole responsibility to assure that its proposal is received on or before the RFP closing date.

A **BIDDER** may withdraw its proposal anytime prior to the fixed deadline for receipt of proposals (closing date), by submitting to the **UNIVERSITY** contact, Alex Martin, a written notification of its withdrawal, signed by the vendor or its authorized agent. The vendor may thereafter submit a new or modified proposal prior to such date and time set for receipt of proposal.

The **UNIVERSITY** reserves the right to reject any and all proposals and to waive informalities and minor irregularities in proposals received and to accept any portion of a proposal or all items bid if deemed in the best interest of the **UNIVERSITY** to do so.

Any restrictions on the use of data contained within a proposal must be clearly stated in the proposal itself and the indication of enclosed proprietary information clearly marked on the outside of the sealed proposal package. Proprietary information submitted in response to this Request for Proposal will be handled in accordance with applicable State of California procurement regulations.

4.7 NEWS RELEASES

BIDDERS may not distribute any announcement or news release regarding this project without written approval by the **UNIVERSITY** of California, Davis. Any materials to be provided to regulatory agencies, other entities, or to the public shall be submitted to the **UNIVERSITY** for review and distribution unless otherwise directed by a **UNIVERSITY** technical representative.

No form of the **UNIVERSITY'S** name shall be used in promotional materials, signs, announcements or other forms of communication or advertising originated by vendor unless the **UNIVERSITY'S** express written permission for such use has been obtained in advance.

4.8 RESPONSE MATERIAL OWNERSHIP

All material submitted regarding this RFP becomes the property of the **UNIVERSITY** and will only be returned to the **BIDDER** at the **UNIVERSITY'S** option.

4.9 INCURRING COSTS

The **UNIVERSITY** is not liable for any cost incurred by **BIDDERS** prior to issuance of an agreement, contract or purchase order.

4.10 ACCEPTANCE OF PROPOSAL CONTENT

The contents of the proposal of the successful **BIDDER** will become contractual obligations of the **BIDDER** if the **UNIVERSITY** takes acquisition action in reliance thereon. Failure of the successful **BIDDER** to accept these obligations in a purchase agreement, purchase order, delivery order or similar acquisition contract may result in cancellation of the award and such **BIDDER** may be removed from future solicitations. The **UNIVERSITY** may, at its option, enter into negotiations with the successful **BIDDER**, but neither party shall have any contractual obligations unless or until a written contract is signed by both parties or the **UNIVERSITY** takes acquisition action in reliance upon the **BIDDER'S** response. Under these conditions, the **UNIVERSITY** reserves the right to enter into negotiations with the next ranking **BIDDER** on the same terms and conditions as set forth herein. The **UNIVERSITY** reserves the right to reject all proposals received in response to this request for any reason or for no reason.

4.11 OFFER/ACCEPTANCE PERIOD

The **UNIVERSITY** intends to make a bid selection for contract negotiation within the period indicated in the Schedule of Activities. Proposals in the possession of the **UNIVERSITY** at the closing time for receipt of proposals are considered final and will be held as an irrevocable offer for one hundred eighty (180) days from that date.

4.12 ADDITIONAL DATA

The **BIDDER** must submit any additional information or data not requested in this RFP which the **BIDDER** believes it must be considered in the evaluation of a response.

4.13 BASIS OF AWARD

Proposals meeting pre-qualification criteria will be evaluated and awarded points based on the specifications and requirements listed in this RFP. Final award will be based on the lowest cost per quality point. To determine the lowest cost per quality point, each **BIDDER'S** proposed cost of the project shall be divided by the total quality points awarded to that particular **BIDDER'S** proposal as described above. To determine the total quality points, an average will be taken of the total points awarded by individual **UNIVERSITY** committee evaluators (where vendors use different pricing model or bid for separate sections of the RFP, the **UNIVERSITY** will make every effort to arrive at a "cost per unit/service," to ensure a level comparison). The resulting average of quality points will be divided into the total cost to determine the cost per quality point.

The **BIDDER** whose proposal has the lowest cost-per-quality point score will be awarded the opportunity to engage in final negotiations on the provisions of the Agreement. If, however, the **UNIVERSITY** and the **BIDDER** with the lowest cost-per-quality point score are unable to reach agreement the **UNIVERSITY** reserves the right to cease negotiations with that **BIDDER** and either award the **BIDDER** with the next lowest quality point score the opportunity to negotiate or reject all proposals. If the parties are unable to reach agreement, the **UNIVERSITY** reserves the right to cease negotiations with the second **BIDDER** and either award the **BIDDER** with the third

lowest quality point score the opportunity to negotiate, or reject all proposals, and so on until either agreement on the provisions of the Agreement are reached or the **UNIVERSITY** rejects all proposals.

Responses that are incomplete in that there has been a failure to respond to all of the requested areas and **BIDDERS** not meeting prequalification standards shall be disqualified. The **UNIVERSITY** reserves the right to set the criteria for and make the determination independently in each case.

The **UNIVERSITY** reserves the right to accept, reject or waive any irregularities in any bid proposal. The **UNIVERSITY** reserves the right to recommend the purchase of a **BIDDER'S** product after reviewing, evaluating and comparing all bid proposals and negotiating an agreement pursuant to the evaluation criteria indicated in this RFP.

If funds are not available to the **UNIVERSITY**, this award will either be postponed or cancelled.

The **UNIVERSITY** reserves the right to select partial solutions from the vendor's offering.

4.14 BIDDER SELECTION

The selection of a successful **BIDDER** through this RFP is not intended to be exclusionary. The **UNIVERSITY** has made every reasonable attempt to ensure that all **BIDDERS** capable of supplying that which is listed in this RFP have received a copy of the RFP. However, if any **BIDDER** feels they have been overlooked, they must contact the Purchasing Department, University of California at Davis, to receive a copy of the RFP.

4.15 F.O.B. POINT

All prices bid shall be F.O.B. Destination, University of California, Davis, California; freight pre-paid, and shall include performance to the satisfaction of the specifications listed in this proposal and to the satisfaction of the evaluation committee.

4.16 SPECIFICATION REQUIREMENT

All proposals must meet or exceed the specifications provided herein. Evaluation of the extent to which proposals meet specifications will be performed **SOLELY** and determined **SOLELY** by the University of California, Davis, in concurrence with the University of California, Davis, Purchasing Department.

4.17 FORMAT OF RFP RESPONSE

Proposals must be submitted in the same format as the RFP, inclusive of all sections and appendices. **BIDDERS** are required to identify each section of the RFP and respond accordingly. The proposal shall be prepared in a straightforward and concise manner, identifying clearly and succinctly any and all deviations and enhancements. Emphasis should be placed on the conformance to the RFP instructions, responsiveness to the RFP requirements and completeness and clarity of content. The Proposal should include a Table of Contents that gives page numbers and should be in sufficient detail to facilitate easy reference to all requested information.

The Proposal shall be signed by an individual who is authorized to bind the vendor contractually and shall show the name of the company and the RFP identification number **01-014170426AM**. The signature should be presented at the beginning of the proposal. The name and title of the individual signing the form should be typed immediately below the signature. An unsigned proposal shall be rejected.

4.18 RFP DISTRIBUTION

The **UNIVERSITY** is the agency authorized to distribute Proposals. Distribution of Proposals to parties other than those specifically designated by the **UNIVERSITY** is not authorized. Failure to observe this guideline may result in vendor disqualification.

4.19 DISCLOSURE OF INFORMATION

All information and material submitted to the **UNIVERSITY** in response to this RFP may be reproduced by the **UNIVERSITY** for the purpose of providing copies to authorized **UNIVERSITY** personnel involved in the evaluation of the proposals but shall be exempt from public inspection under the California Public Records Act until such time as an Agreement is executed. Once an Agreement is executed, the California Public Records Acts limits the **UNIVERSITY'S** ability to withhold data or trade secrets, as defined by statute. If a vendor's proposals contain any such trade secrets that the vendor does not want disclosed to the public, subsequent to the execution of the agreement, each sheet of such information must be marked by the vendor as a "trade secret." If, after the agreement is executed, a third party requests a copy of any vendor's proposal and such documents contain material marked "trade secret," the **UNIVERSITY** shall withhold that information if it meets the statutory definition of trade secret and the vendor agrees to defend, indemnify and hold harmless the **UNIVERSITY** in any subsequent legal action based on its withholding.

This **UNIVERSITY** shall have the right to use and disclose information marked as a "trade secret" under the following conditions:

1. Such information was already in possession of the **UNIVERSITY**.
2. Such information has entered the public domain other than by the **UNIVERSITY'S** breach of any agreement to keep it confidential.
3. Such information is obtained lawfully from a third party.
4. Such information has been provided to a third party without confidentiality obligations.

4.20 ADDITIONAL TERMS AND CONDITIONS

Appendices: The **UNIVERSITY** of California standard purchase order terms and conditions Appendix A, as attached, applies to any resulting contract.

Project Timelines: The **BIDDER** shall complete all work specified herein, and follow a negotiated Project Time schedule, including the submission of documentation. Failure to complete the mutually negotiated milestones and documentation on time will result in default by the **BIDDER**.

Software/Hardware: If applicable, the **BIDDER** shall ensure software/hardware compatibility for all software, databases and computer hardware equipment necessary for operation of the system.

Prevailing Wage: **BIDDER** shall pay to each employee a salary for work on this contract not less than the general prevailing wage rate in effect in the locality in which the work is done, if applicable.

CA OHSA: The seller warrants and represents that the equipment, when delivered, shall conform to applicable safety standards and, where applicable, requirements of the California Occupational Safety and Health Act.

Electrical Requirement: All electrical equipment furnished against this contract shall conform to the California Administrative Code, Title 8, Electrical Safety Orders, Article 11, Section 2395-Grounding.

Insurance: To facilitate timely award of this order, insurance requirements as outlined in the attached, Appendix A must accompany your quote or be in force and on file in the **UNIVERSITY** Purchasing Department as a result of a previous order. All of the required policies shall name the Regents of the **UNIVERSITY** of California as an additional insured, shall be in a form as issued by an insurer approved by the **UNIVERSITY**, and shall contain an endorsement requiring not less than thirty days written notice to the **UNIVERSITY** prior to any cancellation or modification thereof. Thereafter, a certificate evidencing the renewal of each such policy shall be furnished the **UNIVERSITY** at least ten days prior to the expiration of the term of policy. Failure to comply with this requirement may result in cancellation of any order resulting from this request for proposal.

Termination: The **UNIVERSITY** retains the right to cancel any resulting order at any time, for convenience, without penalty to the **UNIVERSITY**.

Assignment: This agreement shall not be assigned by either party without the prior written consent of the other party.

Funding: The award of this RFP is contingent upon funding availability.

Advance Payment: **No payment will be made in advance of product delivery or work performed.**

Audit: Any order resulting from this Request for Proposal shall be subject to the examination and audit of the Auditor General of the State of California for a period of three years after final payment under this order. The examination and audit shall be confined to those matters connected with the performance of the contract, including, but not limited to the cost of administering the contract.

Independent Contractor: It is understood and agreed by the **UNIVERSITY** and **BIDDER** that in the performance of this agreement, the **BIDDER** shall be and act as an independent contractor and not as the agent or employee of the **UNIVERSITY**. It is expressly understood and agreed that this agreement is not intended and shall not be construed to create the relationship of agent, servant, employee, partnership, joint venture or association between the **UNIVERSITY** and the **BIDDER**. The **BIDDER** is not an employee of the **UNIVERSITY** and is not entitled to the

benefits provided by the **UNIVERSITY** to its employees, including, but not limited to, group insurance, pension plans, workers' compensation or unemployment insurance.

The **BIDDER** shall be solely responsible for the conduct and control of the work to be performed by the **BIDDER** under this Agreement. The **BIDDER'S** services for the **UNIVERSITY** shall be performed in accordance with currently approved methods and ethical standards applicable to the **BIDDER'S** professional capacity.

Subcontracting: **BIDDER** (Contractor) has prime contract responsibility; subcontractors may be used, but the prime Contractor must accept full responsibility for subcontractors' performance. All subcontractors and the type of contractual arrangement must be identified by the Contractor. The prime Contractor shall be responsible for meeting all terms and conditions of this agreement. In addition, the prime Contractor shall insure all subcontractors obtain, keep in force, and maintain insurance coverage as specified by the University for all work performed under this order. The University reserves the right to approve/disapprove all subcontractors.

In the event that University determines that an employee of **BIDDER** or a subcontractor hired by **BIDDER** is unqualified, unruly, or in any way in endangering the project, **BIDDER** shall remove employee/subcontractor at the request of the University. This provision shall apply to all **BIDDER** personnel. **BIDDER** shall pay to each employee and subcontractor a salary for work on this contract not less than the general prevailing wage rate in effect in the locality in which the work is done.

Record Retention: Contractor, and any subcontractors performing work hereunder, shall maintain accounts, records, documents and other evidence ("Records") detailing all elements of their proposal costs and supporting all charges made by them under any contract resulting from this request for proposal. These records shall be retained by Contractor and subcontractor for a period of three (3) years from the date of the expiration of any resulting contract. The system of accounts employed by the Contractor and the subcontractors hereunder shall be satisfactory to the University, shall be in accordance with generally accepted accounting principles consistently applied, and shall be subject to inspection and audit by University and any of its duly authorized representatives at all reasonable times and places.

Expenses: **BIDDERS** shall furnish all personnel, travel, accommodations, facilities, equipment and other supplies and material which may be required to perform the work outlined within this agreement, with the exception of items specified in the RFP. **BIDDERS** are required to provide qualified personnel and maintain the skill and experience levels of personnel throughout the contract. It is expected that the personnel specified in the proposal will perform the task for which they are proposed. In the event that the **BIDDER'S** personnel vacancies occur, the **BIDDER** must provide replacement personnel with skills and experience equivalent to those specified in the **BIDDER'S** Proposal. The **BIDDER** must notify the **UNIVERSITY** and Planning and Budget Office of personnel vacancies and provide resumes of replacement staff as support for the **BIDDER'S** compliance with this provision.

Force Majeure: In the event any party is unable to meet its obligation hereunder as a result of an act of God or of the public enemy, war, insurrection, fires, floods, epidemics, quarantine restrictions, strike, lockouts, other labor disputes or any other causes beyond the control of the party affected, its obligation hereunder shall be excused and suspended for the duration of the same.

Taxpayer Identification Number: California Public Contract Code Section 10518 requires contractor (vendor) who enters into a contract with the **UNIVERSITY** of California for \$10,000 or more shall list their Taxpayer Identification Number (Federal Employer Identification Number or Social Security Number, if applicable) on each contract or PO. The number shall remain unchanged regardless of future name changes.

Employer Identification Number: Pursuant to the Federal Privacy Act of 1974, and the California Information Practices Act of 1977 you are hereby notified that disclosure of your social security number and/or your Employer Identification Number is required pursuant to Sections 6109, 6011 and 6051 of Subtitle F of the Internal Revenue Code and pursuant to Regulation 4, Section 404, 1256, Code of Federal Regulations, under Section 218, Title II of the Social Security Act, as amended. The social security number is used to verify your identity. The principal uses of the number shall be to report payments and income taxes withheld to Federal and State governments.

Exclusion: Vendor/Contractor warrants that it is not excluded from participation in any governmental sponsored program, including, without limitation, the Medicare, Medicaid, or Campus programs (<http://exclusions.oig.hhs.gov/search.html>) and the Federal Procurement and Non-procurement Programs (<http://epls.arnet.gov/PrivacyActProvisionsEPLS.html>). This purchase order shall be subject to immediate termination in the event that Vendor/Contractor is excluded from participation in any federal healthcare or procurement program.

Examination of records: The University, the Federal Sponsoring Agency, the Controller General of the United States, or any of their duly authorized representatives, shall have access to any books, documents, papers, or records of the seller which are directly pertinent to this order for the purpose of making audits, examinations, excerpts, and transcriptions.

Rebates: Successful **BIDDER** shall provide all applicable rebates, credits, incentives earned, used, or on account. Checks shall be made payable to "The Regents of the University of California" and mailed to the University of California, Davis, One Shields Avenue, Cashier's Office, Davis, California, 95616. **BIDDER** shall make reference to department name and purchase order number on all checks. Periodic Statement Requirement: Successful **BIDDER** shall send periodic statements listing all rebates, credits, or incentives earned, used or on account for the University of California, Davis. Statements shall include department name and purchase order number, etc... Statements should be mailed to the University of California, Davis, One Shields Avenue, Purchasing Department, Davis, California 95616-8690, Attention: Director, Materiel Management.

4.21 FINAL ACCEPTANCE

The **BIDDER** may be required to submit written progress reports, at the time of invoicing, indicating items completed, items not completed, and any anticipated issues that have surfaced. Failure to provide these progress reports will delay payment of invoices. The **BIDDER** shall include in the reports recommendations and alternate courses of action for the solution of project problems and delays.

The **UNIVERSITY** will agree to final acceptance on any system only after the supplied equipment, or product is tested and found to perform within acceptable standards of operation, in compliance with all published and implied performance specifications, and is considered by the **UNIVERSITY** to be ready for practical application. Burden of proof regarding disputes as to

accuracy of invoices shall fall upon the **BIDDER**. The **UNIVERSITY** shall not unreasonably withhold relevant materials and records necessary to resolve such disputes.

4.22 LATE INTEREST CHARGES

Payments for **UNIVERSITY** purchases for services for any future Agreement shall not be subject to any late or interest charges.

4.23 ETHICS

BIDDER shall exercise extreme care and due diligence to prevent any action or conditions which could result in conflict with the best interest of the **UNIVERSITY**.

Throughout the term of any subsequent Agreement, **BIDDER** shall not accept any employment or engage in any work, which creates a conflict of interest with the **UNIVERSITY** or in any way compromises the work to be performed under this RFP or subsequent Agreement. **BIDDER** and / or its employees shall not offer gifts, entertainment, payment, loans, or other gratuities or consideration to **UNIVERSITY** employees, their families, other **BIDDERS**, subcontractors, or other third (3rd) parties for the purpose of influencing such persons to act contrary to the **UNIVERSITY'S** interest or for personal gain. **BIDDER** shall immediately notify the **UNIVERSITY** of any and all such violations of this clause upon becoming aware of such violations.

4.24 PARKING

No free parking facilities shall be provided by the **UNIVERSITY** for **BIDDER'S** personnel vehicles / employees. **UNIVERSITY** may require vehicles parked on **UNIVERSITY** property to be registered and be subject to the fees established by the Campus. Following any Agreement award, instructions and recommendations for parking will be provided to the **BIDDER** by each campus.

4.25 ENVIRONMENTAL SUSTAINABILITY

Environmental Sustainability: Seller shall strive to comply with the "University of California's Policy Guidelines For Sustainability" both in conducting business with the University and in managing its own internal systems and procedures. This policy can be viewed at http://www.ucop.edu/purchserv/rfp/sas/attach_d.pdf

Seller shall strive for all correspondence and information presented in hard copy to be printed double-sided on 30% or higher Post-Consumer Waste (PCW) recycled paper.

Seller shall strive to utilize environmentally responsible packaging and recycling practices that include, but are not limited to:

- * Products that are packed and shipped are to have packing and packaging which is environmentally sensitive.
- * Stuffing (e.g., "paper filler", etc.) is to be biodegradable.
- * INSTAPAK should not be used.
- * Wrapping, boxing and crating are to be minimized.
- * Recycled content and biodegradable materials are to be utilized.
- * Large shipments (pallets/skids, etc.) are to be shrink-wrapped.

* Pallets need to be of standard size with 4-way entry and should be reusable

Seller shall strive to work with Original Equipment Manufacturers (OEM's), suppliers, etc. so that direct ship and pass through shipments are packaged with the same consideration. Product shall be protected in such a way to avoid any shipping and handling damage while in-transit. Seller shall strive to minimize the adverse effects of packaging on the environment.

Seller shall strive to provide applicable environmentally preferable options which may include:

- * Products with Energy Star, EPA, Forest Stewardship Council (FSC), Green Seal, Greenguard, EPEAT or equivalent certification standards with supporting documentation.
- * Reusable, refurbished or remanufactured options where feasible.
- * Minimal cadmium, lead, mercury and VOC product content options.
- * Products with recycled content
- * CFC free products.

4.26 CERTIFICATION

I certify that I am authorized to sign on behalf of the organization I represent for this offer, and agree to all terms and conditions described herein.

Date

Authorized Signature

Company Name

Address

City/State/Zip Code

Print Name of Signatory

Telephone Number with Area Code

\

Fax Number with Area Code

Email Address

Web page Address

Appendix A

University of California Terms and Conditions of Purchase

ARTICLE 1 - The materials, supplies or services covered by this order shall be furnished by Seller subject to all the terms and conditions set forth in this order including the following, which Seller, in accepting this order, agrees to be bound by and to comply with in all particulars and no other terms or conditions shall be binding upon the parties unless hereafter accepted by them in writing. Written acceptance or shipment of all or any portion of the materials or supplies, or the performance of all or any portion of the services, covered by this order shall constitute unqualified acceptance of all its terms and conditions. The terms of any proposal referred to in this order are included and made a part of the order only to the extent it specifies the materials, supplies, or services ordered, the price therefore, and the delivery thereof, and then only to the extent that such terms are consistent with the terms and conditions of this order.

ARTICLE 2 - INSPECTION. The services, materials and supplies furnished shall be exactly as specified in this order free from all defects in Seller's performance, design, workmanship and materials, and, except as otherwise provided in this order, shall be subject to inspection and test by University at all times and places. If, prior to final acceptance, any services and any materials and supplies furnished therewith are found to be incomplete, or not as specified, University may reject them, require Seller to correct them without charge, or require delivery of such materials, supplies, or services at a reduction in price which is equitable under the circumstances. If Seller is unable or refuses to correct such items within a time deemed reasonable by University, University may terminate the order in whole or in part. Seller shall bear all risks as to rejected services and, in addition to any costs for which Seller may become liable to University under other provisions of this order, shall reimburse University for all transportation costs, other related costs incurred, or payments to Seller in accordance with the terms of this order for unaccepted services and materials and supplies incidental thereto. Notwithstanding final acceptance and payment, Seller shall be liable for latent defects, fraud or such gross mistakes as amount to fraud.

ARTICLE 3 - CHANGES. University may make changes within the general scope of this order in drawings and specifications for specially manufactured supplies, place of delivery, method of shipment or packing of the order by giving notice to Seller and subsequently confirming such changes in writing. If such changes affect the cost of or the time required for performance of this order, an equitable adjustment in the price or delivery or both shall be made. No change by Seller shall be allowed without written approval of University. Any claim of Seller for an adjustment under this Article must be made in writing within thirty (30) days from the date of receipt by Seller of notification of such change unless University waives this condition in writing. Nothing in this Article shall excuse Seller from proceeding with performance of the order as changed hereunder.

ARTICLE 4 - TERMINATION

A. University may, by written notice stating the extent and effective date, cancel and/or terminate this order for convenience in whole or in part, at any time. University shall pay Seller as full compensation for performance until such termination:

- (1) the unit or pro rata order price for the performed and accepted portion; and
- (2) a reasonable amount, not otherwise recoverable from other sources by Seller as approved by University, with respect to the unperformed or unaccepted portion of this order, provided compensation hereunder shall in no event exceed the total order price.

B. University may by written notice terminate this order for Seller's default, in whole or in part, at any time, if Seller refuses or fails to comply with the provisions of this order, or so fails to make progress as to endanger performance and does not cure such failure within a reasonable period of time, or fails to perform the services within the time specified or any written extension thereof. In such event, University may purchase or otherwise secure services and, except as otherwise provided herein, Seller shall be liable to University for any excess costs occasioned University thereby. If, after notice of termination for default, University determines that the Seller was not in default or that the failure to perform this order was due to causes beyond the control and without the fault or negligence of Seller (including, but not restricted to, acts of God or of the public enemy, acts of University, acts of Government, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, unusually severe weather, and delays of a subcontractor or supplier due to such causes and without the fault or negligence of the subcontractor or supplier), termination shall be deemed for the convenience of University, unless University shall determine that the services covered by this order were obtainable by Seller from other sources in sufficient time to meet the required performance schedule.

C. If University determines that Seller has been delayed in the work due to causes beyond the control and without the fault or negligence of Seller, University may extend the time for completion of the work called for by this order, when promptly applied for in writing by Seller; any extension granted shall be effective only if given in writing. If such delay is due to failure of University, not caused or contributed to by Seller, to perform services or deliver property in accordance with the terms of the order, the time and price of the order shall be subject to change under the Changes Article. Sole remedy of Seller in event of delay by failure of University to perform shall, however, be limited to any money actually and necessarily expended in the work during the period of delay, solely by reason of the delay. No allowance will be made for anticipated profits.

D. The rights and remedies of University provided in this Article shall not be exclusive and are in addition to any other rights and remedies provided by law or under this order.

E. As used in this Article, the word "Seller" includes Seller and its subsuppliers at any tier.

ARTICLE 5 - LIABILITY FOR UNIVERSITY - FURNISHED PROPERTY. Seller assumes complete liability for any tooling, articles or material furnished by University to Seller in connection with this order and Seller agrees to pay for all such tooling, articles or material damaged or spoiled by it or not otherwise accounted for to University's satisfaction. The furnishing to Seller of any tooling, articles, or material in connection with this order shall not, unless otherwise expressly provided, be construed to vest title thereto in Seller.

ARTICLE 6 - TITLE. Title to the material and supplies purchased hereunder shall pass directly from Seller to University at the f.o.b. point shown, or as otherwise specified in this order, subject to the right of University to reject upon inspection.

ARTICLE 7 - PAYMENT, EXTRA CHARGES, DRAFTS. Seller shall be paid, upon submission of acceptable invoices, for materials and supplies delivered and accepted or services rendered and accepted. University will not pay cartage, shipping, packaging or boxing expenses, unless specified in this order. Drafts will not be honored. Invoices must be accompanied by shipping documents or photocopies of such, if transportation is payable and charged as a separate item.

ARTICLE 8 - CHARACTER OF SERVICES. Seller, as an independent contractor, shall furnish all equipment, personnel and material sufficient to provide the services expeditiously and efficiently during as many hours per shift and shifts per week and at such locations as the University may so require and designate.

ARTICLE 9 - FORCED, CONVICT, AND INDENTURED LABOR

A. By accepting this order, Seller hereby certifies that no foreign-made equipment, materials, or supplies furnished to the University pursuant to this order will be produced in whole or in part by forced labor, convict labor, or indentured labor under penal sanction.

B. Any Seller contracting with the University who knew or should have known that the foreign-made equipment, materials, or supplies furnished to the University were produced in whole or in part by forced labor, convict labor, or indentured labor under penal sanction, when entering into a contract pursuant to the above, may have any or all of the following sanctions imposed:

(1.) The contract under which the prohibited equipment, materials, or supplies were provided may be voided at the option of the University.

(2.) Seller may be removed from consideration for University contracts for a period not to exceed 360 days.

ARTICLE 10 - INDEMNITY.

A. General. Seller shall defend, indemnify, and hold harmless University, its officers, employees, and agents, from and against all losses, expenses (including attorneys' fees), damages, and liabilities of any kind resulting from or arising out of this agreement and/or Seller's performance hereunder, provided such losses, expenses, damages and liabilities are due or claimed to be due to the negligent or willful acts or omissions of Seller, its officers, employees, agents, subcontractors, or anyone directly or indirectly employed by them, or any person or persons under Seller's direction and control.

B. Proprietary Rights. Seller shall indemnify, defend, and hold harmless University, its officers, agents, and employees against all losses, damages, liabilities, costs, and expenses (including but not limited to attorneys' fees) resulting from any judgment or proceeding in which it is determined, or any settlement agreement arising out of the allegation, that Seller's furnishing or supplying University with parts, goods, components, programs, practices, or methods under this order or University's use of such parts, goods, components, programs, practices, or methods supplied by Seller under this order constitutes an infringement of any patent, copyright, trademark, trade name, trade secret, or other proprietary or contractual right of any third party. The foregoing shall not apply unless University has informed Seller as soon as practicable of the suit or action alleging such infringement. Seller shall not settle such suit or action without the consent of University. University retains the right to participate in the defense against any such suit or action.

C. Products. Seller shall fully indemnify, defend, and hold harmless University from and against any and all claim, action, and liability, for injury, death, and property damage, arising out of the dispensing or use of any of Seller's product provided under authorized University orders. In addition to the liability imposed by law on the Seller for damage or injury (including death) to persons or property by reason of the negligence, willful acts or omissions, or strict liability of the Seller or his agents, which liability is not impaired or otherwise affected hereby, the Seller hereby assumes liability for and agrees to save University harmless and indemnify it from every expense, liability or payment by reason of any damage or injury (including death) to persons or property suffered or claimed to have been suffered through any act or omission of the Seller.

The University agrees to provide Seller with prompt notice of any such claims and to permit Seller to defend any claim or suit, and that it will cooperate fully in such defense.

ARTICLE 11 - DECLARED VALUATION OF SHIPMENTS. Except as otherwise provided on the face of this order, all shipments by Seller under this order for University's account shall be made at the maximum declared value applicable to the lowest transportation rate or classification and the bill of lading shall so note.

ARTICLE 12 - WARRANTY. Seller agrees that the supplies or services furnished under this order shall be covered by the most favorable commercial warranties the Seller gives to any customer for the same or substantially similar supplies or services, or such other more favorable warranties as specified in this order. The rights and remedies so provided are in addition to and do not limit any rights afforded to University by any other article of this order. Such warranties will be effective notwithstanding prior inspection and/or acceptance of the services or supplies by the University.

ARTICLE 13 - ASSIGNMENT AND SUBCONTRACTING. This order is assignable by University. Except as to any payment due hereunder, this order may not be assigned or subcontracted by Seller without written approval of University. In case such consent is given, it shall not relieve Seller from any of the obligations of this Agreement and any transferee or subcontractor shall be considered the agent of Seller and, as between the parties hereto, Seller shall be and remain liable as if no such transfer or subcontracting had been made.

ARTICLE 14 - EQUAL OPPORTUNITY AFFIRMATIVE ACTION. Seller shall not maintain or provide racially segregated facilities for employees at any establishment under its control. Seller agrees to adhere to the requirements set forth in Executive Orders 11246 and 11375, and with respect to activities occurring in the State of California, to the California Fair Employment and Housing Act (Government Code section 12900 et seq.). Expressly, Seller shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, national origin, ancestry, medical condition (as defined by California Code section 12925f), marital status, age, physical and mental handicap in regard to any position for which the employee or applicant for employment is qualified, or because he or she is a disabled veteran or veteran of the Vietnam era. Seller shall further specifically undertake affirmative action regarding the hiring, promotion and treatment of minority group persons, women, the handicapped, and disabled veterans and veterans of the Vietnam era. Seller shall communicate this policy in both English and Spanish to all persons concerned within its company, with outside recruiting services, and the minority community at large. Seller shall provide the University on request a breakdown of its labor force by groups, specifying the above characteristics within job categories, and shall discuss with the University its policies and practices relating to its affirmative action programs.

ARTICLE 15 - The clauses contained in the following paragraphs of the Federal Acquisition Regulations are incorporated by reference. The full text is available upon request:

FAR 52.222-04 Contract Work Hours and Safety Standards Act

FAR 52.222-26 Equal Opportunity

FAR 52.223-02 Clean Air and Water (If order exceeds \$100,000)

ARTICLE 16 - WORK ON UNIVERSITY OR GOVERNMENT PREMISES. If Seller's work under this order involves performance by Seller at University or United States Government owned sites or facilities, the following provisions shall apply:

A. Liens. Seller agrees that at any time upon request of University he will submit a sworn statement setting forth the work performed or material furnished by subcontractors, suppliers and materialmen, and the amount due and to become due to each, and that before the final payment called for hereunder, will if requested, submit to University a complete set of vouchers showing what payments have been made for materials and labor used in connection with the work called for hereunder.

Seller shall:

To the extent compliance is required, Seller shall comply with all University safety rules and regulations when on University premises.

A. Comprehensive or Commercial Form General Liability Insurance (contractual liability included) with limits as follows:

D. Workers' Compensation as required by California State law.

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- (1) Provide for thirty (30)-days advance written notice to the University of any modification, change, or cancellation of any of the above insurance coverage.
- (2) Indicate that The Regents of the University of California has been endorsed as an additional insured for the coverage referred to under a. and b. This provision shall only apply in proportion to and to the extent of the negligent acts or omissions of Seller, its officers, agents, or employees.
- (3) Include a provision that the coverage will be primary and will not participate with nor be excess over any valid and collectible insurance or program of self-insurance carried or maintained by the University.

ARTICLE 18 - PERMITS. Seller agrees to procure all necessary permits or licenses and abide by all applicable laws, regulations and ordinances of the United States and of the state, territory and political subdivision in which the work under this order is performed. Seller shall be liable for all damages and shall indemnify and save University harmless from and against all damages and liability which may arise out of failure of Seller to secure and pay for any such licenses or permits or to comply fully with any and all applicable laws, ordinances and regulations.

ARTICLE 19 - COOPERATION. Seller and its subcontractors, if any, shall cooperate with University and other vendors and contractors on the premises and shall so carry on their work that other cooperating vendors and contractors shall not be hindered, delayed or interfered with in the progress of their work, and so that all of such work shall be a finished and complete job of its kind.

ARTICLE 20 - WAIVER OF DEFAULT. Any failure of University at any time, or from time to time, to enforce or require the strict keeping and performance by Seller of any of the terms or conditions of this order shall not constitute a waiver by University of a breach of any such terms or conditions and shall not affect or impair such terms or conditions in any way, or the right of University at any time to avail itself of such remedies as it may have for any such breach or breaches of such terms or conditions.

ARTICLE 21 - TAXES. Seller shall pay all contributions, taxes and premiums payable under federal, state and local laws measured upon the payroll of employees engaged in the performance of work under this order, and all applicable sales, use, excise, transportation, privilege, occupational and other taxes applicable to materials and supplies furnished or work performed hereunder and shall save University harmless from liability for any such contributions, premiums, and taxes.

ARTICLE 22 - OTHER APPLICABLE LAWS. Any provision required to be included in a contract of this type by any applicable and valid federal, state or local law, ordinance, rule or regulations shall be deemed to be incorporated herein.

ARTICLE 23 - GOVERNING LAW. The law of the State of California shall control this Appendix and any document to which it is appended.

KEYNOTES

- AV AUDIOVISUAL SYSTEMS: COMPLY WITH DIVISION 27.
- (AV1) (E) CONCRETE SLAB.
- (AV2) SHELF FOR THE CRESTRON "CMPO". PROVIDE EQUAL TO NIGEL B DESIGN PART # NB-PMP. FOR MORE INFORMATION PLEASE CALL NIGEL B DESIGN AT (818) 487-9323 OR GO TO NIGELBDESIGN.COM.
- (AV3) VIDEO PROJECTOR.
- (AV4) FINISHED CEILING; SEE ARCHITECTURAL DRAWINGS.
- (AV5) NOT USED.
- (AV6) NOT USED.
- (AV7) PROVIDE CHIEF MANUFACTURING RPAA1 SERIES CEILING MOUNT WITH SLB SERIES PROJECTOR MOUNTING PLATE TO MATCH PROJECTOR PROVIDED BY DISTRICT. SEE DETAIL 3.
- (AV8) PROVIDE GROMMET HOLE IN CEILING FOR PROJECTOR MOUNT COLUMN ASSEMBLY.
- (AV9) PROVIDE EQUAL TO CHIEF MANUFACTURING CMA SERIES ADJUSTABLE EXTENSION COLUMN, NOMINAL 1 1/2" PIPE.
- (AV10) PROVIDE EQUAL TO CHIEF MANUFACTURING CMA110, 8" X 8" STEEL PLATE CEILING PLATE FITTING WITH 1 1/2" NPT PIPE THREAD ADAPTER.
- (AV11) B-LINE ADJUSTABLE HINGE LONGITUDINAL OR TRANSVERSE BRACE.
- (AV12) B-LINE B11 CHANNEL LONGITUDINAL OR TRANSVERSE BRACE.
- (AV13) PROVIDE 2 COMPLETE DIAGONAL BRACE ASSEMBLIES SPACED AT 90 DEGREES IN PLAN. FOR EACH BRACE DIAGONAL MEMBER, PROVIDE CUT SEGMENT OF B-LINE B22S OR B22SH CHANNEL. INSTALL WITH SLOT FACING UP.
- (AV14) PROVIDE B-LINE B335-2-3/8 THREE HOLE ADJUSTABLE HINGE. FASTEN TO DIAGONAL STRUT WITH 2 EACH B-LINE AV225 1/2-13 TWIRL NUT AND 1/2" X 1" HHCS HEX HEAD CAP SCREW.
- (AV15) AT EACH DIAGONAL BRACE, PROVIDE 4 INCH CUT SEGMENT OF B-LINE B22SH CHANNEL. FASTEN STRUT TO VERTICAL COLUMN WITH SLOT FACING OUT WITH B-LINE B501-1 1/2 U-BOLT. AT EACH NUT OF U-BOLT, PROVIDE B-LINE 1/4" X 1 1/4" FFW FLAT FENDER WASHER AND 5/16" FW FLAT WASHER.
- (AV16) PROVIDE B-LINE B335-2-1/2 THREE HOLE ADJUSTABLE HINGE. FASTEN TO DIAGONAL STRUT WITH 2 EACH B-LINE AV225 1/2-13 TWIRL NUT AND 1/2" X 1" HHCS HEX HEAD CAP SCREW. FASTEN TO COLUMN BRACE STRUT OR SLAB STRUT WITH B-LINE AV225 1/2-13 TWIRL NUT AND 1/2" X 1" HHCS HEX HEAD CAP SCREW.
- (AV17) MOUNTING HOLES.
- (AV18) TRIM FLANGE.
- (AV19) STEEL CASING.
- (AV20) THREADED ROD.
- (AV2) LOW VOLTAGE CONTROLLER.
- (AV22) JUNCTION BOXES.

- E ELECTRICAL: COMPLY WITH DIVISION 26.
- (E1) INSTALL POWER RECEPTACLE FLUSH IN CEILING ABOVE MOUNT. SEE ELECTRICAL DRAWINGS.

Smith,
Fause &
McDonald Inc.

Communications Engineering Group

351 8th Street
San Francisco, California 94103
(415) 255-9140 Fax: (415) 255-9180

KEY PLAN

NO	REVISION DESCRIPTION	DATE

PROJECT

UC DAVIS

GRADUATE SCHOOL OF

MANAGEMENT AND

CONFERENCE CENTER

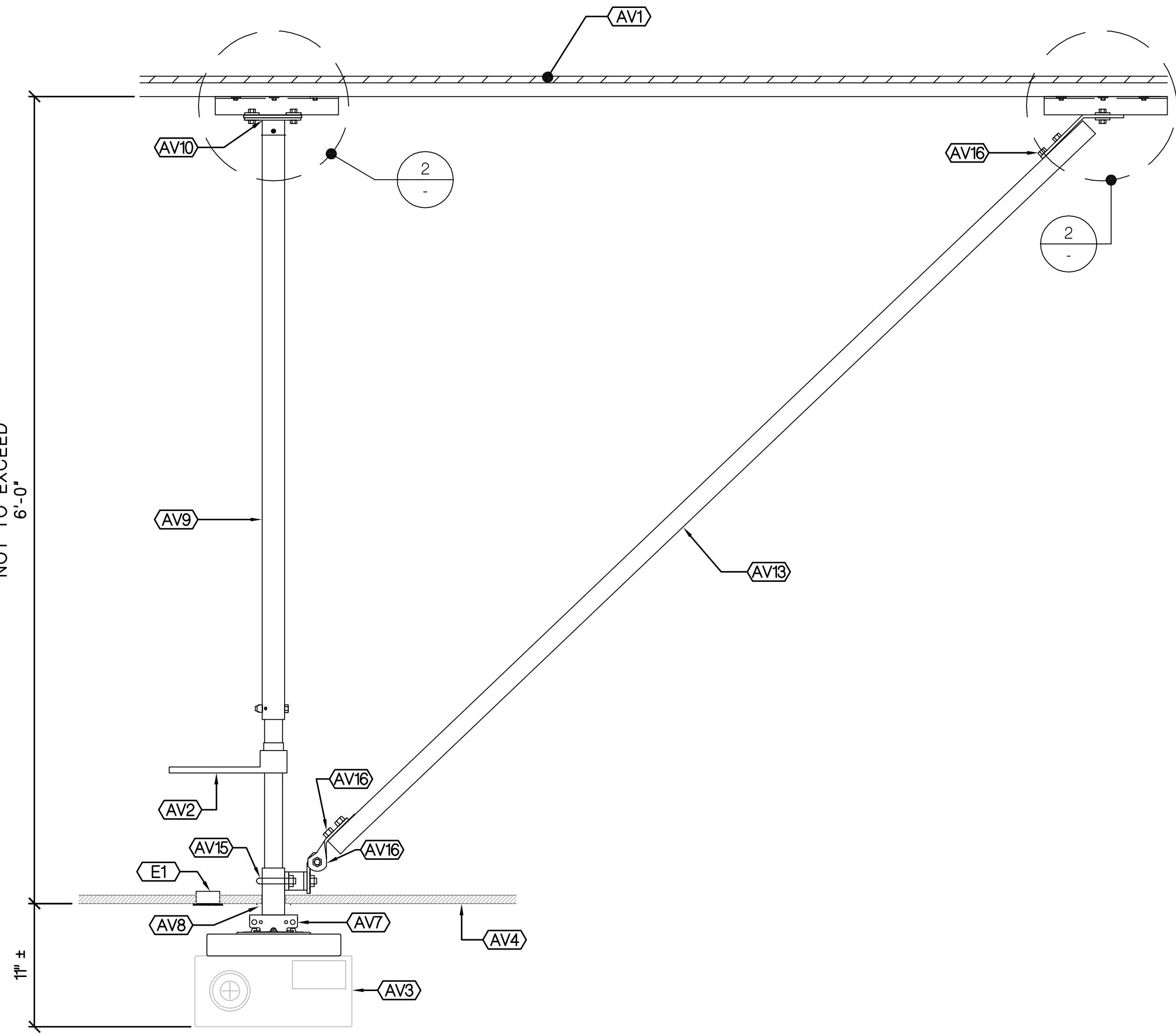
SHEET

DETAILS -

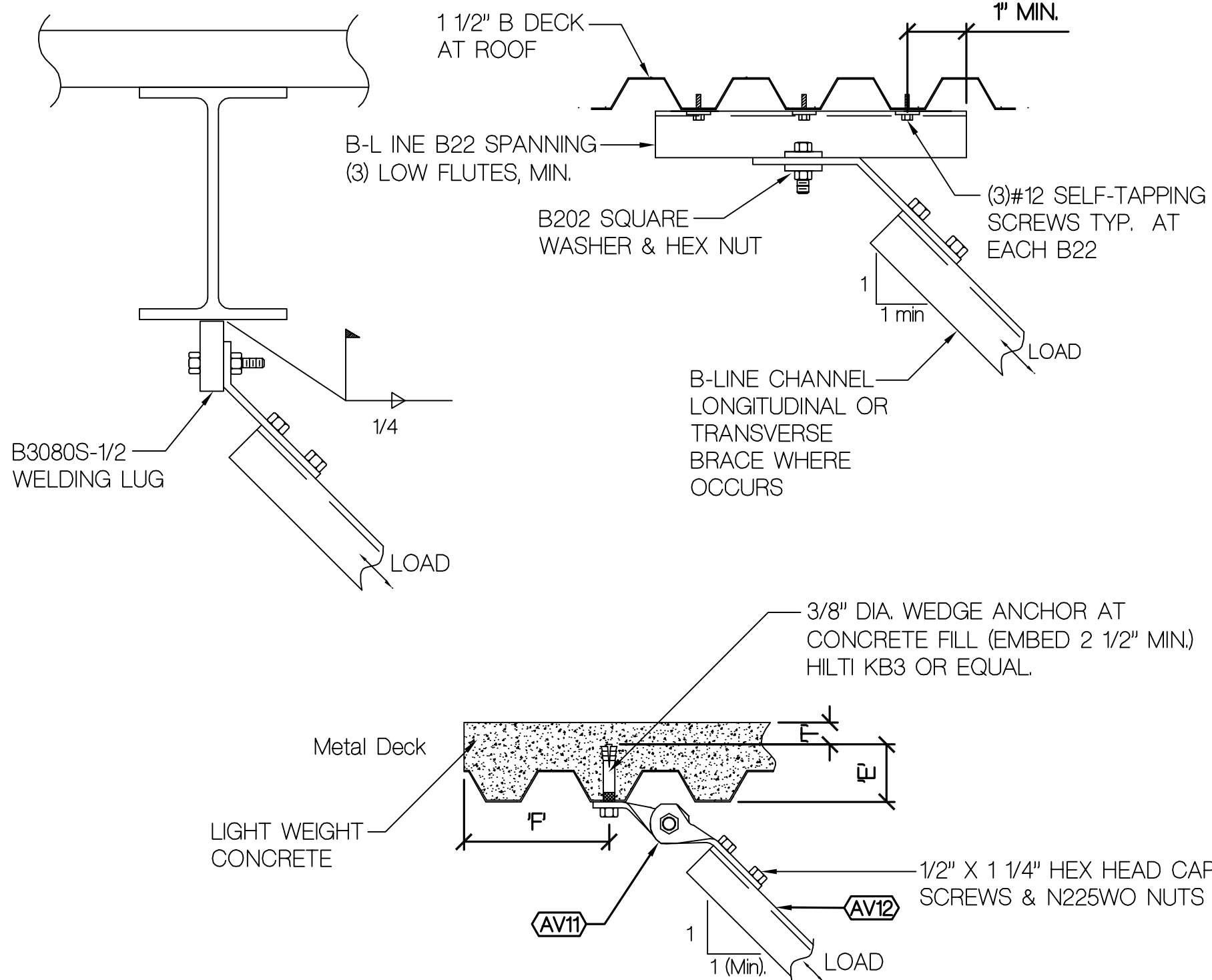
AV PROJECTOR AND

SCREEN MOUNTING

SCALE AS NOTED		FOR 30" x 42" SHEET	
JOB NUMBER	2000466B	DRAWING	
DRAWN BY	IK, DB	AV9.03	
DESIGNED BY	PAM		
DATE	10/05/09		
SHEET		OF	



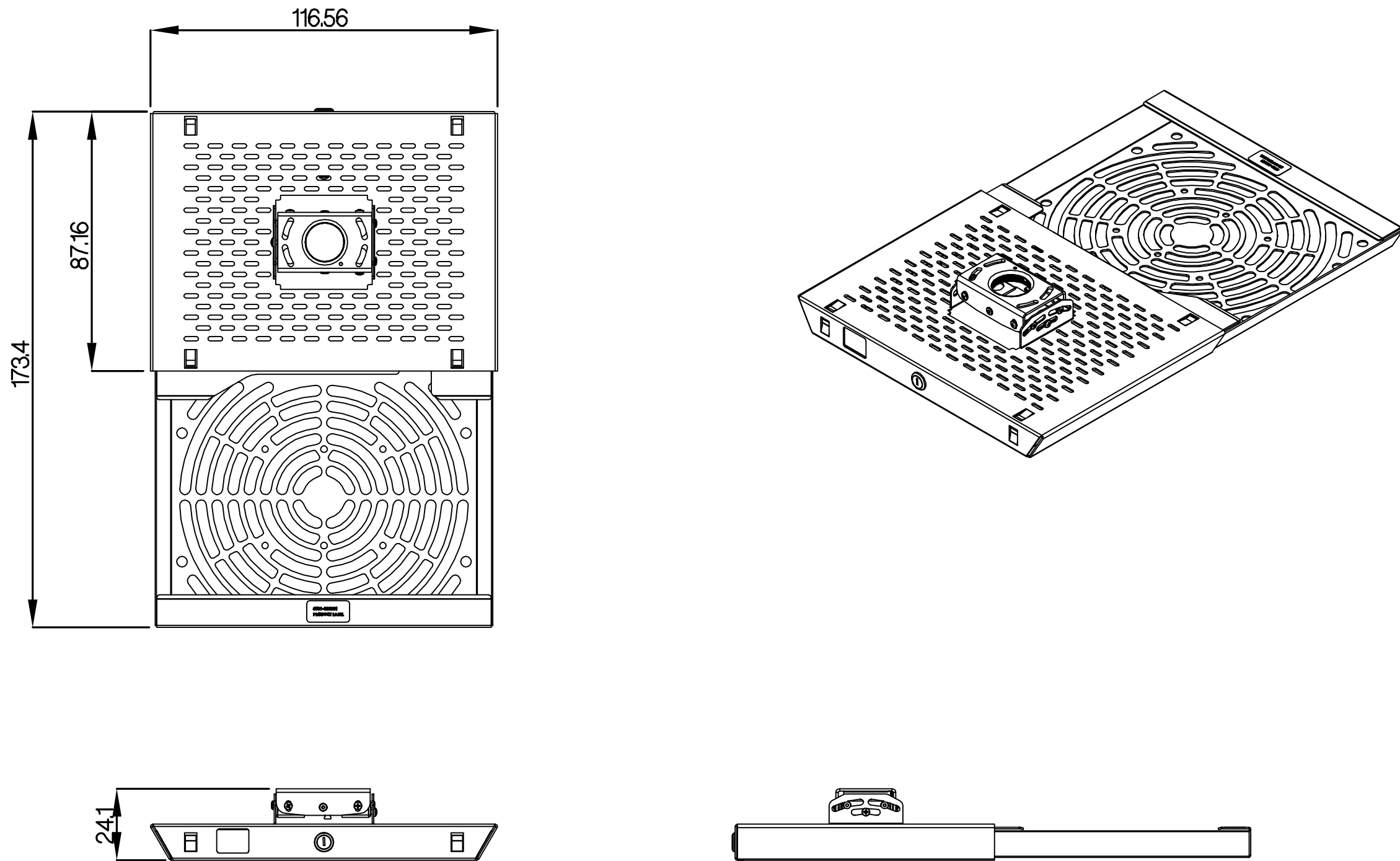
1 CONFERENCE ROOMS
PROJECTOR MOUNT NOT TO EXCEED 6'-0" NTS



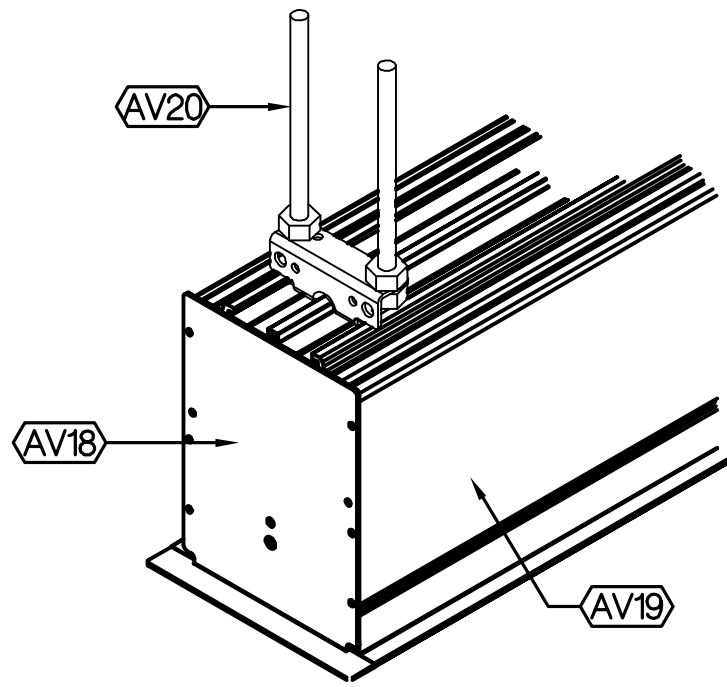
Structure Connection Type	Load	Anchor* Bolt Dia. "D"		Minimum Embedment of Anchor in Concrete "E" **		Minimum Distance Between Anchors		Minimum Distance From Edge To Center of Bolt "F"		Minimum Concrete Coverage "I"	
		Lbs. (kN)	In. (mm)	In. (mm)	(mm)	In. (mm)	(mm)	In. (mm)	(mm)	In. (mm)	(mm)
I, II	300 (1.33)	3/8"	(9)	2 1/2"	(63)	5"	(127)	4 7/8"	(124)	3 1/4"	(86)
III	450 (2.00)	1/2"	(13)	3 1/2"	(89)	7"	(178)	6 3/4"	(171)	1 1/16"	(27)
IV	675 (3.00)	5/8"	(16)	4"	(101)	8"	(203)	8 1/4"	(209)	1 3/8"	(35)
V	975 (4.33)	3/4"	(19)	4 3/4"	(120)	9 1/2"	(241)	9 3/4"	(247)	1 7/16"	(36)

* CONCRETE FASTENER PER SECTION 17026

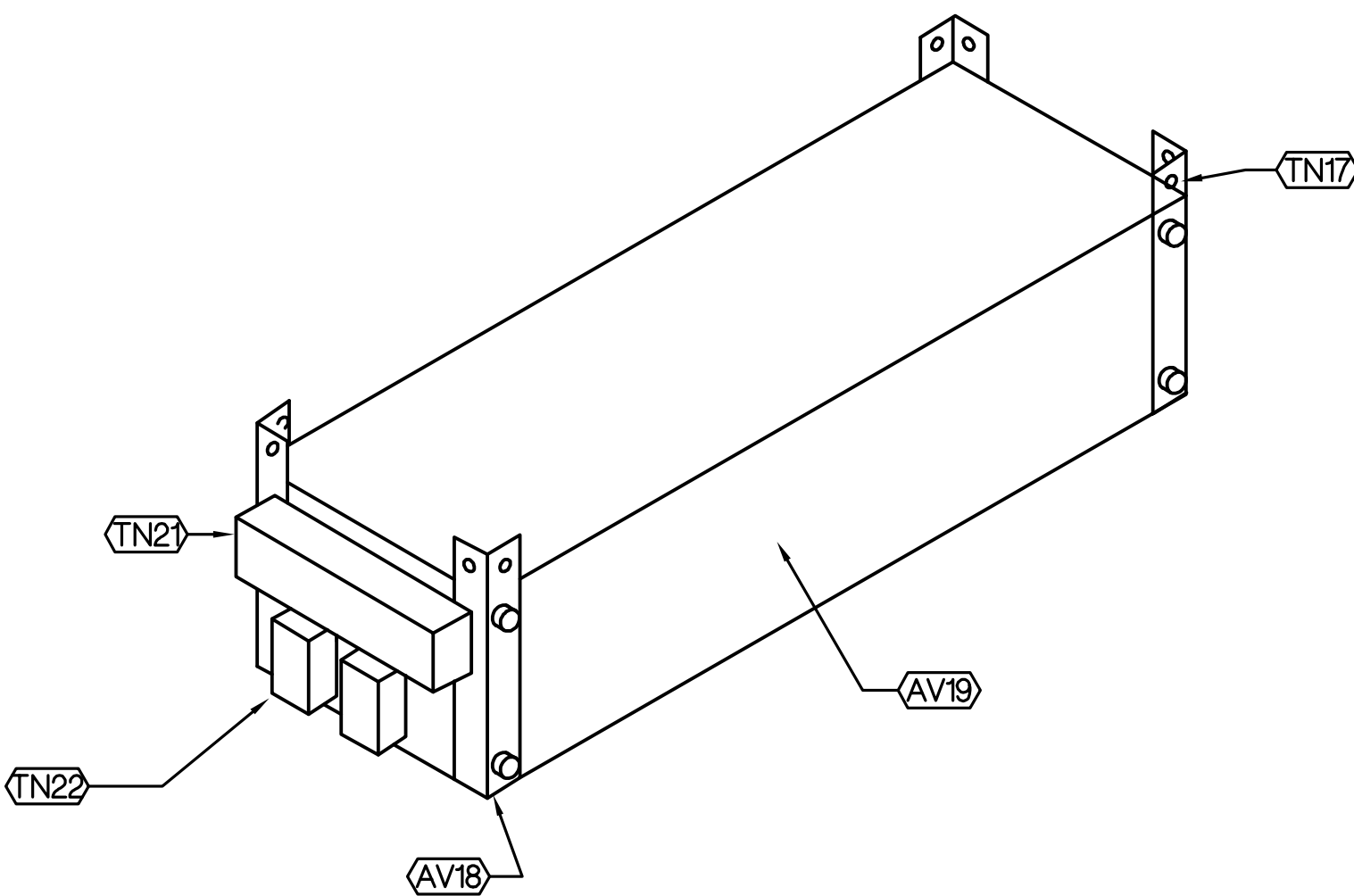
2 LONGITUDINAL OR TRANSVERSE BRACE NTS



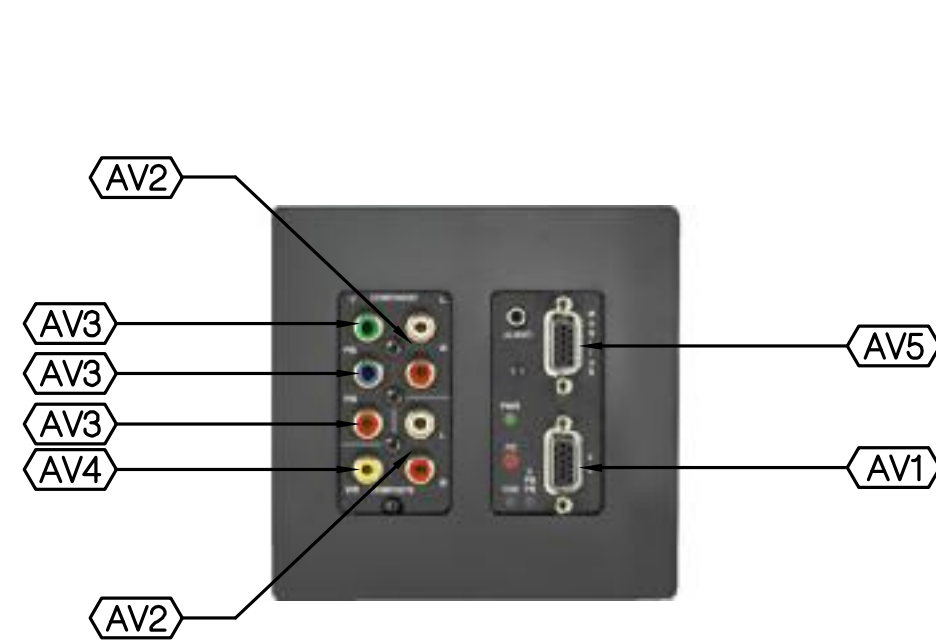
3 RPAA1 SERIES CEILING MOUNT NTS



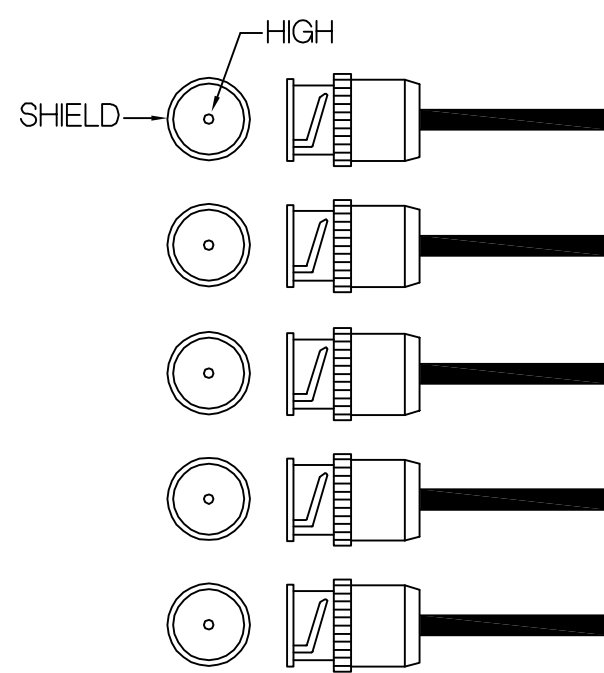
4 MOUNTING DETAILS FOR SCREEN SHC1-6 NTS



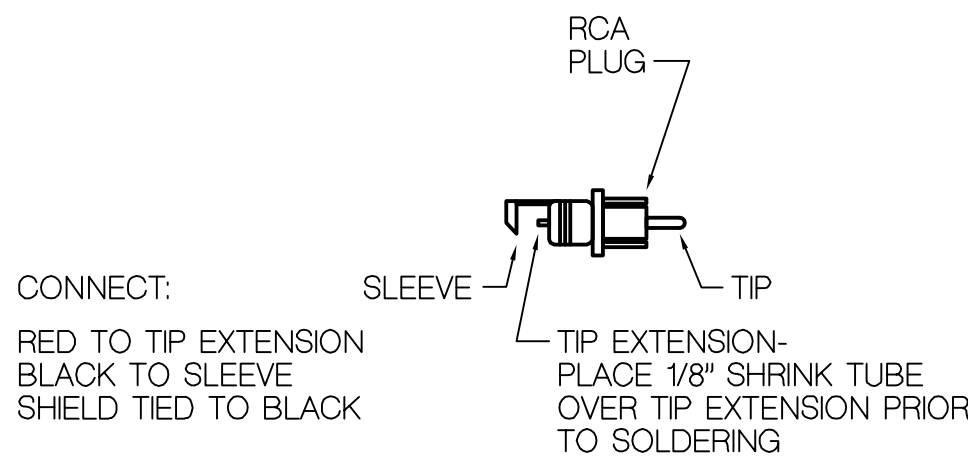
5 MOUNTING DETAILS FOR SCREEN SHC7-10 NTS



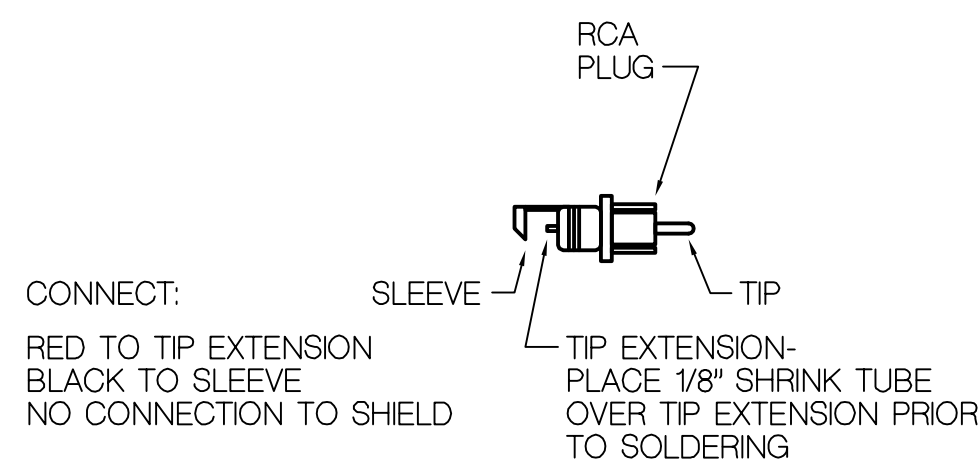
1 WALL PANEL INPUT - WPIC NTS



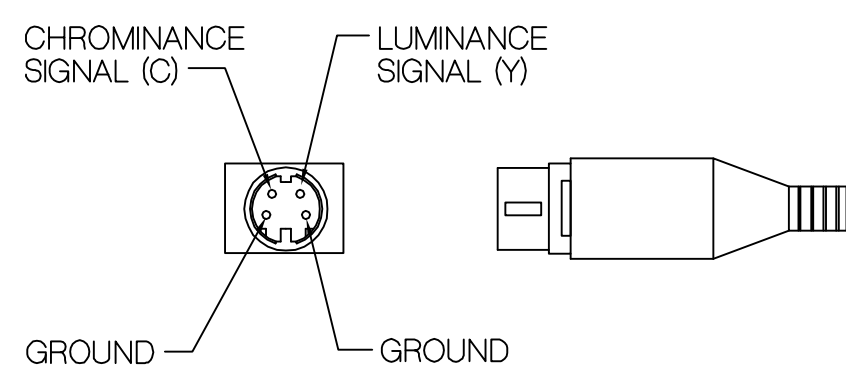
2 MALE BNC RGBHV PLUGS NTS



3 MALE RCA PLUG (UNBAL) INPUT NTS



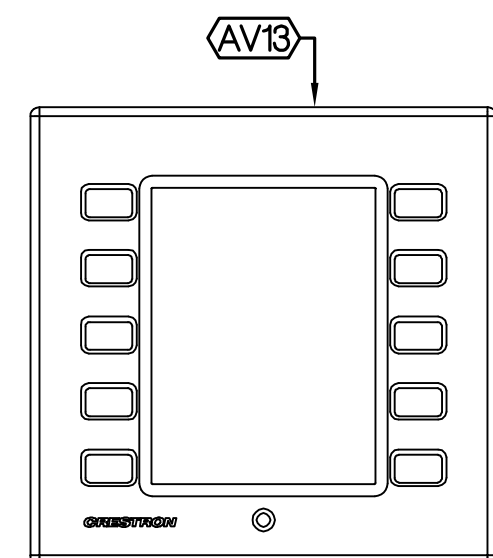
4 MALE RCA PLUG (UNBAL) OUTPUT NTS



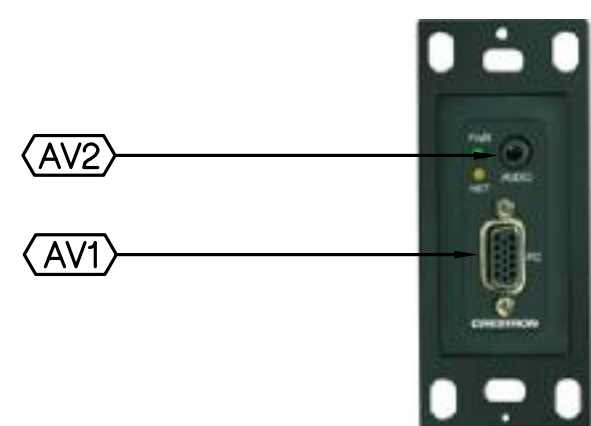
5 MALE Y/C S-VIDEO CONNECTOR NTS



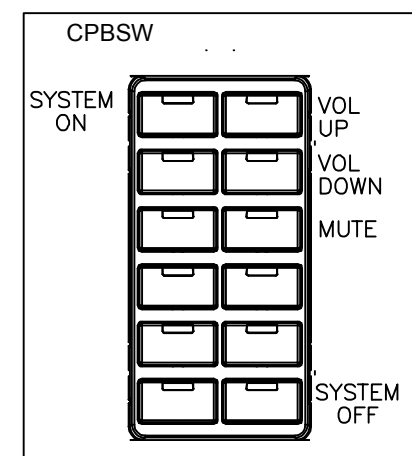
6 CATEGORY MEDIA PROJECTOR OUTPUT - CMPO NTS



7 CPB NTS



8 WPIPC NTS



9 CPSBW NTS

KEYNOTES

- AV AUDIOVISUAL SYSTEM: COMPLY WITH DIVISION 27.
- AV1 RGBHV INPUT.
- AV2 STEREO LINE LEVEL AUDIO INPUT.
- AV3 COMPONENT VIDEO INPUT.
- AV4 COMPOSITE VIDEO INPUT.
- AV5 RGBHV OUTPUT.
- AV6 SPEAKER LEVEL OUTPUT.
- AV7 S-VIDEO OUTPUT.
- AV8 COMPOSITE VIDEO OUTPUT.
- AV9 A/V NETWORK (RS-485).
- AV10 10/100 BASE-T LAN PORT.
- AV11 CATEGORY RATED CABLE PORT.
- AV12 PROJECTOR CONTROL & MONITORING SERIAL PORT.
- AV13 CONTROL PANEL LABELING TO BE COMPLETED BY CONTRACTOR. SUBMIT MENU SEQUENCE AND PROPOSED BUTTON LABELING AS SUBMITTAL FOR REVIEW.

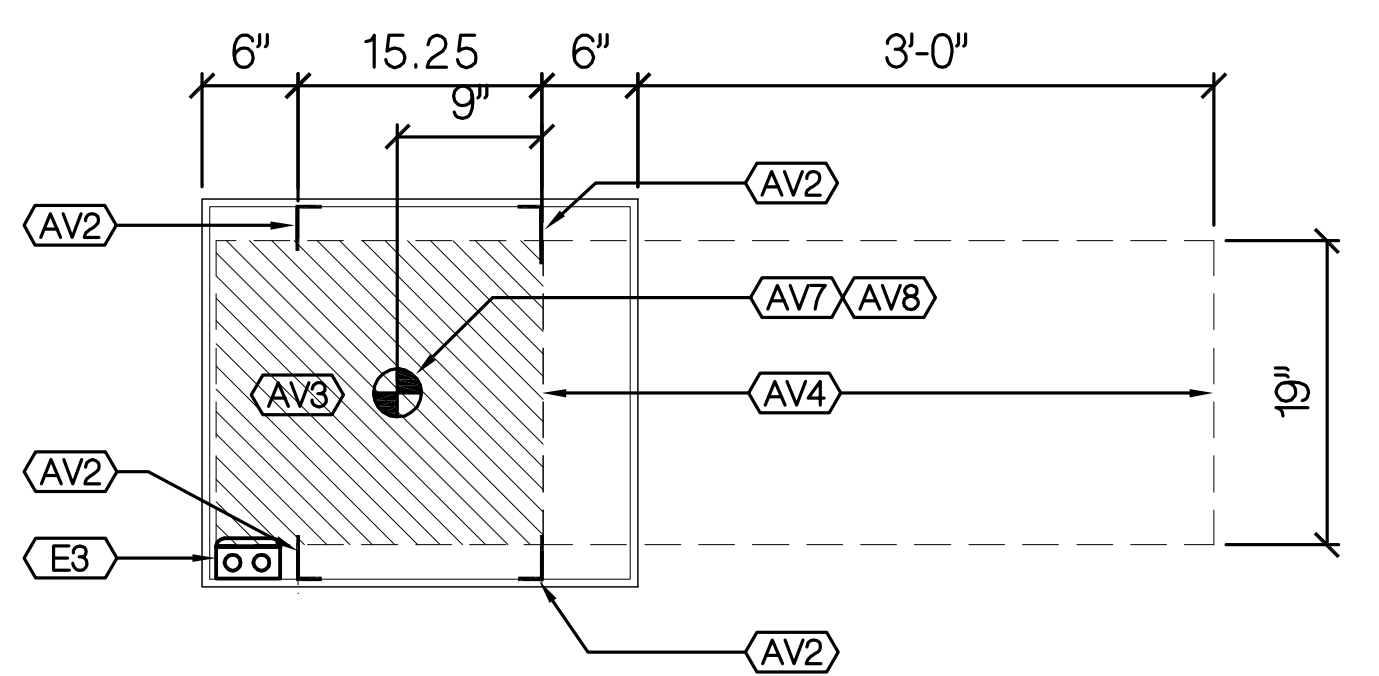
KEY PLAN

NO	REVISION DESCRIPTION	DATE

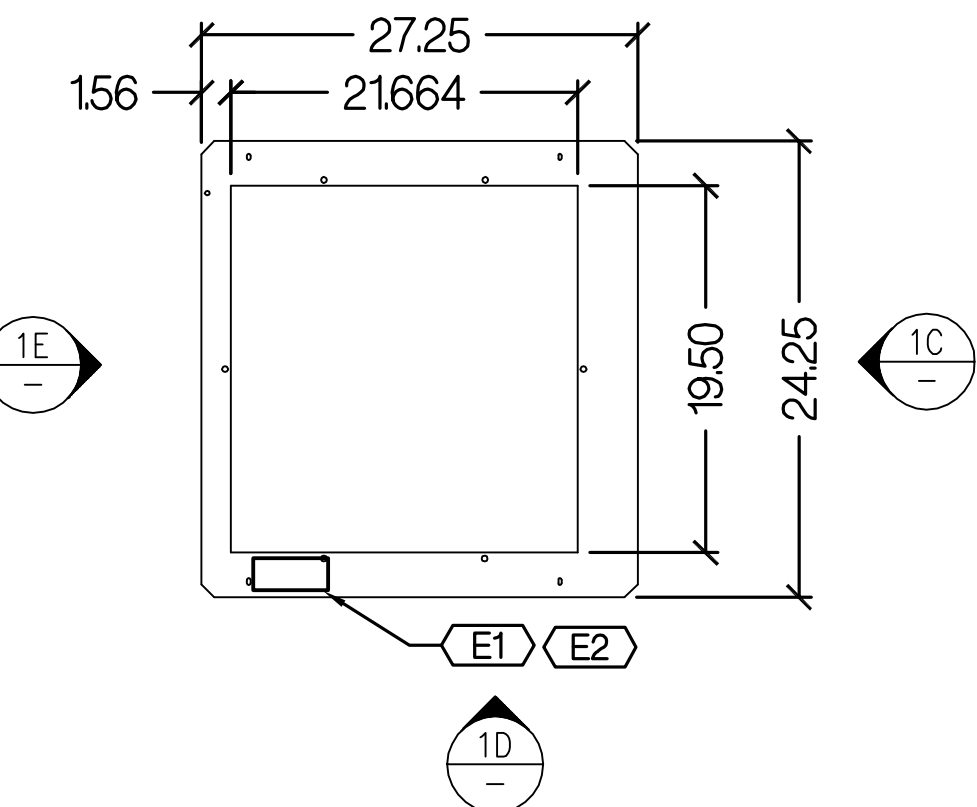
PROJECT
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CONFERENCE CENTER

SHEET
DETAILS -
AUDIO-VISUAL SYSTEMS

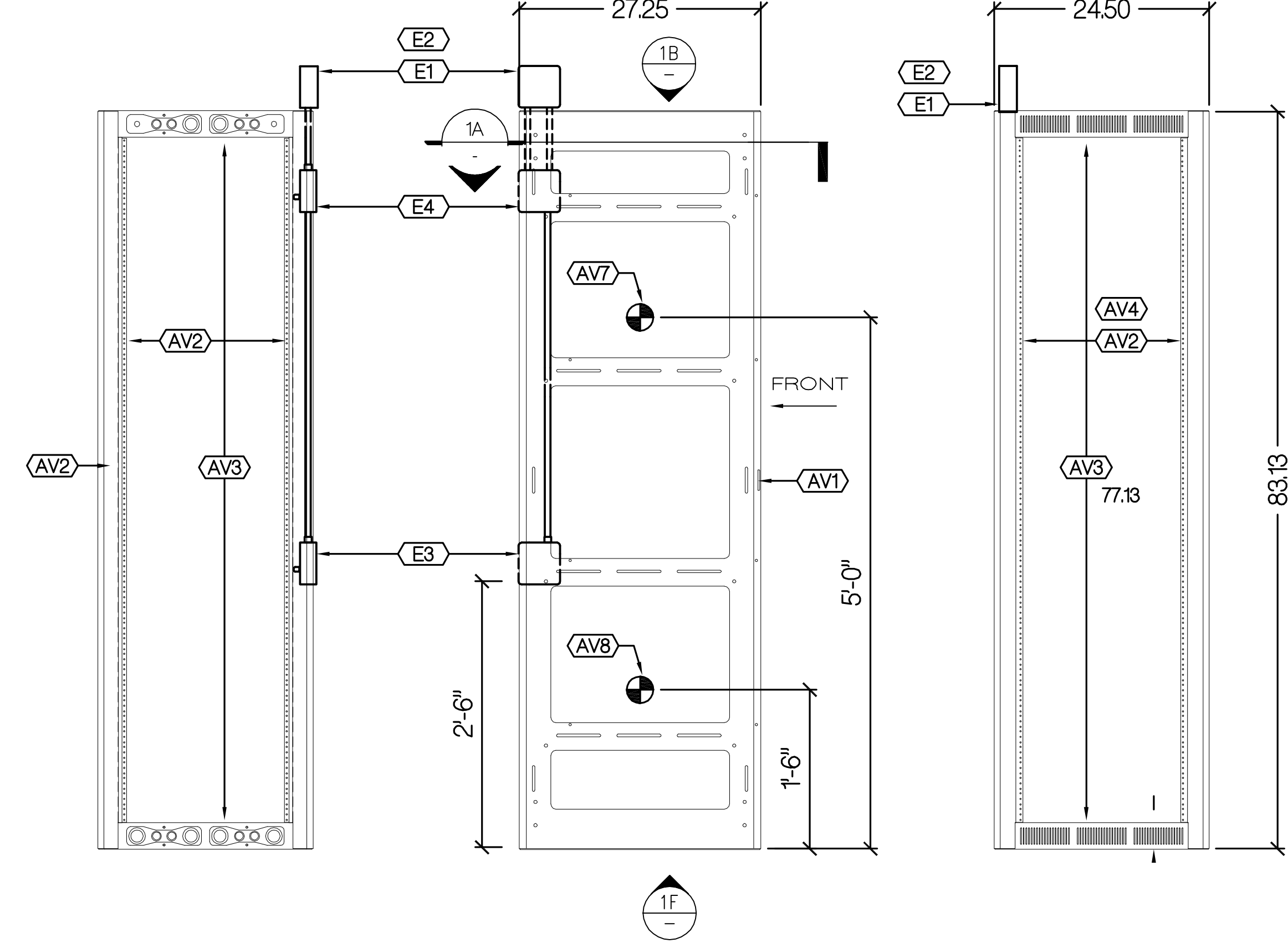
SCALE AS NOTED	FOR 30" x 42" SHEET
JOB NUMBER 2000466B	DRAWING
DRAWN BY IK, DB	AV9.02
DESIGNED BY PAM	
DATE 10/05/09	SHEET OF



1A SECTION VIEW - R33



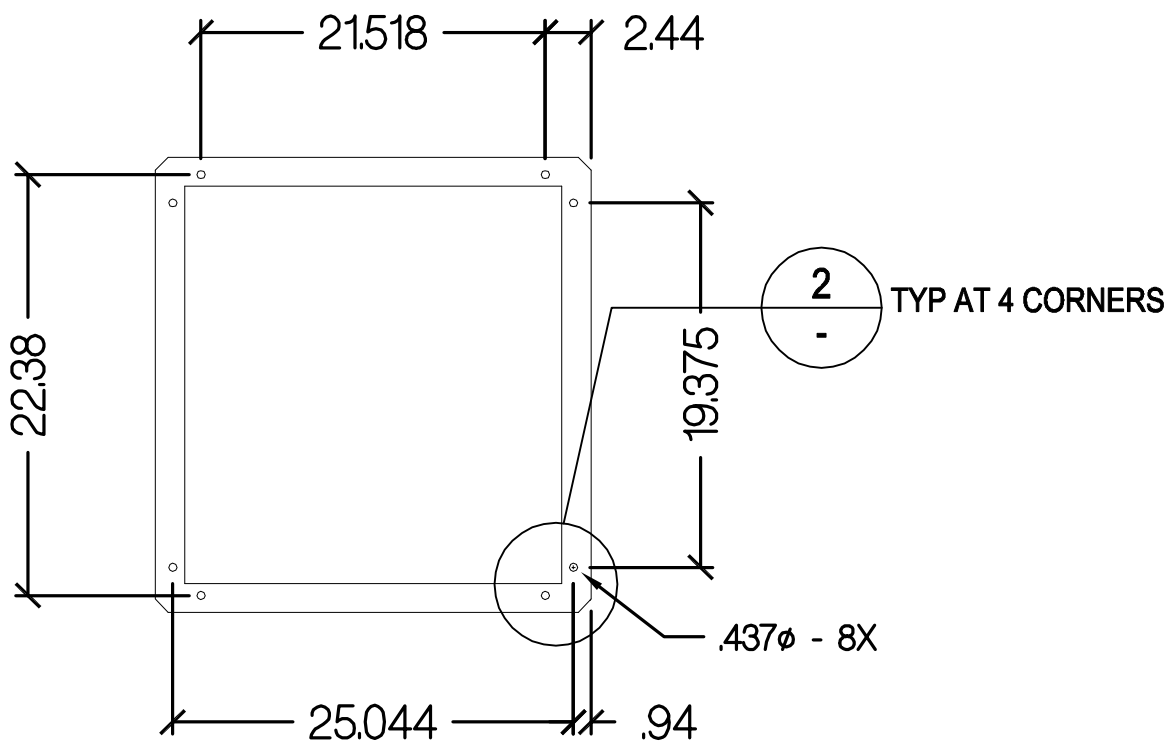
1B TOP VIEW - R33



1E REAR VIEW - R33

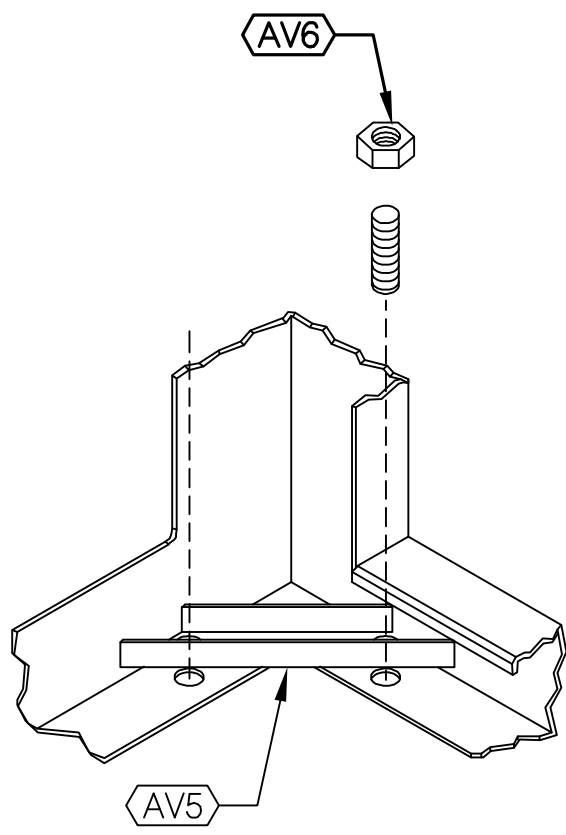
1D SIDE VIEW - R33

1C FRONT VIEW - R33

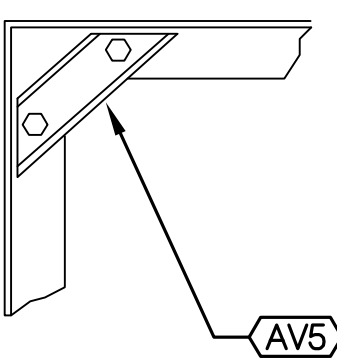


1F BOTTOM VIEW

1 RACK R33 DETAILS AND ELEVATIONS
NTS



2B RACK INSIDE CORNER
TYP. 4 CORNERS



2A PLAN VIEW
TYP. 4 CORNERS

2 SEISMIC BRACKET INSTALLATION
NTS

KEYNOTES

- AV AUDIOVISUAL SYSTEM: COMPLY WITH DIVISION 27.
- (AV1) ENCLOSURE (RACK) FRAME. FASTEN TO FLOOR. SUBMIT FASTENING DETAILS.
- (AV2) PROVIDE RACK RAILS SPACED HORIZONTALLY FOR 19 INCH RACK PANEL MOUNTING. PROVIDE RACK RAILS TAPPED 12-24. COMPLY WITH ANSI/EIA-310-D SPACING. POSITION FRONT RAILS BACK FROM FACE OF FRAME AS REQUIRED TO MOUNT VERTICAL WIRE MANAGER, BUT NOT TO EXCEED 6 INCHES. POSITION REAR RAILS BACK 6 INCHES FROM FACE OF FRAME.
- (AV3) EQUIPMENT CLEAR MOUNTING AREA. HOLD VOLUME SHOWN CLEAR OF ANY OBSTRUCTIONS OR INTRUSIONS.
- (AV4) EQUIPMENT CLEAR FRONT PULL-OUT AREA. HOLD CLEAR OF OBSTRUCTIONS.
- (AV5) PROVIDE SEISMIC BRACKET MRK-Z4 SERIES INSTALLED TIGHT AT EACH CORNER OF THE STEEL HOST ENCLOSURE FRAME. THE LEVELING FOOT RIV-NUT IN THE CORNER OF THE FRAME SHALL NOT BE REMOVED. TIGHTEN THE FLOOR ANCHOR TO THE MANUFACTURERS SPECIFIED TORQUE. DEFLECTION WILL OCCUR AROUND THE RIV-NUT, THIS IS REQUIRED; IT PRE-LOADS THE CORNER IN COMPRESSION.
- (AV6) AT EACH CORNER OF THE STEEL HOST ENCLOSURE FRAME, PROVIDE 2 EACH 3/8 INCH ITW RAMSET/RED HEAD TRUBOLT WEDGE ANCHOR WITH MINIMUM 3 INCH EMBEDMENT. INSTALL PER DETAIL 1/TN1522. PROVIDE TOTAL OF 8 ANCHORS AT EACH STEEL HOST ENCLOSURE FRAME.
- (AV7) ASSUMED LOAD CENTROID FOR DATA ELECTRONITN. ALLOW 300 POUNDS TOTAL LOAD FASTENED TO FRONT RAILS ONLY.
- (AV8) ASSUMED LOAD CENTROID FOR UNINTERRUPTIBLE POWER SYSTEM. ALLOW 400 POUNDS TOTAL LOAD FASTENED TO BOTH FRONT AND REAR RAILS.

E ELECTRICAL: COMPLY WITH DIVISION 26.

- (E1) SEE ELECTRICAL DRAWINGS FOR RELATED RACEWAY, CIRCUITING, CONDUCTORS AND DEVICES.
- (E2) POINT OF CONNECTION: PROVIDE DEVICE BOX 469 INCHES SQUARE, 2125 INCHES DEEP, 420 CUBIC INCH CAPACITY, WITH CONDUIT KNOCKOUTS FOR 0.75 AND 1 INCH CONDUIT AT BOX SIDES. MOUNT BOX VERTICALLY. PROVIDE SQUARE BLANK COVER.
- (E3) UNINTERRUPTIBLE POWER SYSTEM (UPS) RECEPTACLE.

AT ENCLOSURES INDICATED ON ENLARGED PLANS AS "1DF TYPE 2": PROVIDE DEVICE BOX 469 INCHES SQUARE, 2125 INCHES DEEP, 420 CUBIC INCH CAPACITY, WITH CONDUIT KNOCKOUTS FOR 0.75 INCH CONDUIT AT BOX SIDES. MOUNT BOX VERTICALLY. PROVIDE SQUARE SURFACE COVER, 0.5 INCH DEEP FOR 1 DUPLEX FLUSH RECEPTACLE. PROVIDE NEMA 5-20R DUPLEX RECEPTACLE. PROVIDE 0.75 INCH EMT TO SERVICE RECEPTACLE BOX ABOVE. PROVIDE 2 EACH #12 AND 1 #12 GROUND TO POINT OF CONNECTION BOX ABOVE.

AT ENCLOSURES INDICATED ON ENLARGED PLANS AS "1DF TYPE 1" AND "1BDF": PROVIDE DEVICE BOX 469 INCHES SQUARE, 2125 INCHES DEEP, 420 CUBIC INCH CAPACITY, WITH CONDUIT KNOCKOUTS FOR 0.75 INCH CONDUIT AT BOX SIDES. MOUNT BOX VERTICALLY. PROVIDE SQUARE SURFACE COVER, 0.5 INCH DEEP FOR 2 DUPLEX FLUSH RECEPTACLES. PROVIDE 2 EACH NEMA 5-20R DUPLEX RECEPTACLES. PROVIDE 0.75 INCH EMT TO SERVICE RECEPTACLE BOX ABOVE. PROVIDE 4 EACH #12 AND 2 #12 GROUND TO POINT OF CONNECTION BOX ABOVE.
- (E4) SERVICE RECEPTACLE. PROVIDE DEVICE BOX 469 INCHES SQUARE, 2125 INCHES DEEP, 420 CUBIC INCH CAPACITY, WITH CONDUIT KNOCKOUTS FOR 0.75 INCH CONDUIT AT BOX SIDES. MOUNT BOX VERTICALLY. PROVIDE SQUARE SURFACE COVER, 0.5 INCH DEEP FOR 1 DUPLEX FLUSH RECEPTACLE. PROVIDE NEMA 5-20R DUPLEX RECEPTACLE. PROVIDE 2 EACH 0.75 INCH EMT TO POINT OF CONNECTION BOX ABOVE. PROVIDE 2 EACH #12 AND 1 #12 GROUND TO POINT OF CONNECTION BOX ABOVE.

KEY PLAN

NO	REVISION DESCRIPTION	DATE

PROJECT
**UC DAVIS
GRADUATE SCHOOL OF
MANAGEMENT AND
CONFERENCE CENTER**

SHEET
**DETAILS -
RACK TYPE R33**

SCALE AS NOTED		FOR 30" x 42" SHEET	
JOB NUMBER 2000466B		DRAWING	
DRAWN BY IK, DB		AV9.01	
DESIGNED BY PAM			
DATE 0/05/09			
		SHEET	OF

SHEET NOTES

1.

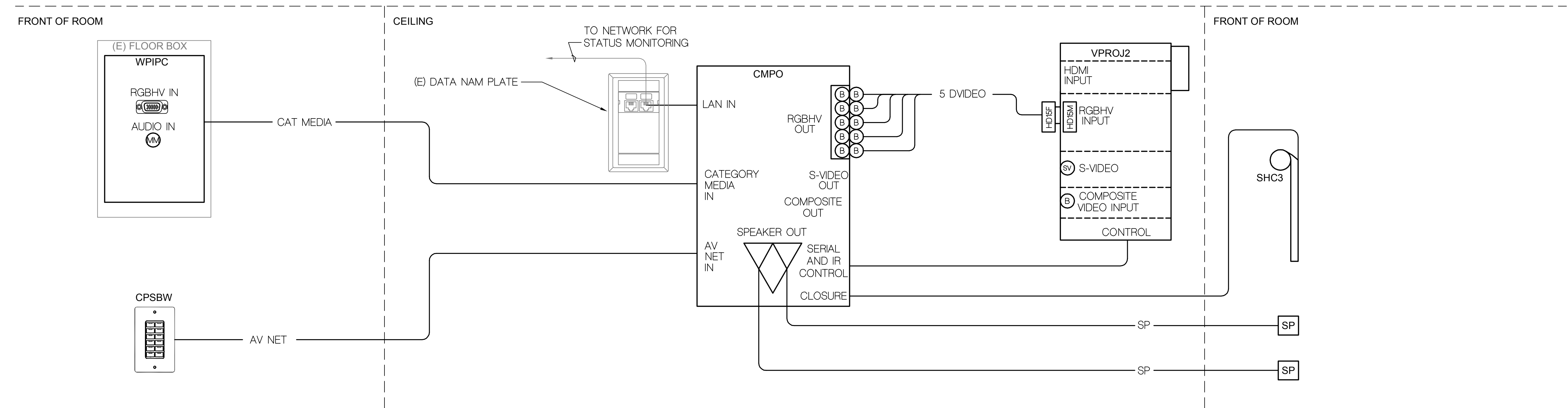
WORK SHOWN IN LIGHT PEN IS EXISTING OR FUTURE.
WORK SHOWN IN DARK PEN IS WORK OF THIS PROJECT.
2.

PROVIDE IDENTICAL A/V SYSTEM FOR BOTH CONFERENCE ROOMS 1209 AND 1213.

Smith,
Fause &
McDonald Inc.

Communications Engineering Group

351 8th Street
San Francisco, California 94103
(415) 255-9140 Fax: (415) 255-9180



1

CONFERENCE ROOMS AUDIOVISUAL
SYSTEMS SINGLE LINE DIAGRAM

NTS

KEY PLAN

NO	REVISION DESCRIPTION	DATE

PROJECT

UC DAVIS
GRADUATE SCHOOL OF
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CONFERENCE CENTER

SHEET

CONFERENCE ROOMS
AUDIOVISUAL SYSTEMS
SINGLE LINE DIAGRAM

SCALE NONE

FOR 30" x 42" SHEET

JOB NUMBER
2000466B

DRAWN BY
IK, DB

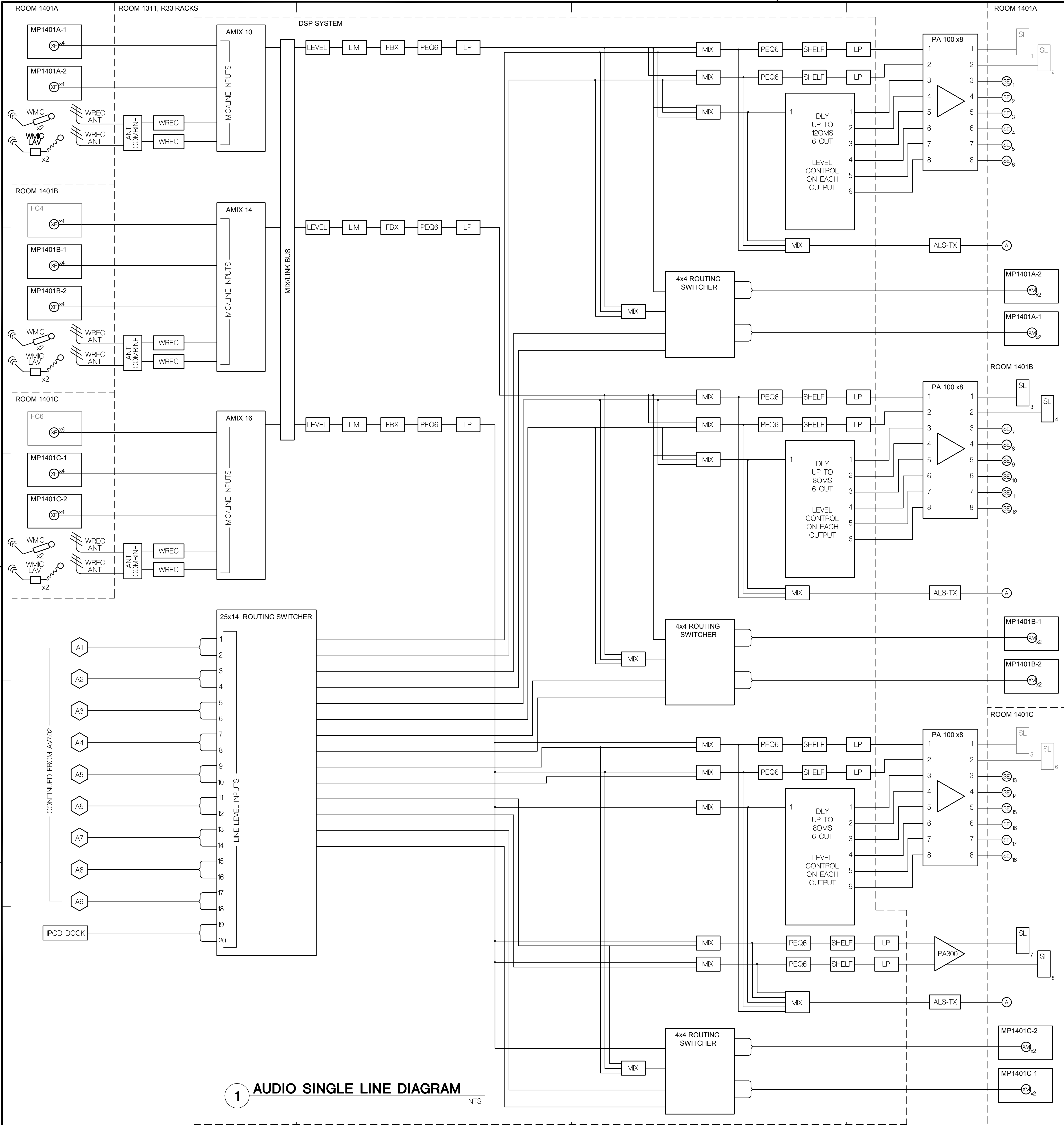
DESIGNED BY
PAM

DATE
10/05/09

DRAWING

AV7.03

SHEET OF



SHEET NOTES

1. WORK SHOWN IN LIGHT PEN IS EXISTING OR FUTURE.
WORK SHOWN IN DARK PEN IS WORK OF THIS PROJECT.

KEYNOTES

AV AUDIOVISUAL SYSTEMS: COMPLY WITH DIVISION 27.

AV1



KEY PLAN

NO	REVISION DESCRIPTION	DATE

PROJECT

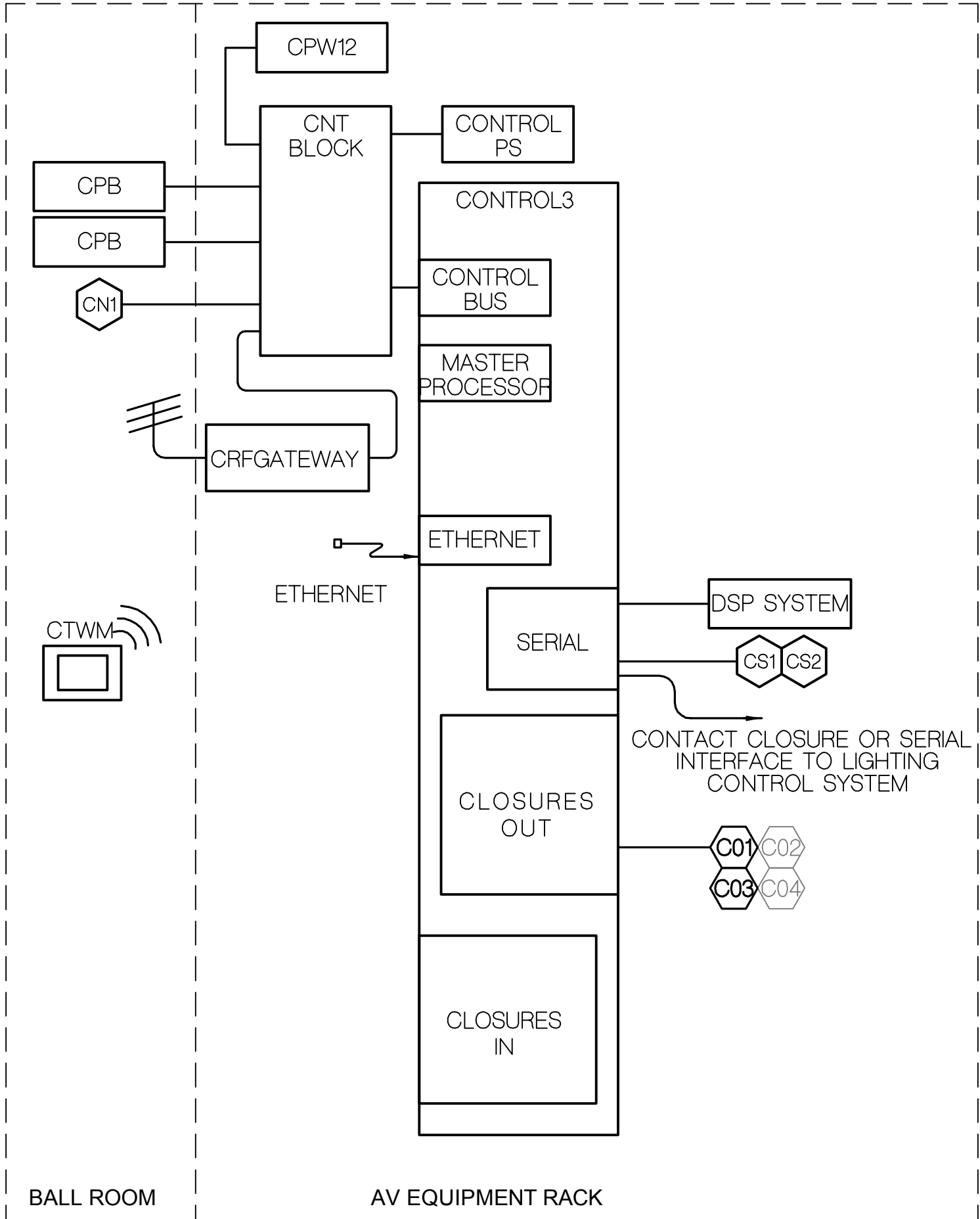
UC DAVIS
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MANAGEMENT AND
CONFERENCE CENTER

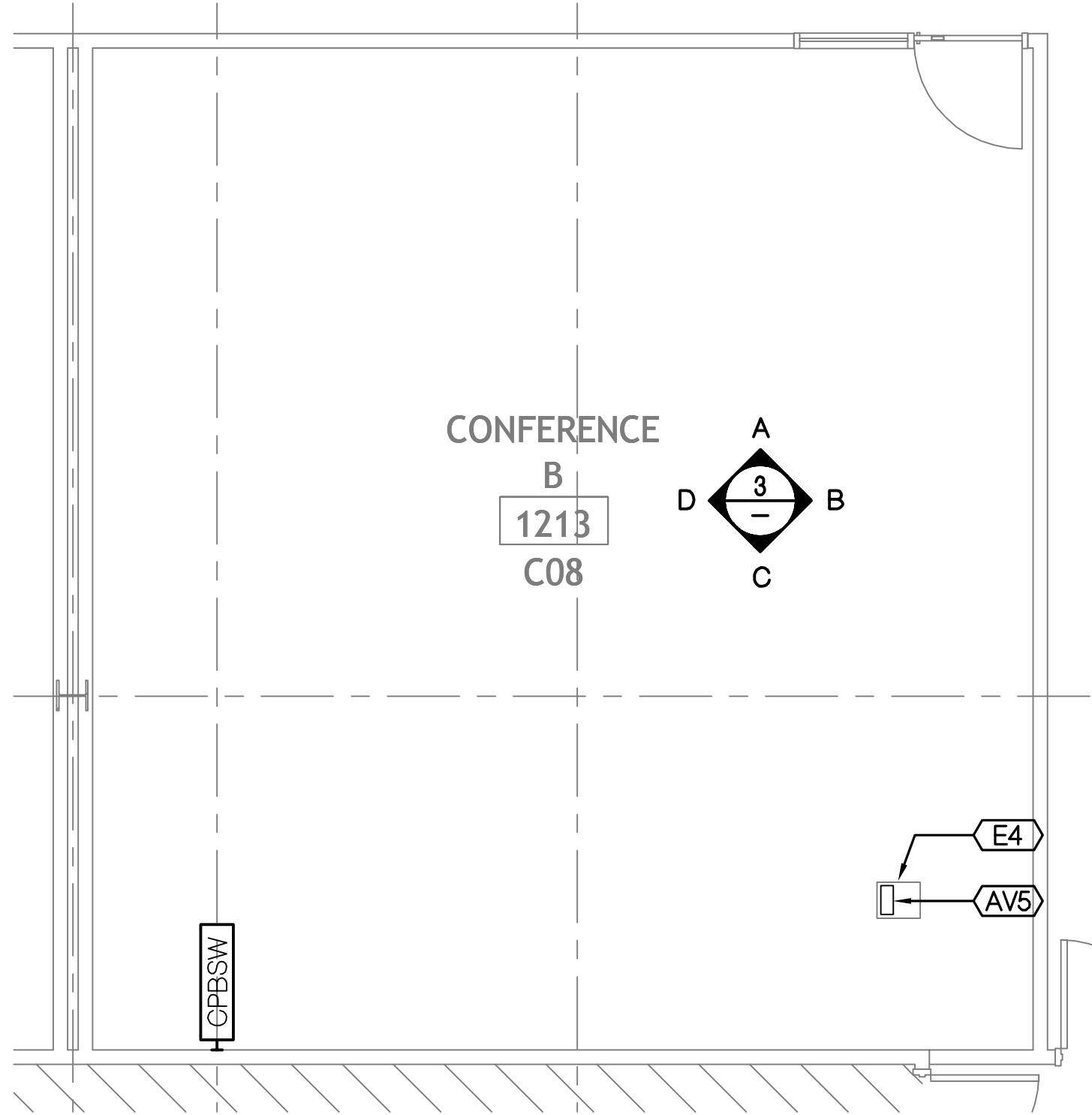
SHEET

BALLROOM
AUDIO & CONTROL SYSTEMS
SINGLE LINE DIAGRAM

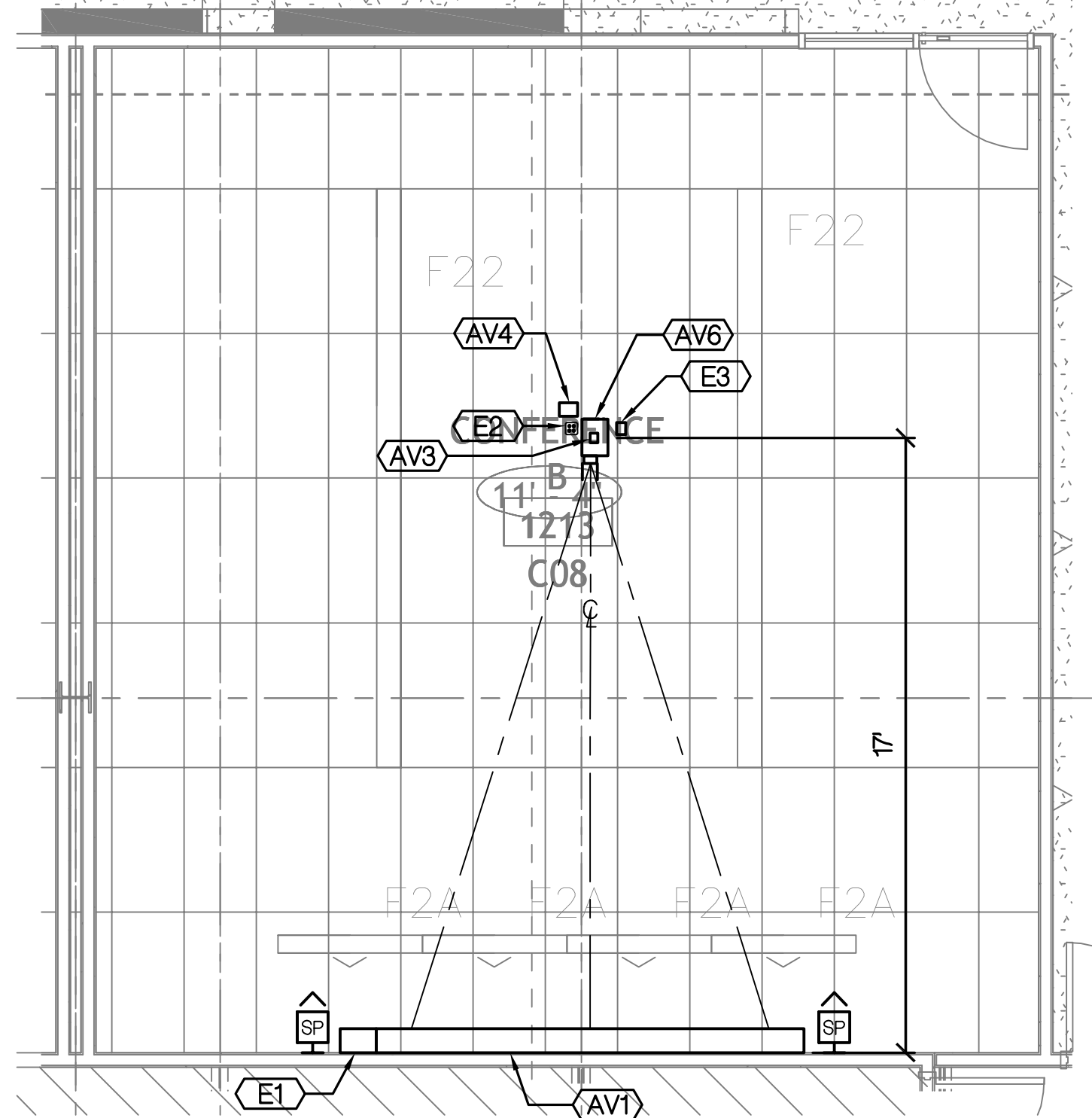
SCALE NONE FOR 30" x 42" SHEET

JOB NUMBER 2000466B	DRAWING
DRAWN BY IK, DB	AV7.01
DESIGNED BY PAM	
DATE 10/05/09	SHEET OF

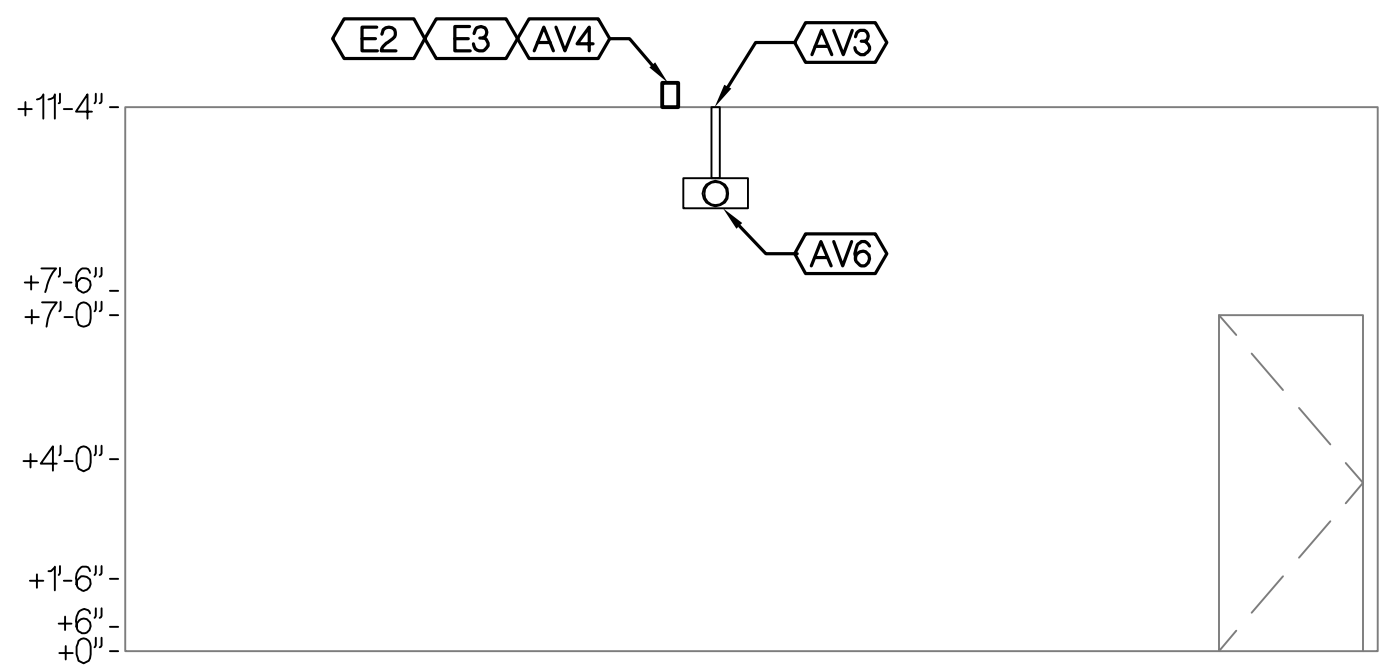




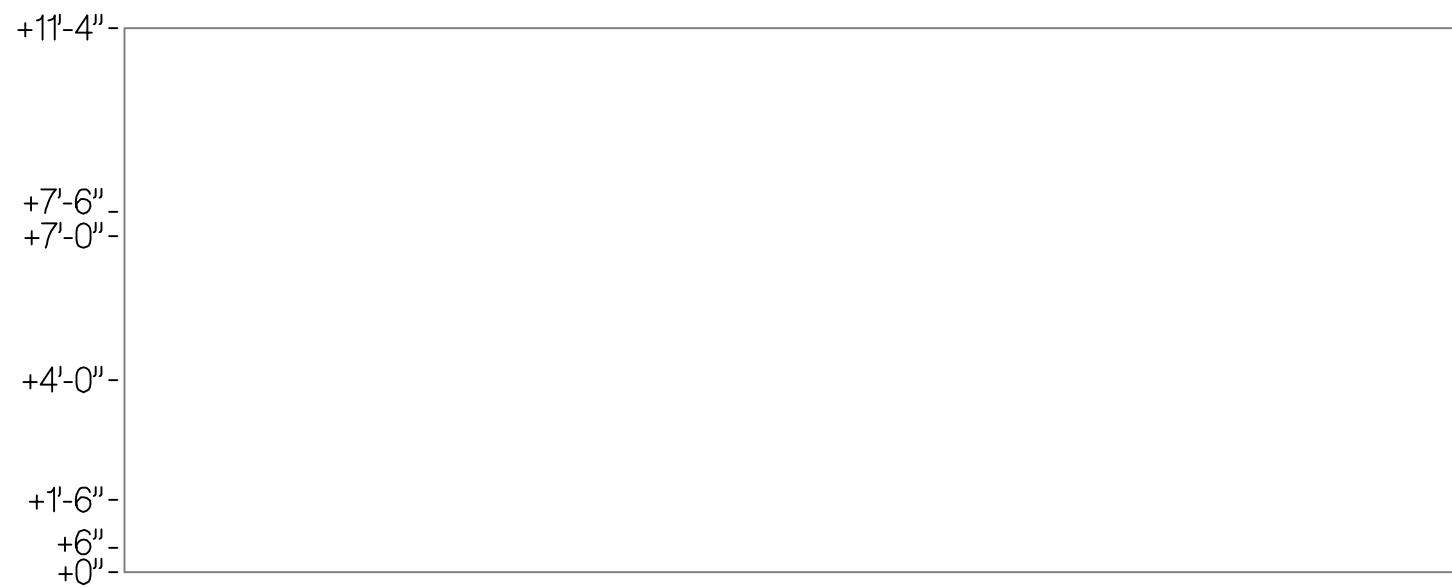
1 CONFERENCE B 1213 ENLARGED PLAN
1/4"=1'-0"



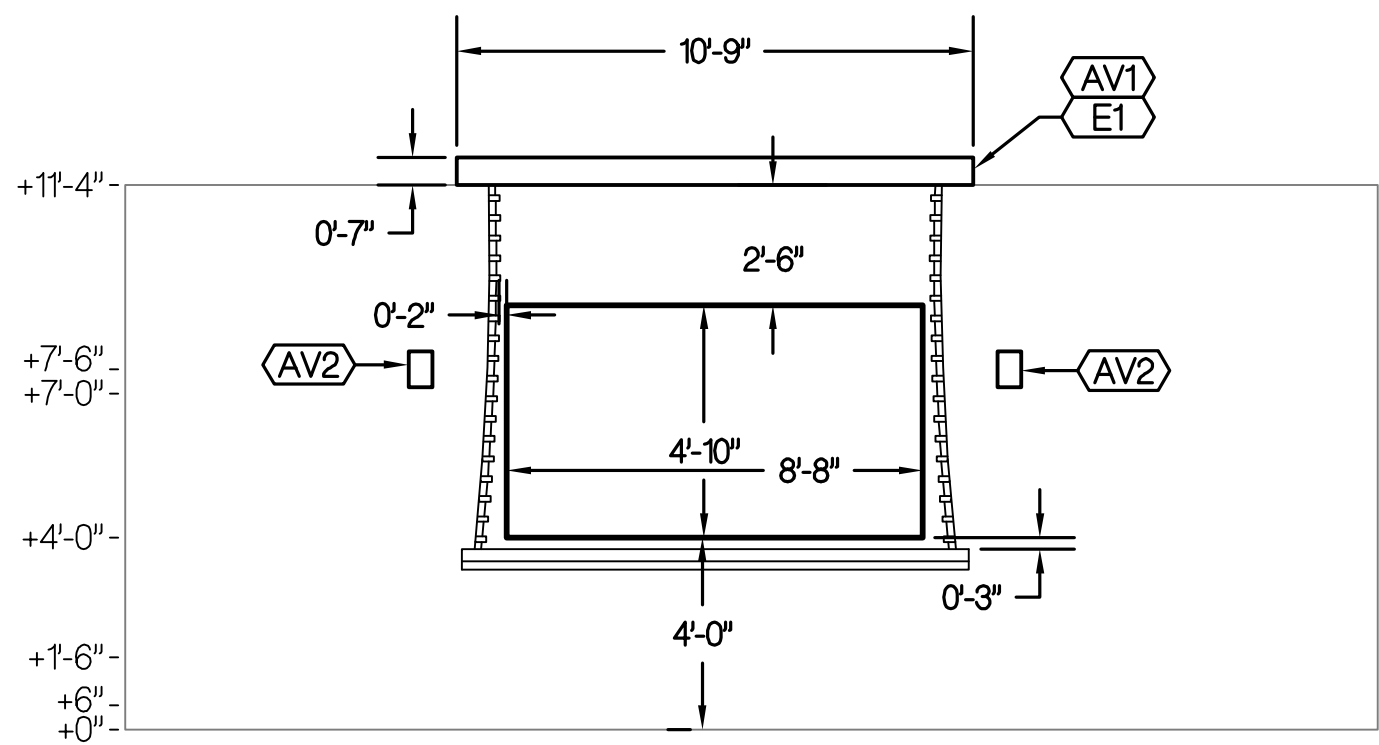
2 CONFERENCE B 1213 REFLECTED CEILING PLAN
1/4"=1'-0"



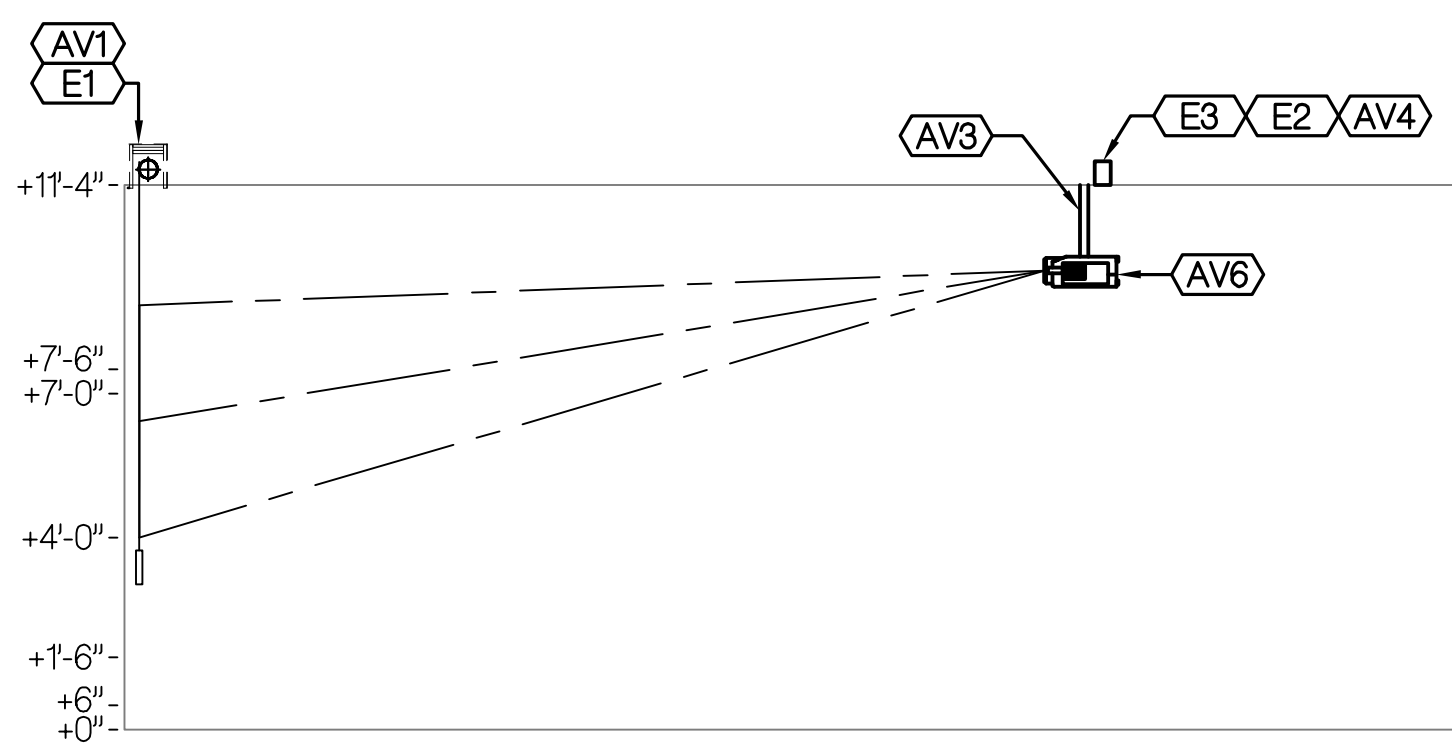
A NORTH



B EAST



C SOUTH



D WEST

3 ELEVATION
1/4" = 1'-0"

KEYNOTES

- AV AUDIOVISUAL SYSTEMS COMPLY WITH DIVISION 27.
- (AV1) TAB-TENSIONED MOTORIZED ELECTRIC PROJECTION SCREEN - 16:9 VIEWING SURFACE 58"H X 104"W SHC3. SURFACE MOUNT FLUSH TO CEILING. PROVIDE AT LEAST 30" MINIMUM BLACK DROP TO PERMIT BOTTOM VIEWING EDGE OF SCREEN TO DROP TO 4'-0" ABOVE FINISHED FLOOR.
- (AV2) PROGRAM AUDIO LOUDSPEAKERS, TYPE SP. INSTALL OLD WORKBOX & FISH CABLING DOWN FROM ACCESSIBLE CEILING.
- (AV3) PROJECTOR DUAL CHAMBER (LV & POWER) POLE SUPPORT MOUNT.
- (AV4) PROJECTOR OUTPUT RECEIVER, CMPO.
- (AV5) RGBHV & STEREO AUDIO INPUT PLATE, WRIPC MOUNTED IN (E) FLOOR BOX.
- (AV6) VIDEO PROJECTOR, VPROJ2.
- E ELECTRICAL: COMPLY WITH DIVISION 16 - SEE ELECTRICAL DRAWINGS
- (E1) (E) PROVIDE HARD WIRED POWER CONNECTION TO SCREEN MOTOR. VERIFY MOTOR LOCATION IN FIELD. SCREEN OPERATION TO BE UNDER CONTROL OF FUTURE AV CONTROL SYSTEM.
- (E2) (E) QUAD 120V, 15A RECEPTACLE FOR FUTURE VIDEO PROJECTOR & SIGNAL PROCESSING CEILING MTD.
- (E3) (E) WORK AREA OUTLET WITH AT LEAST 1 DATA NAM FOR FUTURE MONITORING OF PROJECTOR STATUS CEILING MTD.
- (E4) (E) WIREMOLD 880 SERIES FLOORBOX.



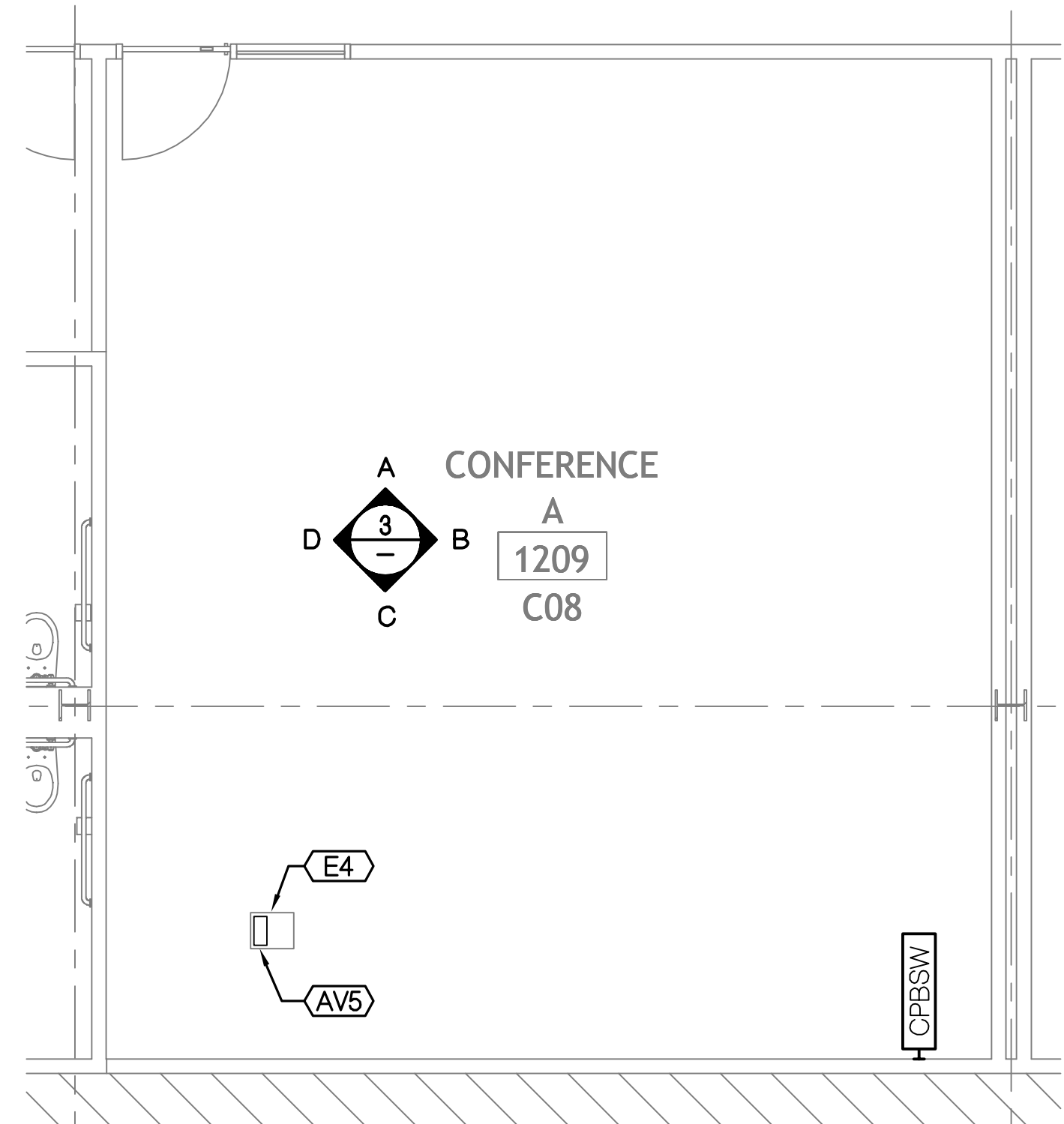
KEY PLAN

NO	REVISION DESCRIPTION	DATE

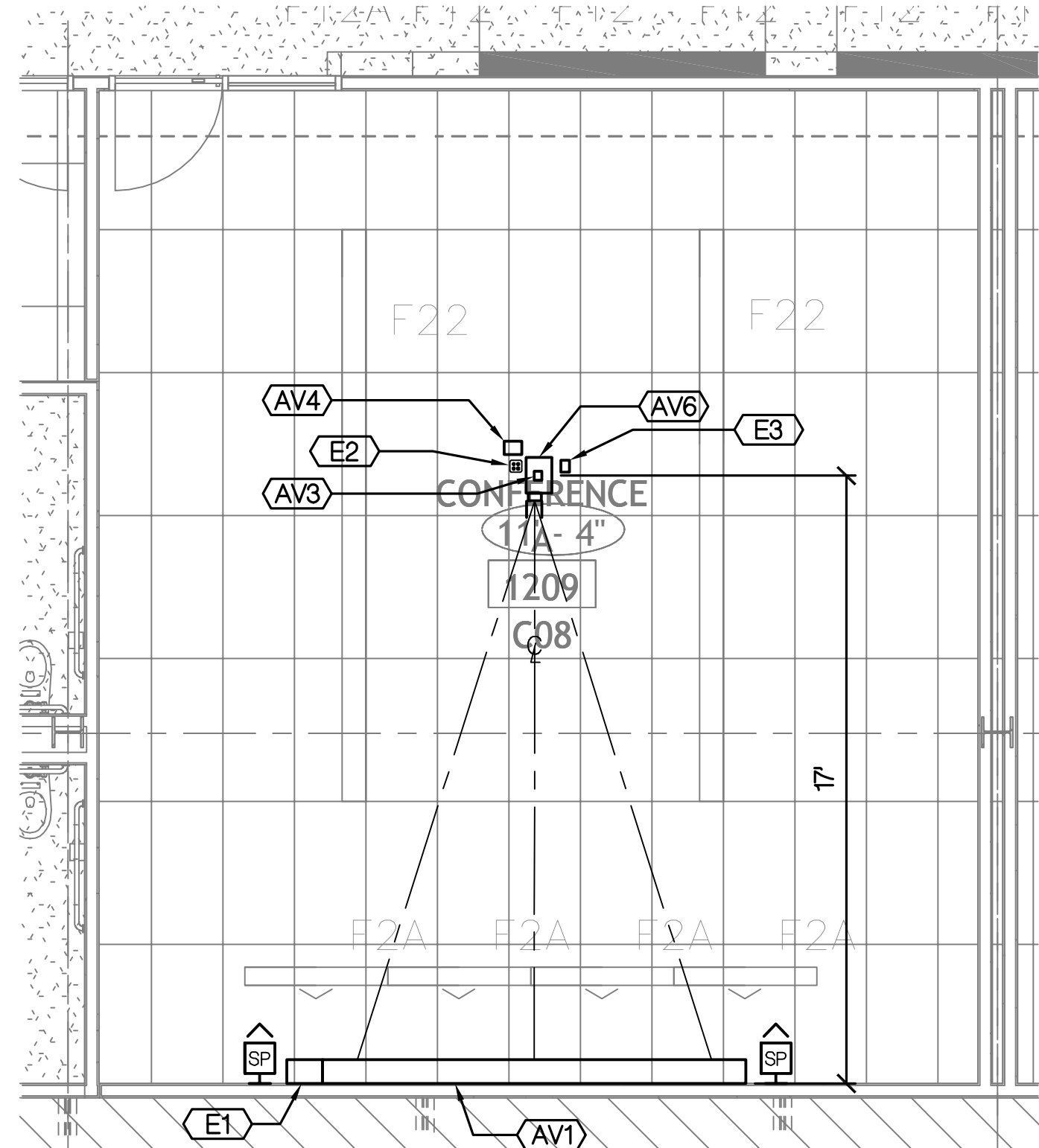
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CONFERENCE CENTER

SHEET
CONFERENCE B 1213
ENLARGED PALN, RCP
AND ELEVATION

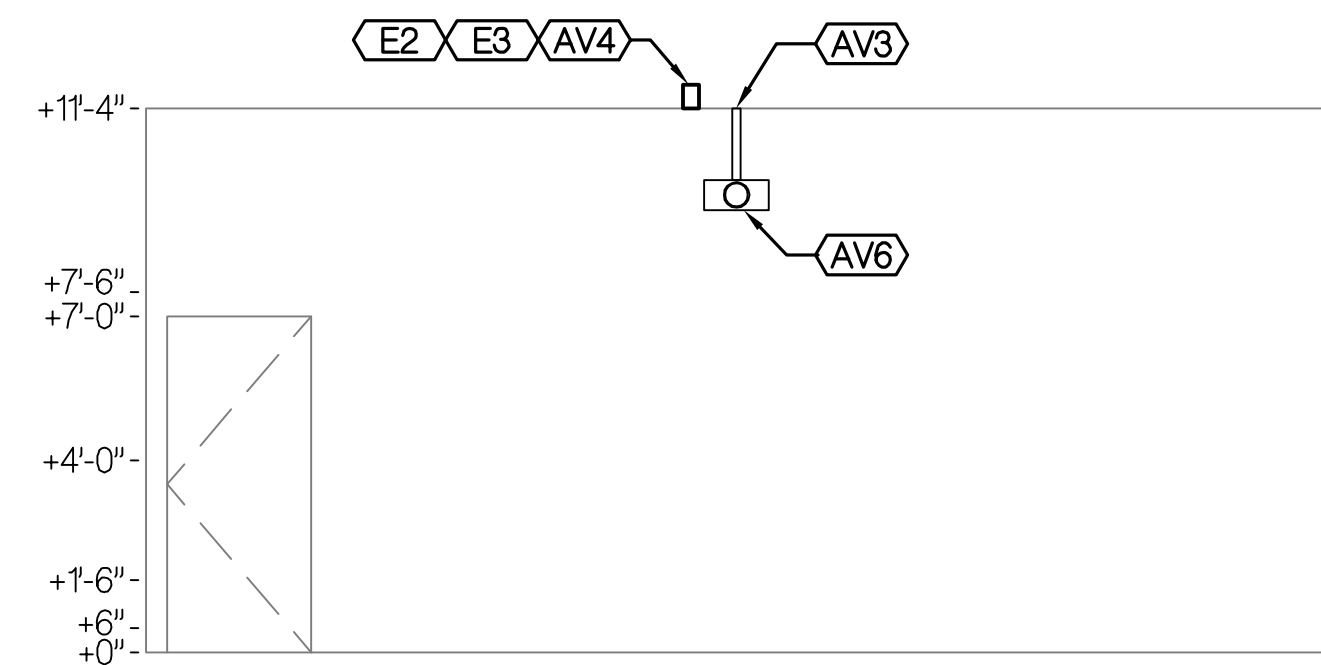
SCALE AS NOTED		FOR 30" x 42" SHEET	
JOB NUMBER 2000466B		DRAWING <	



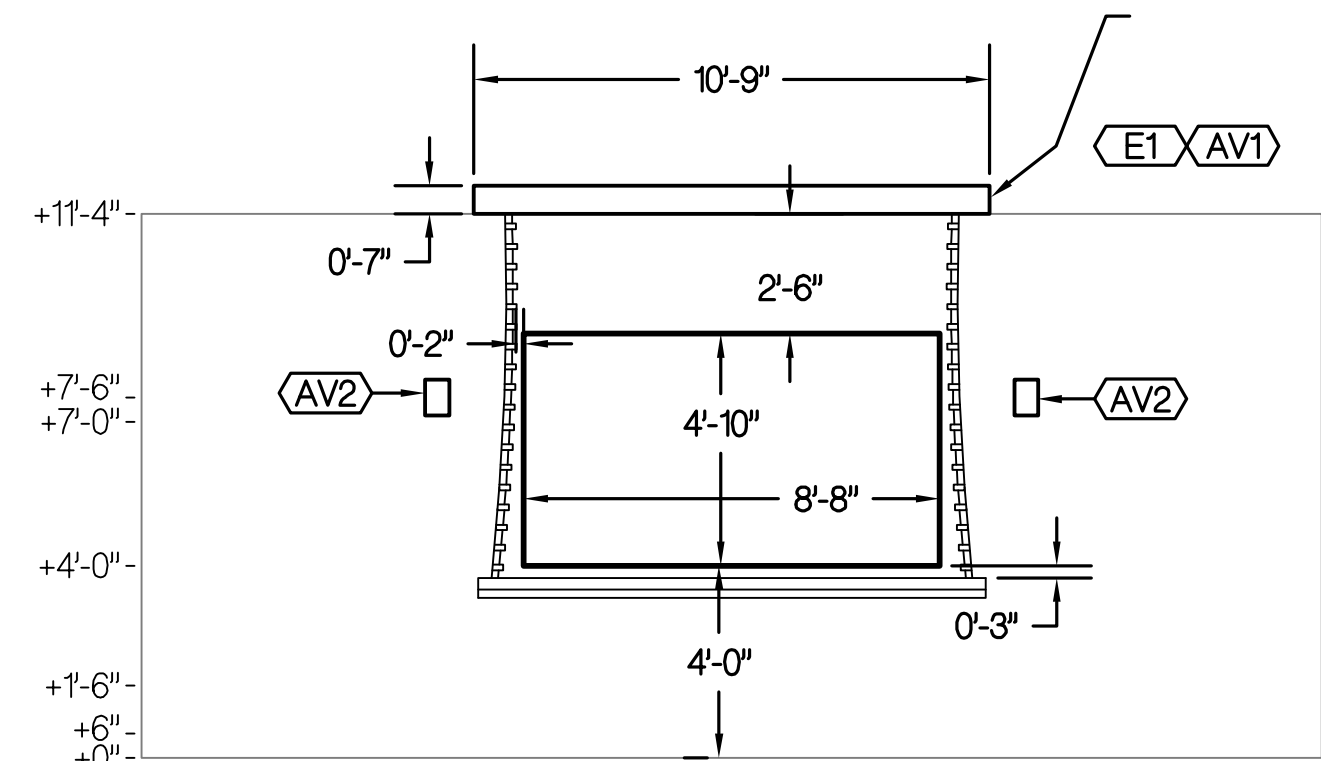
1 CONFERENCE A 1209 ENLARGED PLAN
1/4"=1'-0" NORTH



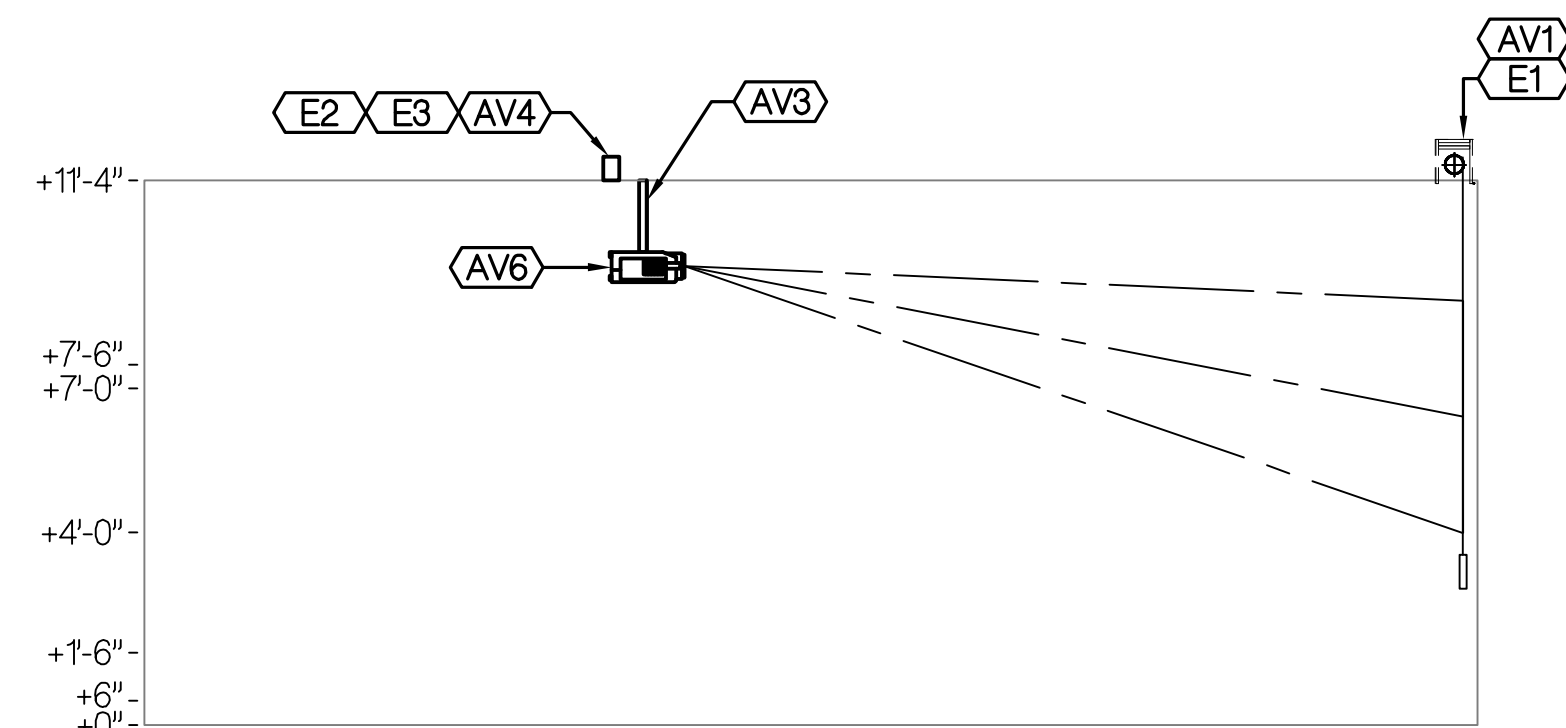
2 CONFERENCE A 1209 REFLECTED CEILING PLAN
1/4"=1'-0"



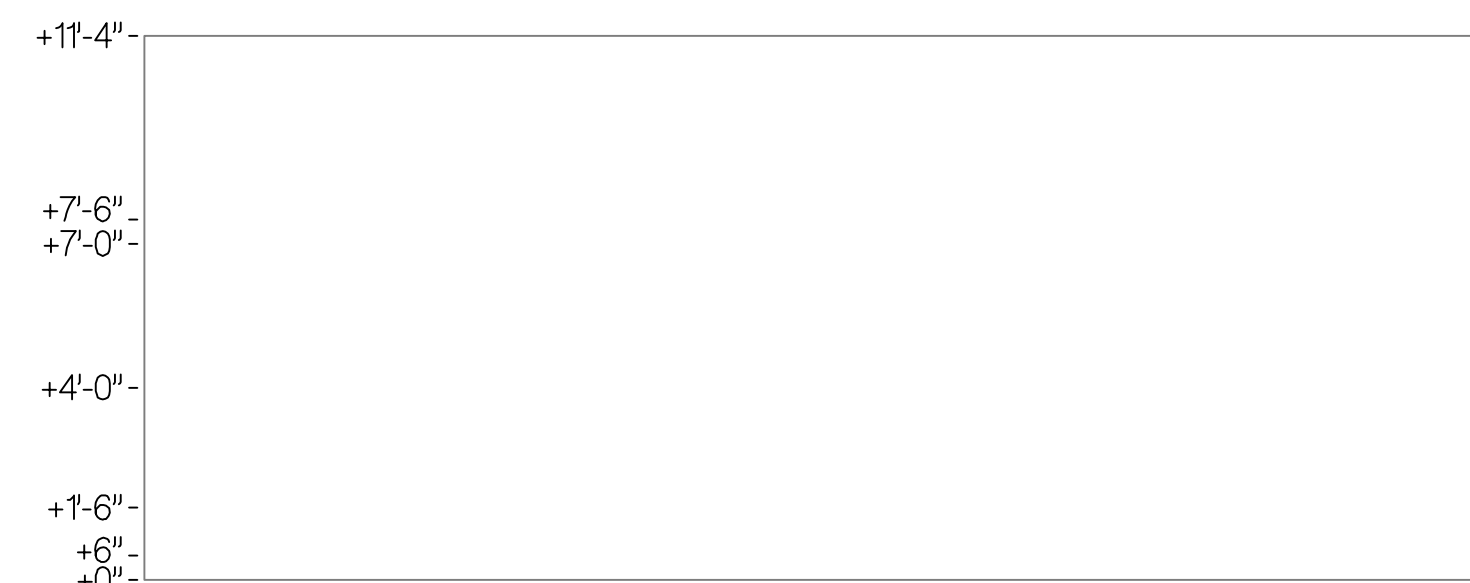
A NORTH



C SOUTH



B EAST



D WEST

3 ELEVATION
1/4" = 1'-0"

KEYNOTES

- AV AUDIOVISUAL SYSTEMS COMPLY WITH DIVISION 27.
- AV1 TAB-TENSIONED MOTORIZED ELECTRIC PROJECTION SCREEN - 169 VIEWING SURFACE 58"H X 104"W SHC3 - SURFACE MOUNT FLUSH TO CEILING. PROVIDE AT LEAST 30" MINIMUM BLACK DROP TO PERMIT BOTTOM VIEWING EDGE OF SCREEN TO DROP TO 4'-0" ABOVE FINISHED FLOOR.
- AV2 PROGRAM AUDIO LOUDSPEAKERS, TYPE SP. INSTALL OLD WORKBOX & FISH CABLING DOWN FROM ACCESSIBLE CEILING.
- AV3 PROJECTOR DUAL CHAMBER (LV & POWER) POLE SUPPORT MOUNT.
- AV4 PROJECTOR OUTPUT RECEIVER, CMPO.
- AV5 RGBHV & STEREO AUDIO INPUT PLATE, WPIC, MOUNTED IN (E) FLOOR BOX.
- AV6 VIDEO PROJECTOR, VPROJ2.
- E ELECTRICAL: COMPLY WITH DIVISION 16 - SEE ELECTRICAL DRAWINGS
- E1 (E) PROVIDE HARD WIRED POWER CONNECTION TO SCREEN MOTOR. VERIFY MOTOR LOCATION IN FIELD. SCREEN OPERATION TO BE UNDER CONTROL OF FUTURE AV CONTROL SYSTEM.
- E2 (E) QUAD 120V, 15A RECEPTACLE FOR FUTURE VIDEO PROJECTOR & SIGNAL PROCESSING CEILING MTD.
- E3 (E) WORK AREA OUTLET WITH AT LEAST 1 DATA NAM FOR FUTURE MONITORING OF PROJECTOR STATUS CEILING MTD.
- E4 (E) WIREMOLD 880 SERIES FLOORBOX.

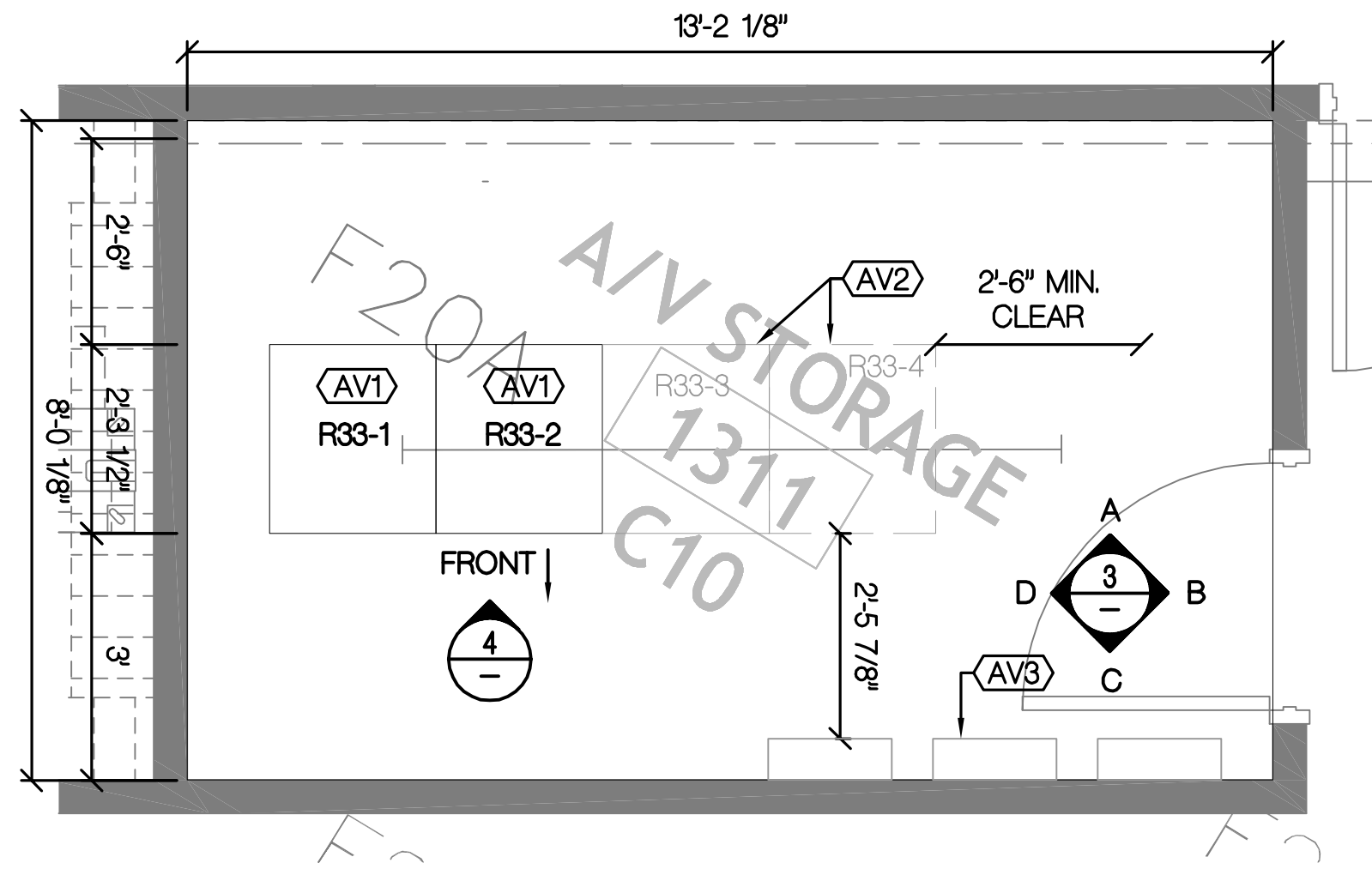
KEY PLAN

NO	REVISION DESCRIPTION	DATE

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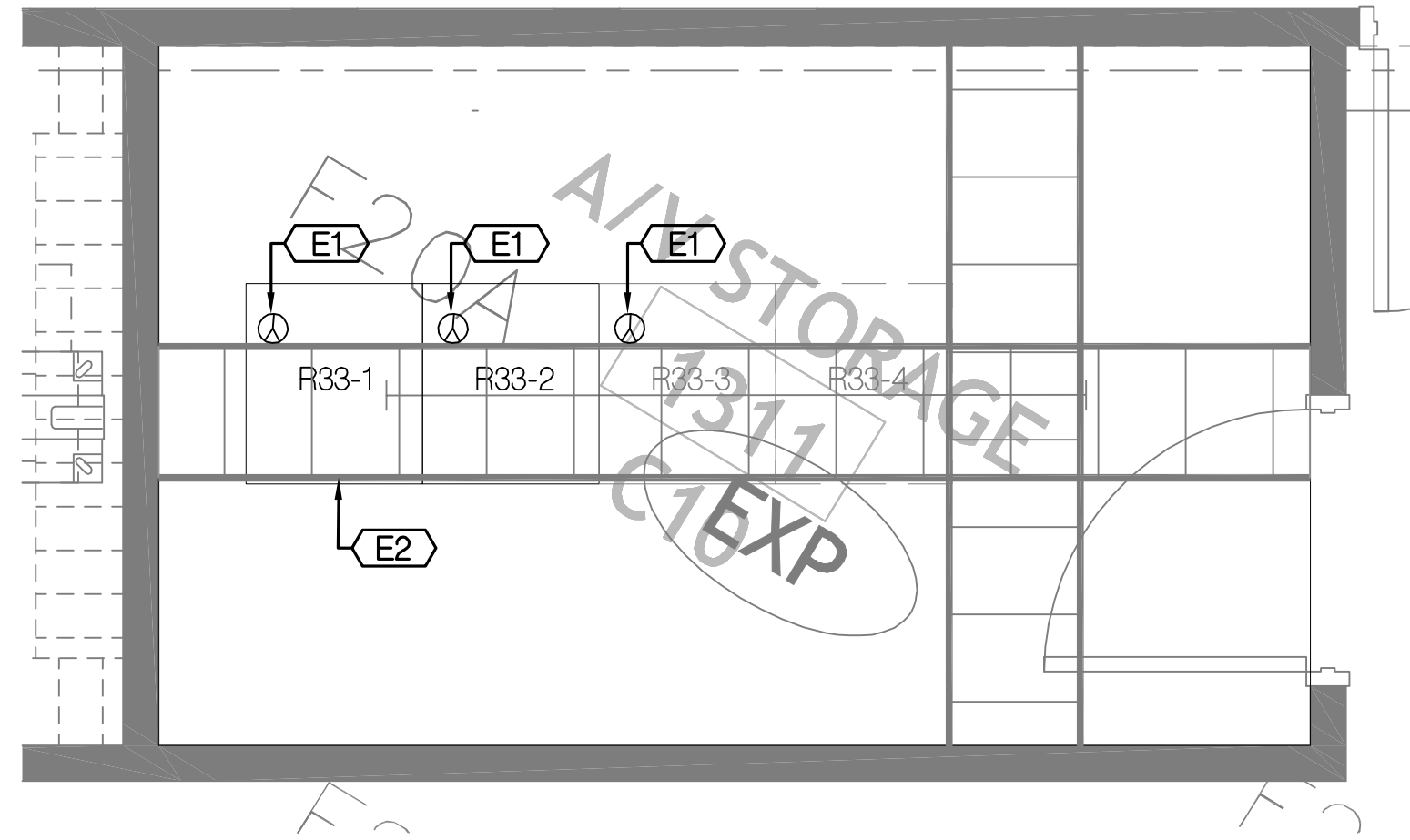
SHEET
CONFERENCE A 1209
ENLARGED PALN, RCP
AND ELEVATION

SCALE AS NOTED		FOR 30" x 42" SHEET	
JOB NUMBER 2000466B	DRAWING	AV4.06	
DRAWN BY IK, DB			
DESIGNED BY PAM			
DATE 10/05/09			
	SHEET		OF



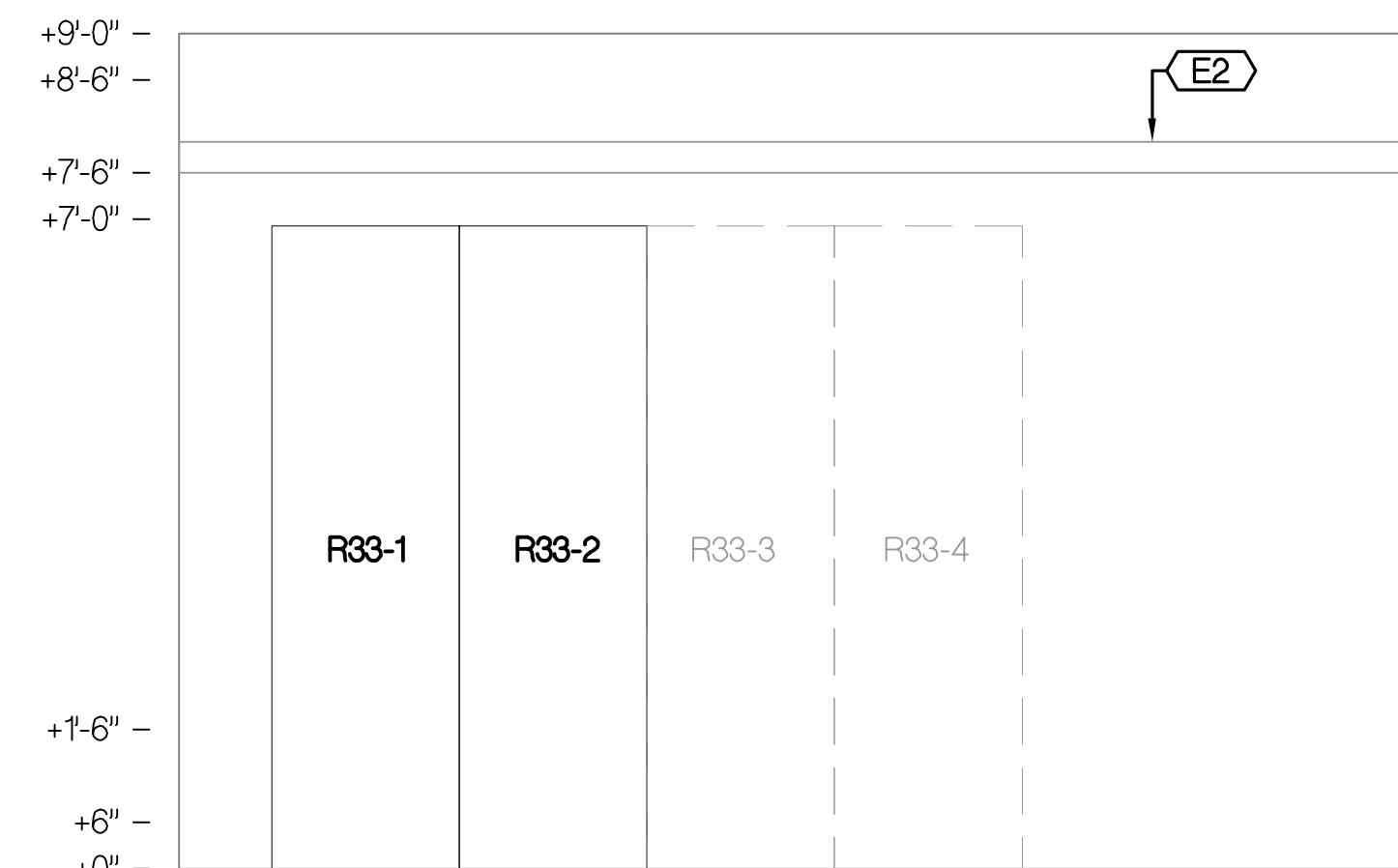
1 AV EQUIPMENT ROOM 1311 ENLARGED PLAN

1/2"=1'-0"

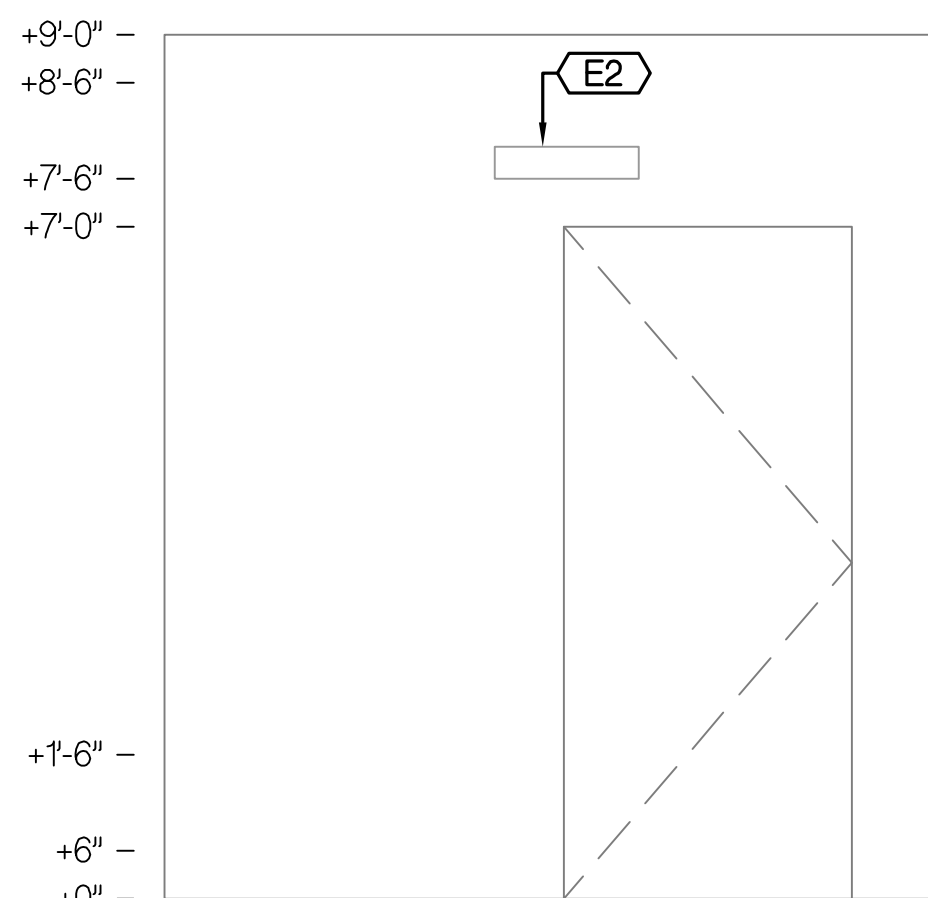


2 AV EQUIPMENT ROOM 1311 REFLECTED CEILING PLAN

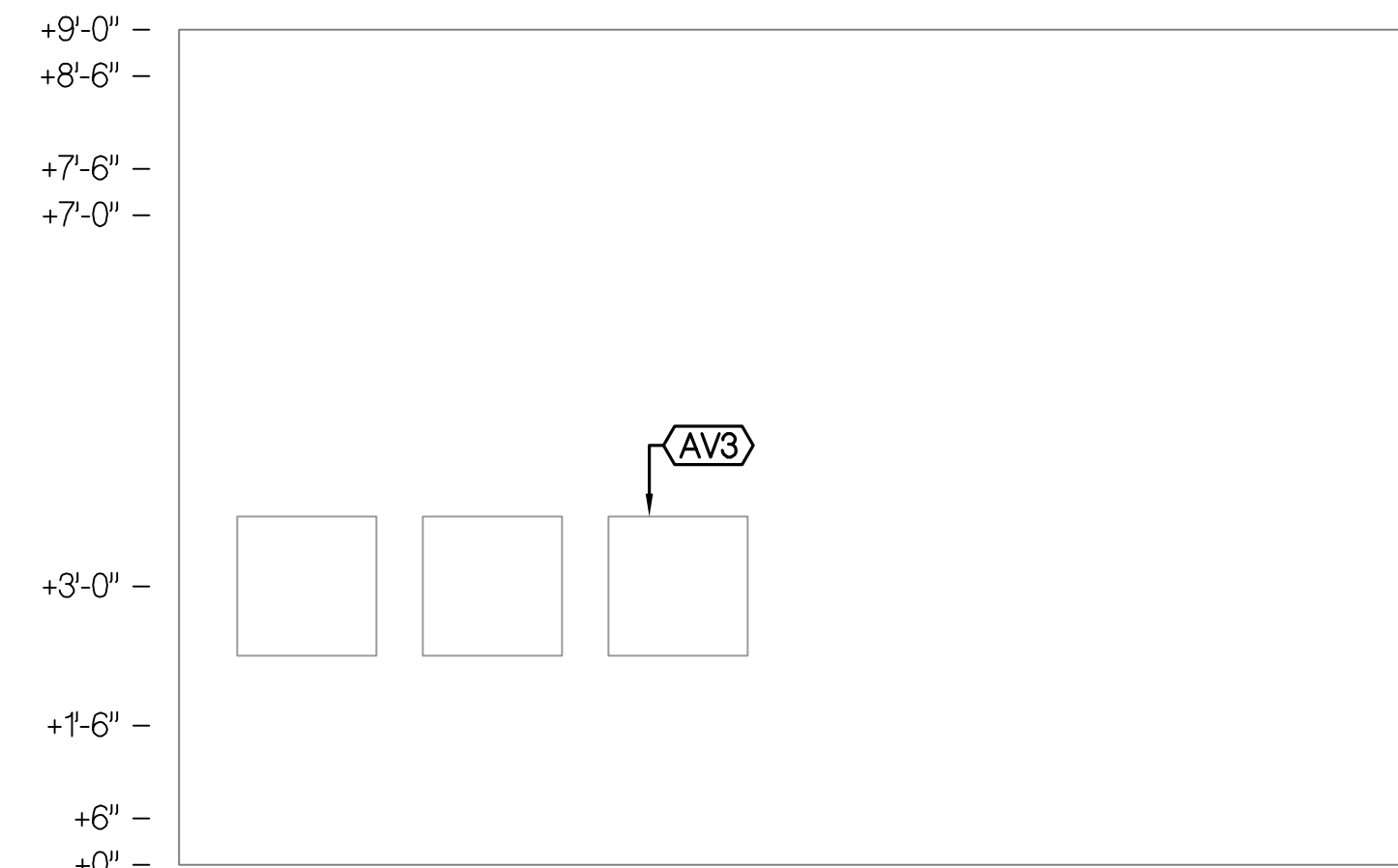
1/2"=1'-0"



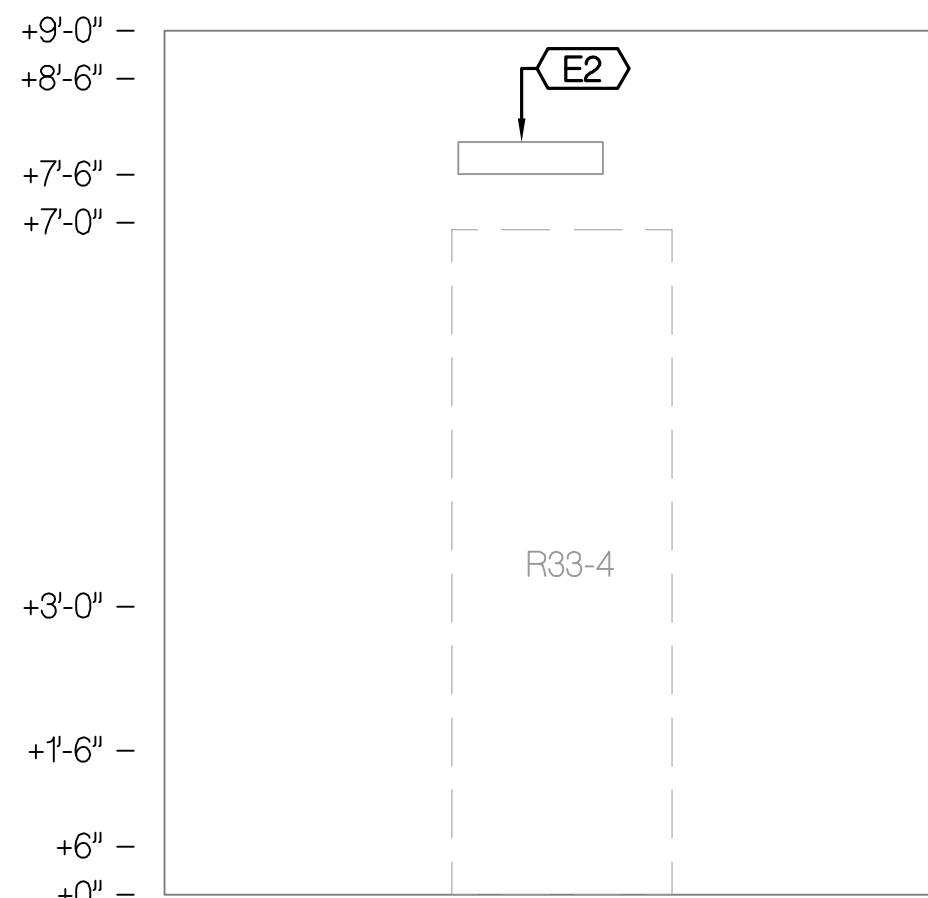
A NORTH



B EAST



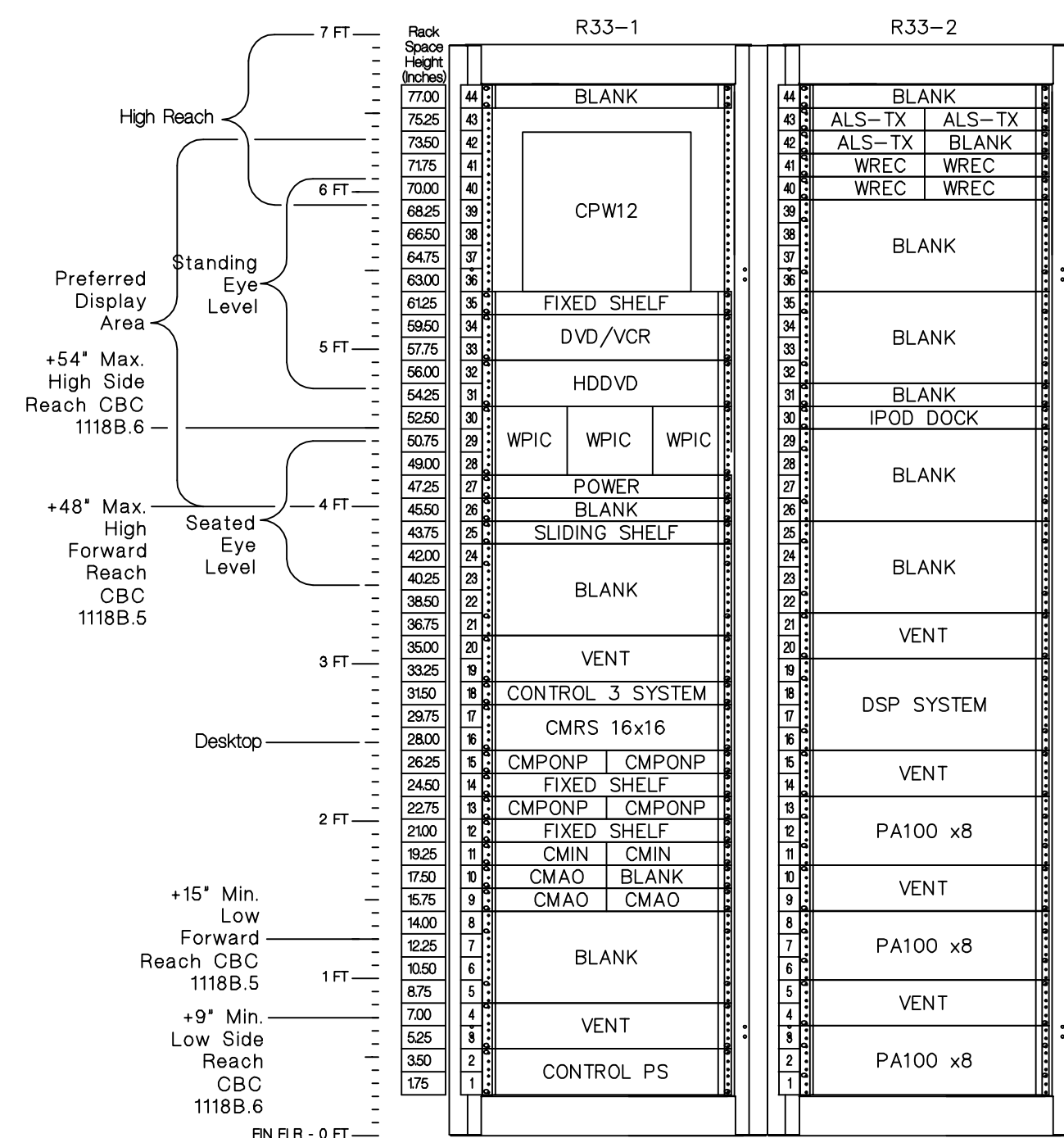
C SOUTH



D WEST

3 ELEVATION

1/2" = 1'-0"



4 RACK R33 ELEVATIONS

1" = 1'-0"

SHEET NOTE

1. WORK SHOWN IN LIGHT PEN IS EXISTING OR FUTURE. WORK SHOWN IN DARK PEN IS WORK OF THIS PROJECT.

KEYNOTES

AV AUDIOVISUAL SYSTEMS. COMPLY WITH DIV. 27.

AV1 4-POST AV EQUIPMENT RACK, R33.

AV2 FUTURE 4-POST AV EQUIPMENT RACK.

AV3 (E) AV SIGNAL TERMINAL CABINETS. AVT1 - MICROPHONE LEVEL, AVT2 LINE LEVEL AUDIO/VIDEO, AVT3 SPEAKER LEVEL.

E ELECTRICAL. COMPLY WITH DIVISION 16 - SEE ELECTRICAL DRAWINGS.

E1 (E) 2-20A CKTS PER RACK PROVIDED AT CABLE TRAY MTD ABOVE RACK.

E2 (E) 18X4 NEMA 12C CABLE TRAY MTD AT 7'-6" AFF.

KEY PLAN

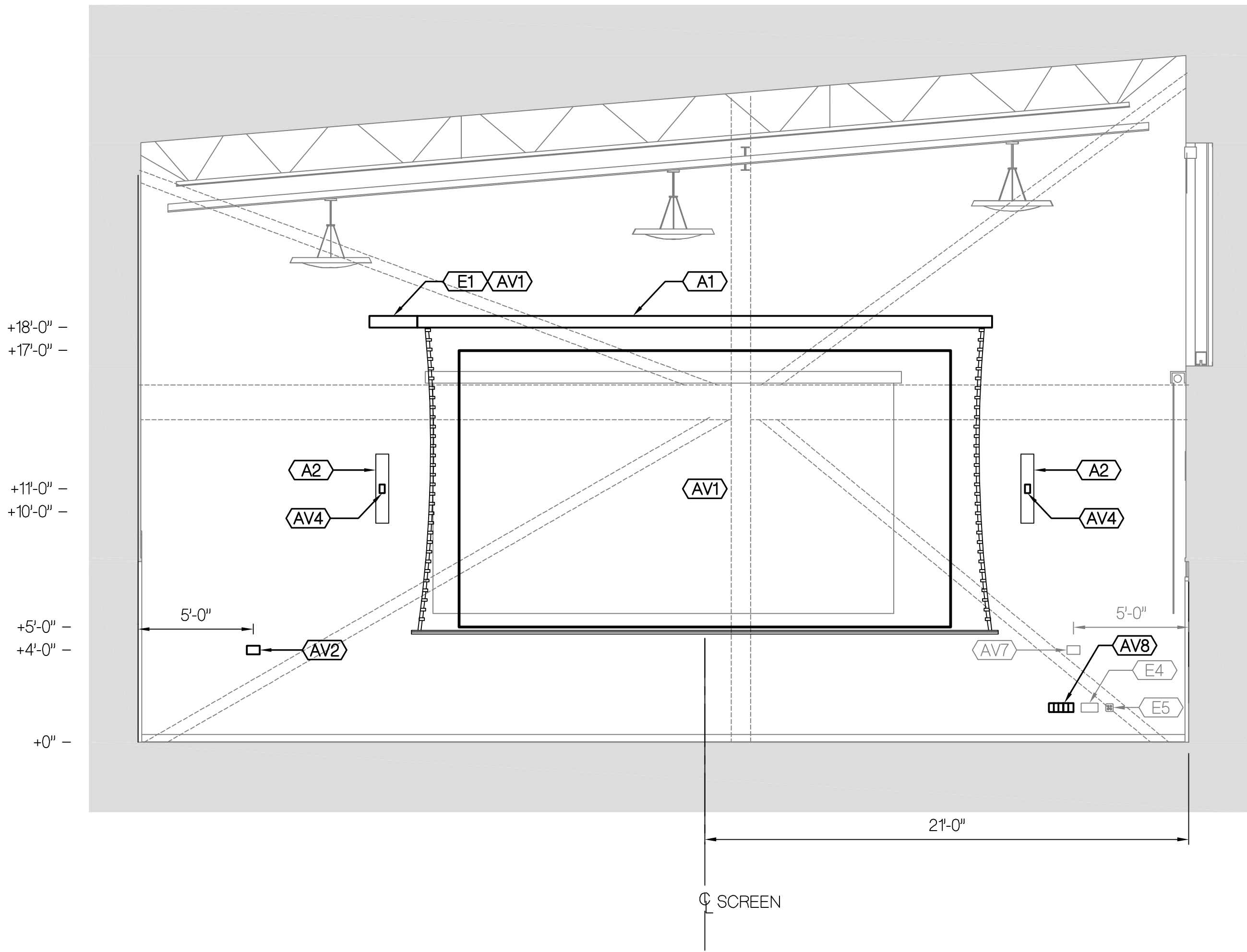
NO	REVISION DESCRIPTION	DATE

PROJECT
**UC DAVIS
GRADUATE SCHOOL OF
MANAGEMENT AND
CONFERENCE CENTER**

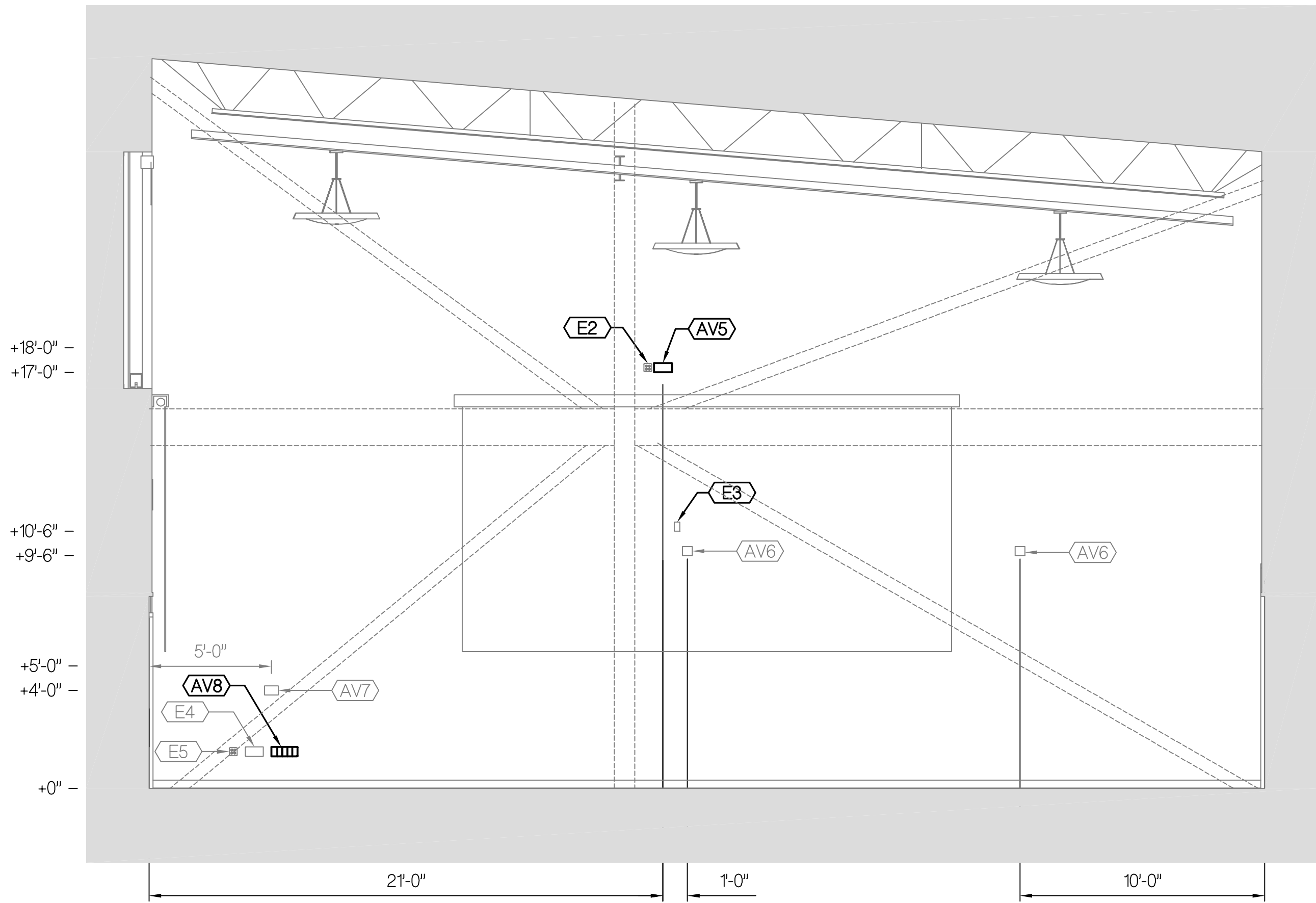
SHEET
**AV EQUIPMENT ROOM 1311
ENLARGED PLAN, RCP
AND ELEVATIONS**

SCALE AS NOTED FOR 30" x 42" SHEET

JOB NUMBER 2000466B	DRAWING
DRAWN BY IK, DB	AV4.05
DESIGNED BY PAM	
DATE 10/05/09	
SHEET	OF



A BALLROOM EAST ELEVATION
1/4"=1'-0"



B BALLROOM WEST ELEVATION
1/4"=1'-0"

1 BALLROOM ELEVATIONS
1/4"=1'-0"

SHEET NOTES

1. WORK SHOWN IN LIGHT PEN IS EXISTING OR FUTURE.
WORK SHOWN IN DARK PEN IS WORK OF THIS PROJECT.

KEYNOTES

- A ARCHITECTURAL: COMPLY WITH DIVISIONS 3 THROUGH 14 - SEE ARCHITECTURAL DRAWINGS.
- (A1) (E) BACKING WALL FOR SCREEN SUPPORT, ARCHITECTURAL COVER FOR SCREEN CASE, & ACCESSIBLE COVER FOR MOTOR COVER.
- (A2) (E) BACKING WALL FOR COLUMN LOUDSPEAKER WEIGHING UP TO 50 LBS WITH COG MTD 8 INCHES FROM WALL.

- E ELECTRICAL: COMPLY WITH DIVISION 16 - SEE ELECTRICAL DRAWINGS
- (E1) (E) HARD WIRED POWER CONNECTION TO SCREEN MOTOR. VERIFY MOTOR LOCATION IN FIELD. SCREEN OPERATION TO BE UNDER CONTROL OF FUTURE AV CONTROL SYSTEM.
- (E2) (E) QUAD 120V, 15A RECEPTACLE FOR FUTURE VIDEO PROJECTOR & SIGNAL PROCESSING MTD AT 17" AFF.
- (E3) (E) WORK AREA OUTLET WITH AT LEAST 1 DATA NAM FOR FUTURE MONITORING OF PROJECTOR STATUS MTD. AT 10'-6" AFF.
- (E4) (E) WORK AREA OUTLET WITH AT LEAST 4 DATA NAMS FOR USE AT PRESENTATION POSITION MTD AT +18" AFF.
- (E5) (E) QUAD 120V, 15A RECEPTACLE AT PRESENTATION POSITION, MTD AT +18" AFF.

- AV AUDIOVISUAL SYSTEMS COMPLY WITH DIVISION 27.

- (AV1) TAB-TENSIONED MOTORIZED ELECTRIC PROJECTION SCREEN - 169 VIEWING SURFACE 12'-0" H X 21'-4" W - SHC10 SURFACE MOUNT FLUSH TO WALL. PROVIDE AT LEAST 12" MINIMUM BLACK DROP TO PERMIT BOTTOM VIEWING EDGE OF SCREEN TO DROP TO 5'-0" ABOVE FINISHED FLOOR. PROVIDE LOW VOLTAGE CONTROL INTERFACE TO PERMIT CONTROL BY AV CONTROL SYSTEM.
- (AV2) (E) 3 GANG BACKBOX WITH 3 GANG RING WITH BLANK COVER PLATE FOR WALL MTD AV CTL PANEL CPB. MNT TOP OF BOX AT + 48" AFF.
- (AV3) NOT USED.
- (AV4) (E) 4S BACKBOX WITH 1 GANG RING MTD FLUSH IN WALL AT 11'-0" AFF FOR PROGRAM AUDIO LOUDSPEAKERS.
- (AV5) (E) 4 GANG BACKBOX WITH 4 GANG RING AND BLANK COVER PLATE MTD FLUSH IN WALL AT 17' FOR 16:9 FORMAT VIDEO PROJECTOR VPROJ1. PROVIDE PROJECTOR WALL MOUNT W/ LOAD CAPACITY OF 50 LBS. MIN. EQUAL TO PEERLESS PST SERIES.
- (AV6) FUTURE ROBOTIC PTZF CAMERA.
- (AV7) (E) 3 GANG BACKBOX WITH 3 GANG RING WITH BLANK COVER PLATE FOR FUTURE WALL MTD AV CTL PANEL CPB. MNT TOP OF BOX AT + 48" AFF.
- (AV8) (E) 6 GANG BACKBOX WITH 6 GANG RING AND BLANK COVER PLATE MTD FLUSH IN WALL AT 18" FOR MEDIA INPUT PANEL.

Smith, Fause & McDonald Inc.
Communications Engineering Group

351 8th Street
San Francisco, California 94103
(415) 255-9140 Fax: (415) 255-9180

KEY PLAN

NO	REVISION DESCRIPTION	DATE

PROJECT

UC DAVIS

GRADUATE SCHOOL OF

MANAGEMENT AND

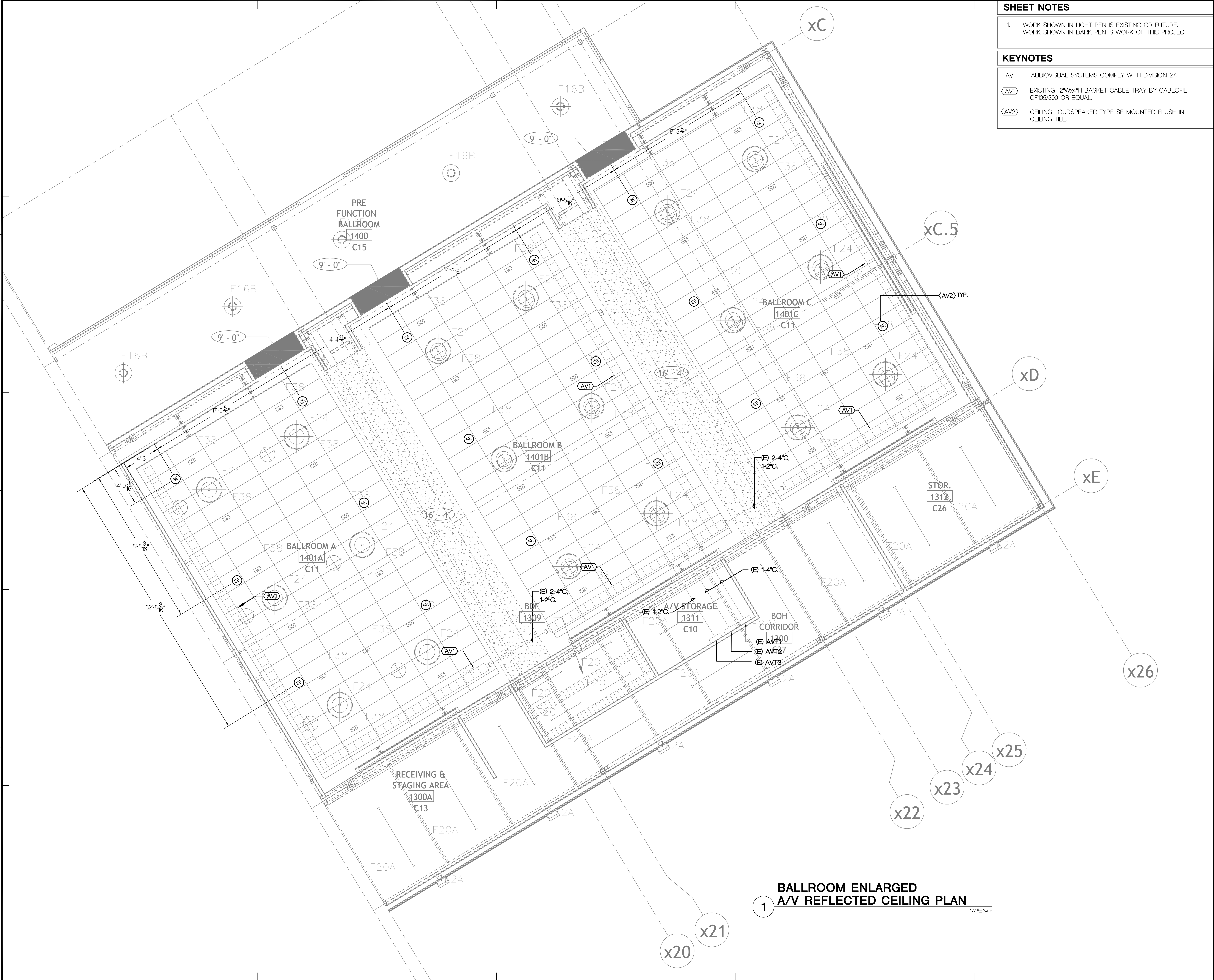
CONFERENCE CENTER

SHEET

BALLROOM WEST

AND EAST ELEVATIONS

SCALE AS NOTED		FOR 30" x 42" SHEET	
JOB NUMBER	2000466B	DRAWING	AV4.04
DRAWN BY	IK, DB	DESIGNED BY	PAM
DATE	10/05/09	SHEET	OF



SHEET NOTES

1. WORK SHOWN IN LIGHT PEN IS EXISTING OR FUTURE.
WORK SHOWN IN DARK PEN IS WORK OF THIS PROJECT.

KEYNOTES

- AV AUDIOVISUAL SYSTEMS COMPLY WITH DIVISION 27.
- (AV1) EXISTING 12"Wx4"H BASKET CABLE TRAY BY CABLOFIL CF105/300 OR EQUAL.
- (AV2) CEILING LOUDSPEAKER TYPE SE MOUNTED FLUSH IN CEILING TILE.

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KEY PLAN

NO	REVISION DESCRIPTION	DATE

PROJECT

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MANAGEMENT AND
CONFERENCE CENTER

SHEET

BALLROOM ENLARGED
AV REFLECTED CEILING PLAN

SCALE 1/4"=1'-0"	FOR 30" x 42" SHEET
JOB NUMBER 2000466B	DRAWING
DRAWN BY IK, DB	AV4.02
DESIGNED BY PAM	
DATE 10/05/09	SHEET OF

SHEET NOTES

- 1 WORK SHOWN IN LIGHT PEN IS EXISTING OR FUTURE.
WORK SHOWN IN DARK PEN IS WORK OF THIS PROJECT.

KEYNOTES

- A ARCHITECTURAL: COMPLY WITH DIVISIONS 3 THROUGH 14 - SEE ARCHITECTURAL DRAWINGS.
- (A1) (E) BACKING WALL FOR SCREEN SUPPORT. PROVIDE ARCHITECTURAL COVER FOR SCREEN CASE. PROVIDE ACCESSIBLE COVER FOR MOTOR COVER.
- (A2) (E) BACKING WALL FOR COLUMN LOUDSPEAKER WEIGHING UP TO 50 LBS WITH COG MTD 8 INCHES FROM WALL.
- (A3) (E) CARPET AT AV FLOOR BOXES TO ENSURE THAT CARPET IS CUT TO LIP OF ACCESS DOOR, AND THAT A CARPET INSERT IS PLACED IN THE BOX LID.
- E ELECTRICAL: COMPLY WITH DIVISION 16 - SEE ELECTRICAL DRAWINGS
- (E1) (E) DUPLEX POWER RECEPTACLE INTEGRATED WITH FPWB ROUGH-IN FOR FPNL22.
- (E2) (E) QUAD 120V, 15A RECEPTACLE FOR FUTURE VIDEO PROJECTOR & SIGNAL PROCESSING.
- (E3) (E) WORK AREA OUTLET WITH AT LEAST 1 DATA NAM FOR FUTURE MONITORING OF PROJECTOR STATUS.
- (E4) (E) WORK AREA OUTLET WITH AT LEAST 4 DATA NAMS FOR USE AT PRESENTATION POSITION MTD AT +18" AFF.
- (E5) (E) QUAD 120V, 15A RECEPTACLE AT PRESENTATION POSITION, MTD AT +18" AFF.
- (E6) (E) 2-20A CKTS PER RACK PROVIDED AT CABLE TRAY MTD ABOVE RACK.
- (E7) (E) 18X4 NEMA 12C CABLE TRAY MTD AT 7'-6" AFF
- (E8) NOT USED.
- (E9) (E) QUAD RECEPTACLE IN 2 GANG COMPARTMENT OF AV FLOORBOX.
- (E10) (E) QUAD RECEPTACLE IN 3 GANG COMPARTMENT OF AV FLOORBOX.
- AV AUDIOVISUAL SYSTEMS COMPLY WITH DIVISION 27.
- (AV1) TAB-TENSIONED MOTORIZED ELECTRIC PROJECTION SCREEN - 169 VIEWING SURFACE 12'-0" H X 21'-4" W - SHC10 SURFACE MOUNT FLUSH TO WALL. PROVIDE AT LEAST 12" MINIMUM BLACK DROP TO PERMIT BOTTOM VIEWING EDGE OF SCREEN TO DROP TO 5'-0" ABOVE FINISHED FLOOR. PROVIDE LOW VOLTAGE CONTROL INTERFACE TO PERMIT CONTROL BY AV CONTROL SYSTEM.
- (AV2) FUTURE TAB-TENSIONED MOTORIZED ELECTRIC PROJECTION SCREEN - 43 VIEWING SURFACE 9'-0" H X 12'-0" W SURFACE MOUNT FLUSH TO WALL.
- (AV3) TAB-TENSIONED MOTORIZED ELECTRIC PROJECTION SCREEN - 169 VIEWING SURFACE 118" H X 210" W - SHC8 SURFACE MOUNT FLUSH TO WALL. PROVIDE BLACK DROP TO PERMIT BOTTOM VIEWING EDGE OF SCREEN TO DROP TO 5'-0" ABOVE FINISHED FLOOR WITH SCREEN CASE CENTER LINE INSTALLED AT 15'-6" AFF. PROVIDE LOW VOLTAGE CONTROL INTERFACE TO PERMIT CONTROL BY AV CONTROL SYSTEM.
- (AV4) (E) 4S BACKBOX WITH 1 GANG RING MTD FLUSH IN WALL AT 11'-0" AFF FOR PROGRAM AUDIO LOUDSPEAKERS.
- (AV5) (E) 4 GANG BACKBOX WITH 4 GANG RING AND BLANK COVER PLATE MTD FLUSH IN WALL AT 17' FOR 169 FORMAT VIDEO PROJECTOR VPROJ1. PROVIDE PROJECTOR WALL MOUNT W/ LOAD CAPACITY OF 50 LBS. MIN. EQUAL TO PEERLESS PST SERIES.
- (AV6) FUTURE ROBOTIC PTZF CAMERA.
- (AV7) (E) 3 GANG BACKBOX WITH 3 GANG RING WITH BLANK COVER PLATE FOR FUTURE WALL MTD AV CTL PANEL CPB. MNT TOP OF BOX AT + 48" AFF.
- (AV8) (E) 6 GANG BACKBOX WITH 6 GANG RING AND BLANK COVER PLATE MTD FLUSH IN WALL AT 18" FOR MEDIA INPUT PANEL.
- (AV9) (E) AV SIGNAL TERMINAL CABINETS. AVT1 - MICROPHONE LEVEL, AVT2 LINE LEVEL AUDIO/VIDEO, AVT3 SPEAKER LEVEL.
- (AV10) (E) 4 GANG BACKBOX WITH 4 GANG RING AND BLANK COVER PLATE MTD FLUSH IN WALL AT 14'-6" FOR FUTURE VIDEO PROJECTORS.
- (AV11) (E) 4S BACKBOX WITH 2 GANG RING MTD FLUSH IN WALL AT 13'-6" AFF IN ROOMS 170 AND 174, AT 14'-4" AFF AT ROOM 172 FOR FUTURE ROBOTIC PTZF CAMERA. PROVIDE BLANK COVER PLATE. PROVIDE 1-1/4" C. UP TO ACCESSIBLE CEILING SPACE FOR FUTURE CAMERA WIRING. CENTER UNDER AV10 PLATE.
- (AV12) (E) 3 GANG BACKBOX WITH 3 GANG RING WITH BLANK COVER PLATE FOR WALL MTD AV CTL PANEL CPB. MNT TOP OF BOX AT + 48" AFF.
- (AV13) (E) 6 GANG BACKBOX WITH 6 GANG RING AND BLANK COVER PLATE MTD FLUSH IN WALL AT 18" FOR MEDIA INPUT PANEL.
- (AV14) INSTALL OLD 3 GANG WORKBOX W/3 GANG RING FOR AV CTL PANEL CPB.
- (AV15) (E) AV FLOORBOX - FSR FL500P, 6" DEPTH, WITH FSR POURPAN PROTECTION FOR SLAB ON GRADE INSTALLATION CONDITION.
- (AV16) (E) AV FLOORBOX - FSR FL600P, 6" DEPTH, WITH FSR POURPAN PROTECTION FOR SLAB ON GRADE INSTALLATION CONDITION.
- (AV17) (E) 4 GANG BACKBOX WITH 4 GANG RING AND BLANK COVER PLATE MTD FLUSH IN WALL AT 14'-6" FOR VIDEO PROJECTORS VPROJ2. PROVIDE PROJECTOR WALL MOUNT W/ LOAD CAPACITY OF 50 LBS. MIN. EQUAL TO PEERLESS PST SERIES.
- (AV18) PROVIDE BLANK COVER PLATE(S).
- (AV19) TILT LOUDSPEAKERS 15 DEGREES DOWN FROM HORIZONTAL.
- (AV20) TILT LOUDSPEAKERS 20 DEGREES DOWN FROM HORIZONTAL.

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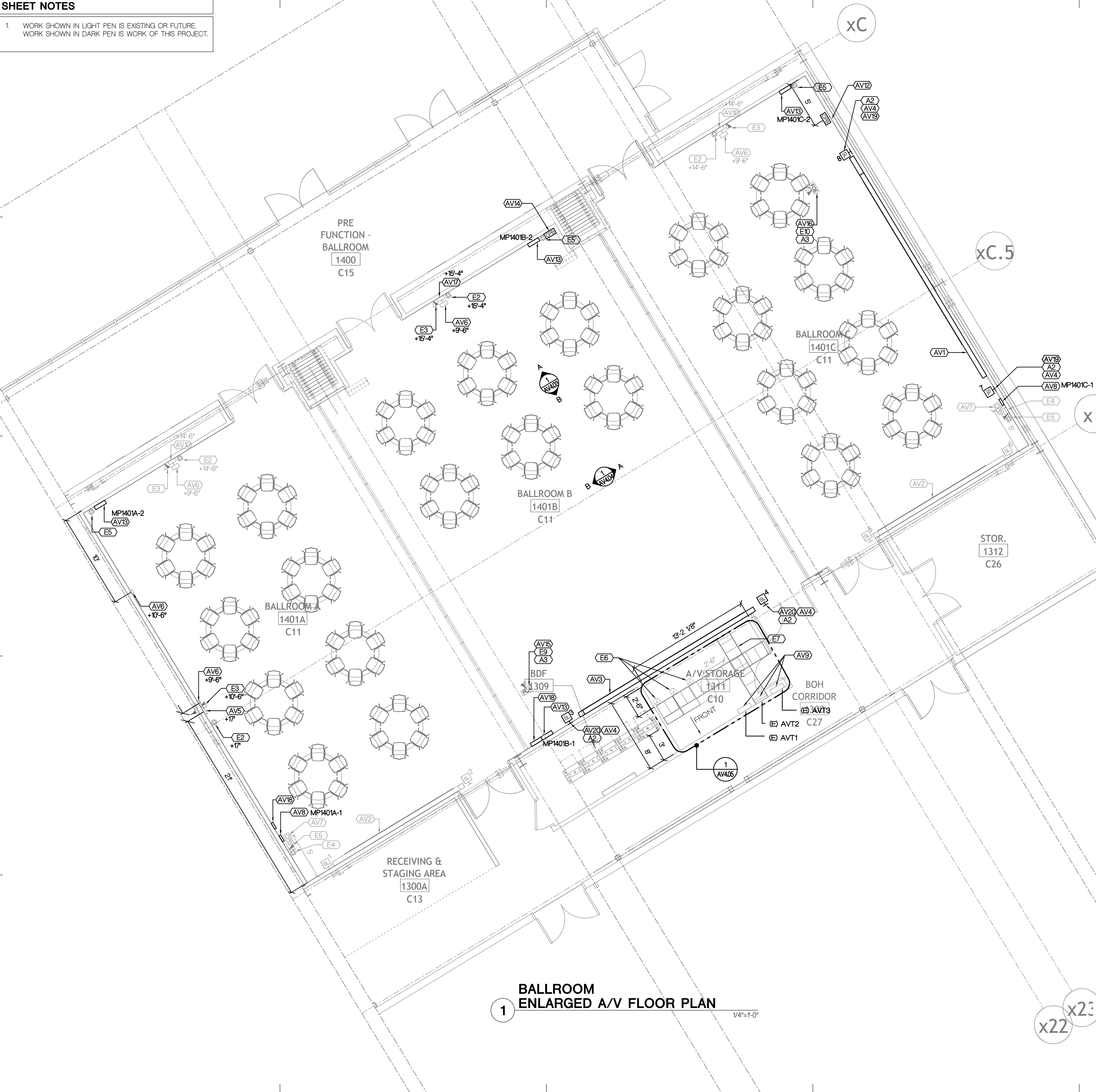
KEY PLAN

NO	REVISION DESCRIPTION	DATE

PROJECT

UC DAVIS
GRADUATE SCHOOL OF
MANAGEMENT AND
CONFERENCE CENTER

SHEET	
BALLROOM ENLARGED AV FLOOR PLAN	
SCALE 1/4"=1'-0"	FOR 30" x 42" SHEET
JOB NUMBER 2000466B	DRAWING
DRAWN BY IK, DB	AV4.01
DESIGNED BY PAM	
DATE 10/05/09	
SHEET	OF



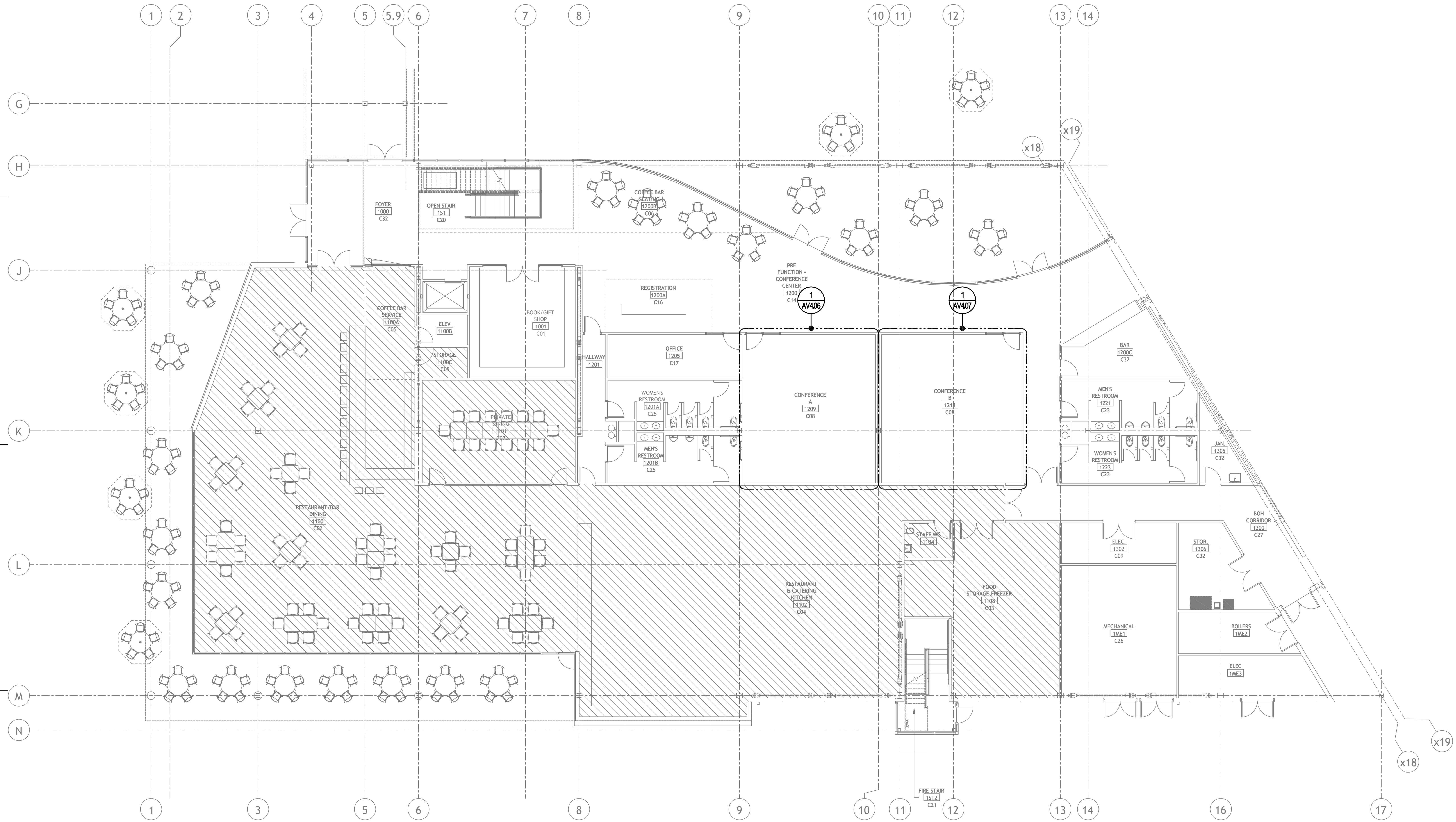
KEYNOTES

AV AUDIOVISUAL SYSTEM: COMPLY WITH DIVISION 27.

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1 FIRST FLOOR A/V PLAN
1/8"=1'-0" NORTH

KEY PLAN

NO	REVISION DESCRIPTION	DATE

PROJECT
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GRADUATE SCHOOL OF
MANAGEMENT AND
CONFERENCE CENTER

SHEET
FIRST FLOOR AV PLAN

SCALE 1/8"=1'-0" FOR 30" x 42" SHEET

JOB NUMBER
2000466B

DRAWN BY
IK, DB

DESIGNED BY
PAM

DATE
10/05/09

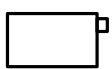
DRAWING

AV2.01

SHEET OF



SYMBOL SCHEDULE

SYMBOL	DEVICE	FUNCTION OR SERVICE	LOCATION	WORK OF	ELEVATION	CABLE FILL & HOMERUN DESTINATION, U.O.N.	FINISH	WEIGHT, LB	DETAIL SHEET(S)
	ANTENNA, AV TRANSMIT	ASSISTIVE LISTENING	ABOVE CEILING	27 41 16	ABOVE CEILING	PER FUNCTIONAL		3	
	CONTROL PANEL, WALL MOUNTED, WIRED, WITH TOUCHPANEL AND 10 CONTROL BUTTONS MIN.	AUDIO VISUAL	INDICATED	27 41 16	INDICATED	1 AV CONTROL	WHITE	3	
	CONTROL PANEL, WALL MOUNTED, WIRED, WITH 12 CONTROL BUTTONS MIN.	AUDIO VISUAL	INDICATED	27 41 16	INDICATED	1 AV CONTROL	WHITE	3	
	A/V MEDIA PANEL	AUDIO VISUAL	WALL	27 41 16	INDICATED	PER FUNCTIONAL			
	FULL HEIGHT RACK, STAND ALONE, ZONE 4 RATED	AUDIO VISUAL	FLOOR	27 41 08			BLACK	500	
	LOUDSPEAKER, HIGH OUTPUT, NARROW BEAMWIDTH, CEILING	AUDIO VISUAL	CEILING	27 41 16	CEILING	PER FUNCTIONAL AND AS NOTED	WHITE	10	
	LOUDSPEAKER, WALL, LINE ARRAY	AUDIO VISUAL	WALL	27 41 16	INDICATED	PER FUNCTIONAL AND AS NOTED	WHITE	10	
	LOUDSPEAKER, TWO-WAY	AUDIO VISUAL	WALL	27 41 16	INDICATED	PER FUNCTIONAL AND AS NOTED	WHITE	25	
	VIDEO PROJECTOR, FIXED CEILING MOUNT OR SHELF MOUNTED - REFER TO ENLARGED PLANS	AUDIO VISUAL	INDICATED	27 41 16	INDICATED	PER FUNCTIONAL AND AS NOTED		20	
	ANTENNA, AV TRANSMIT	WIRELESS MICROPHONE	ABOVE CEILING	27 41 16	ABOVE CEILING	PER FUNCTIONAL		3	

KEY PLAN

[illegible]

PROJECT

UC DAVIS

GRADUATE SCHOOL OF
MANAGEMENT AND
CONFERENCE CENTER

SHEET

SYMBOL SCHEDULE

SCALE NONE FOR 30" x 42" SHEET

JOB NUMBER 2000466B	DRAWING AV0.02 SHEET OF
DRAWN BY IK, DB	
DESIGNED BY PAM	
DATE 10/05/09	

ISR-1	SINGLE CHAMBER SURFACE RACEWAY
3SR-25	THREE CHAMBER SURFACE RACEWAY
A.D.A.	AMERICANS WITH DISABILITIES ACT
ADF	AREA DISTRIBUTION FACILITY
A.F.C.	ABOVE FINISHED CEILING
A.F.F.	ABOVE FINISHED FLOOR
ALT	ALTERNATE
AM.F.F.	ABOVE MEZZANINE FINISHED FLOOR
BDF	BUILDING DISTRIBUTION FACILITY
B.F.C.	BELOW FINISHED CEILING
BLDG	BUILDING
B.O.H.	BACK OF HOUSE
C.	CONDUIT
CAT.	CATEGORY
CBC	CALIFORNIA BUILDING CODE
CEC	CALIFORNIA ELECTRICAL CODE
COMM.	COMMUNICATIONS
CL	CENTERLINE
C.O.	CONDUIT ONLY
CONT.	CONTINUATION
CS	COMMUNICATIONS SYSTEM
(D)	DEMOLISH EXISTING
DED	DUCTIVE
ø, DIA.	DIAMETER
DIV	DIVISION
(E)	EXISTING
EA	EACH
EIA	ELECTRONIC INDUSTRIES ASSOCIATION
ELEV.	ELEVATION
E.O.L.	END OF LINE
EQPT.	EQUIPMENT
FIN	FINISHED
FUT	FUTURE
HR.	HOME RUN
HT.	HEIGHT
J, JBOX	JUNCTION BOX
LAN	LOCAL AREA NETWORK
MATV	MASTER ANTENNA TELEVISION
MAX.	MAXIMUM
MIN.	MINIMUM
MOD.	MODULAR
MON.	MONUMENT
(N)	NEW
NEC	NATIONAL ELECTRICAL CODE
N.I.C.	NOT IN CONTRACT
NTS	NOT TO SCALE
O.C.	ON CENTER
O.D.	OUTSIDE DIAMETER
O.F.E.	OWNER FURNISHED EQUIPMENT
OPP.	OPPOSITE
PNL	PANEL
PROJ.	PROJECT
PSRH	PROJECT STANDARD RECEPTACLE HEIGHT +18" AFF, U.O.N.
P.S.S.H.	PROJECT STANDARD SWITCH HEIGHT +42" AFF TO <u>C</u> , U.O.N.
ROP	REFLECTED CEILING PLAN
RE	REFER TO
REF.	REFERENCE
SIM	SIMILAR
SM	SINGLE MODE OPTICAL FIBER
SN	SHEET NOTE
SP	SHIELDED PAIR - SEE SPECIFICATIONS
SPEC	SPECIFICATION
SR.	SURFACE RACEWAY
STD	STANDARD
STP	SHIELDED TWISTED PAIR
T.C.	TELECOMMUNICATIONS CLOSET
TEL	TELEPHONE
TELCOM	TELECOMMUNICATIONS
TIA	TELECOMMUNICATIONS INDUSTRY ASSOCIATION
T-OPD	TELEPHONE CABLE, OUTSIDE PLANT, DUCTWAY
TP	TWISTED PAIR
TYP.	TYPICAL
U.O.N.	UNLESS OTHERWISE NOTED
W/	WITH
WP	WEATHERPROOF

ROOM KEY
ROOM NAME
ROOM NUMBER

WALL TYPE SYMBOL
TYPE NUMBER
HOUR RATING OF WALL

DRAWING NUMBER
SHEET NUMBER

BLDG. SECTION KEY
DRAWING NUMBER
SHEET NUMBER

WALL SECTION KEY
DRAWING NUMBER
SHEET NUMBER

ELEVATION KEY
DRAWING NUMBER
SHEET NUMBER

WINDOW KEY
TYPE NUMBER

DOOR KEY
DOOR NUMBER

EQUIPMENT KEY
EQUIPMENT NUMBER

KEY NOTE SYMBOL
KEY NOTE NUMBER

DETAIL SYMBOL
DRAWING NUMBER
SHEET NUMBER

CEILING/FLOOR & CEILING/ROOF KEY
TYPE NUMBER

SIGNAGE KEY
SIGNAGE TYPE

NORTH ARROW

COLUMN GRID
GRID LINES

BUILDING LABEL

DRAWING MATCH LINE

REVISION SYMBOL
REVISION NUMBER

ELEVATION REFERENCE

REFER TO SPECIFICATIONS FOR COMPLETE REQUIREMENTS.

PROVIDE RACEWAY, BOXES AND FITTINGS SHOWN ON A/V SYSTEMS (AV) DRAWINGS UNDER THE WORK OF SECTION 27. CONDUITS AND RACKBOXES FOR AUDIO VISUAL SYSTEMS. UNLESS OTHERWISE INDICATED, PROVIDE 1 INCH TRADE SIZE MINIMUM . PROVIDE RACEWAY SIZE AS REQUIRED FOR A MAXIMUM OF 40 PERCENT WIRE FILL.

PROVIDE FIRESTOPPING UNDER THE WORK OF DIVISION 27.

LOCATIONS SHOWN ON THE ARCHITECTURAL DRAWINGS TAKE PRECEDENCE OVER LOCATIONS SHOWN ON THE COMMUNICATIONS SYSTEMS DRAWINGS.

DEVICE QUANTITIES SHOWN ON FLOOR PLANS AND REFLECTED CEILING PLANS TAKE PRECEDENCE OVER DEVICE QUANTITIES SHOWN ON FUNCTIONAL DIAGRAMS.

QUANTITIES SHOWN ON FUNCTIONAL DIAGRAMS TAKE PRECEDENCE OVER QUANTITIES SHOWN ON RACK ELEVATIONS.

QUANTITIES SHOWN ON DEVICE SCHEDULES TAKE PRECEDENCE OVER QUANTITIES SHOWN ON FUNCTIONAL DIAGRAMS, FLOOR PLANS AND REFLECTED CEILING PLANS.

LOCATIONS SHOWN ON LARGE SCALE DRAWINGS TAKE PRECEDENCE OVER LOCATIONS SHOWN ON SMALL SCALE DRAWINGS.

WHERE A/V SYSTEMS WIRING IS INDICATED BUT RACEWAY IS NOT INDICATED, PROVIDE SUCH WIRING SUPPORTED BY ABOVE CEILING J-HOOKS. LOCATE SUCH J-HOOKS IN LOCATIONS THAT ARE ACCESSIBLE AS DEFINED IN THE CALIFORNIA ELECTRICAL CODE.

 WIRE/OR RACEWAY CONCEALED IN WALLS OR IN CEILING .
 PROVIDE RACEWAY PER WIRING NOTES.
 WIRING IN UNDERGROUND CONDUIT.
 WIRE OR/RACEWAY TURNS UP
 WIRE OR/RACEWAY TURNS DOWN
 HOME RUN
 ACJ → CONDUIT TO CABLE TRANSITION POINT
 ACJ → CABLES WITHOUT CONDUIT ABOVE SUSPENDED CEILING, SUPPORTED BY J-HOOKS AT 4'-0" O.C. MINIMAL.
 CABLETRAY
 701 WIRING NOTES. NOTES ARE UNIQUE TO EACH DRAWING SHEET.
 AV1 SHEET NOTES. NOTES ARE UNIQUE TO EACH DRAWING SHEET.
 J 4S JUNCTION BOX WITH BLANK FACE PLATE.

COMPLY WITH CBC 1104B.2 ASSISTIVE-LISTENING SYSTEMS IN ASSEMBLY AREAS.			
PROVIDE COMPLETE ASSISTIVE-LISTENING SYSTEMS UNDER THE WORK OF SECTION 27 41 16			
NUMBER OF PERSONAL RECEIVERS REQUIRED UNDER THE WORK OF SECTION 27 41 16:			
ROOM NO.	ROOM NAME		SEATS
1401A	BALLROOM A		175
1401B	BALLROOM B		222
1401C	BALLROOM C		175
TOTAL SEATS AT ASSEMBLY SPACE WITH INSTALLED SOUND SYSTEMS:			572
PROVIDE NUMBER OF RECEIVERS EQUAL TO 4 PERCENT, BUT IN NO CASE LESS THAN TWO.			
PROVIDE QUANTITY OF RECEIVERS:			23
TYPE OF LISTENING SYSTEM: FREQUENCY-MODULATED RADIO.			
LOCATION: FOR USE ANYWHERE WITHIN THE ASSEMBLY AREAS.			
SIGNAGE: PROVIDE UNDER WORK OF SECTION 10425 SIGNS.			

Sheet	Drawing Number	Description
1	AV001	GENERAL NOTES & LEGEND
2	AV002	SYMBOL SCHEDULE
3	AV201	FIRST FLOOR AV PLAN
4	AV401	BALLROOM ENLARGED AV FLOOR PLAN
5	AV402	BALLROOM ENLARGED AV REFLECTED CEILING PLAN
6	AV403	BALLROOM NORTH AND SOUTH ELEVATIONS
7	AV404	BALLROOM EAST AND WEST ELEVATIONS
8	AV405	AV EQUIPMENT ROOM 1311 ENLARGED PLAN, RCP AND ELEVATIONS
9	AV406	CONFERENCE ROOM A 1209 ENLARGED PLAN, RCP AND ELEVATIONS
10	AV407	CONFERENCE ROOM B 1213 ENLARGED PLAN, RCP AND ELEVATIONS
11	AV701	BALLROOM AUDIO & CONTROL SYSTEMS SINGLE LINE DIAGRAM
12	AV702	BALLROOM CENTER VIDEO SYSTEMS SINGLE LINE DIAGRAM
13	AV703	CONFERENCE ROOMS AUDIO/VISUAL SYSTEMS SINGLE LINE DIAGRAM
14	AV901	DETAILS - RACK R33
15	AV902	DETAILS - AUDIO-VISUAL SYSTEMS
16	AV903	DETAILS - A/V PROJECTOR AND SCREEN MOUNTING
17	AV904	DETAILS - FIRESTOPPING

Loudspeaker type (See Plans and Specifications)

SHB4 X2 ← Loudspeaker quantity
1 & 2 3.7W TAP ← 70V power tap

Loudspeaker reference number

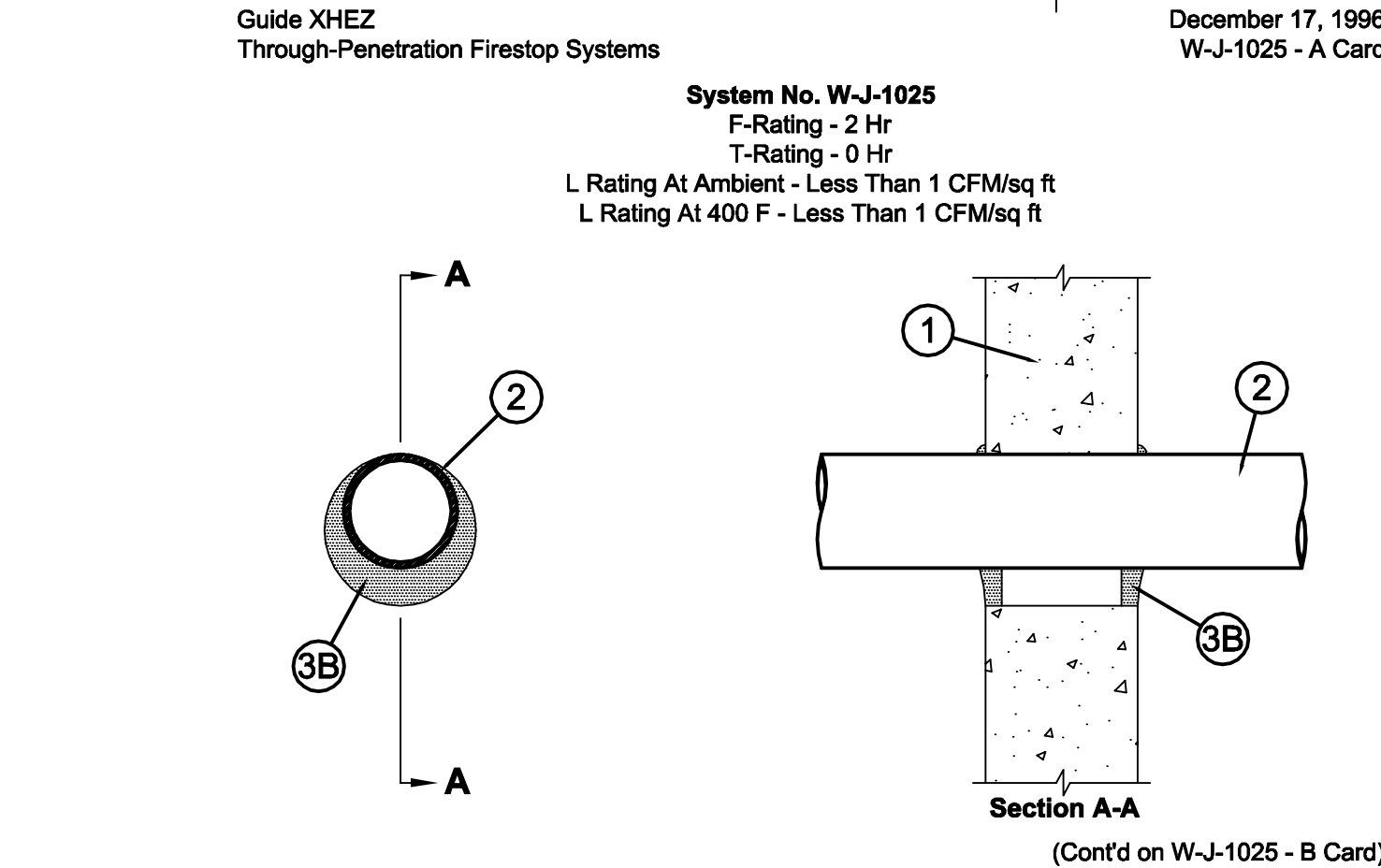
BM	TRANSFORMER BALANCED, LINE INPUT MODULE, PRIORITY MUTE GENERATING	RR	REPEAT RELAY
VM	TRANSFORMER BALANCED, MIC INPUT MODULE, PRIORITY MUTE GENERATING	XF — XM	XLR CONNECTOR, 3 PIN, FEMALE; MALE
VB	TRANSFORMER BALANCED, LINE INPUT MODULE, PRIORITY MUTE RECEIVING, ADJUSTABLE MUTE LEVEL	4F — 4M	XLR CONNECTOR, 4 PIN, FEMALE; MALE
K	RELAY COIL	ASF — ASM	AUDIO SPEAKER CONNECTOR, FEMALE; MALE
VC-R	70 WATT PRIORITY ATTENUATOR, RACK MOUNTED	B	BNC CONNECTOR, 75 OHMS IMPEDANCE
	PUSH BUTTON SWITCH	D	DIN CONNECTOR, MIDI STANDARD
	MOMENTARY PUSH BUTTON SWITCH	P	1/4" PHONE CONNECTOR
	SWITCH		TRIPLE FIVE WAY BINDING POSTS
	SWITCH		TYPE "P" CONNECTOR
	NORMALLY OPEN CONTACT		RESISTIVE TERMINATION AT CIRCUIT CHARACTERISTIC IMPEDANCE
	NORMALLY CLOSED CONTACT		WIRING CONTINUES AS INDICATED
			WIRING HOME RUN AS INDICATED
			FLY-ON OR FLY-OFF POINT
			TUBULAR CLAMP BARRIER BLOCK, SWITCH BLOCK SECTION QUANTITY AS REQUIRED BY CIRCUIT
		SVM — SVF	S-VIDEO CONNECTOR, MALE; FEMALE
		RF — RFM	TYPE RCA AUDIO OR VIDEO CONNECTOR, FEMALE; MALE
			SCREW TERMINAL
		MF — MM	TRS MINI STEREO AUDIO CONNECTOR, FEMALE; MALE

NOTES:

X — DENOTES SEQUENCE NUMBER

[illegible]

SHEET	
GENERAL NOTES AND ABBREVIATIONS	
SCALE AS NOTED	FOR 30" x 42" SHEET
JOB NUMBER 2000466B	DRAWING AV0.01
DRAWN BY JK, DB	
DESIGNED BY PAM	
DATE 0/05/09	
	SHEET OF

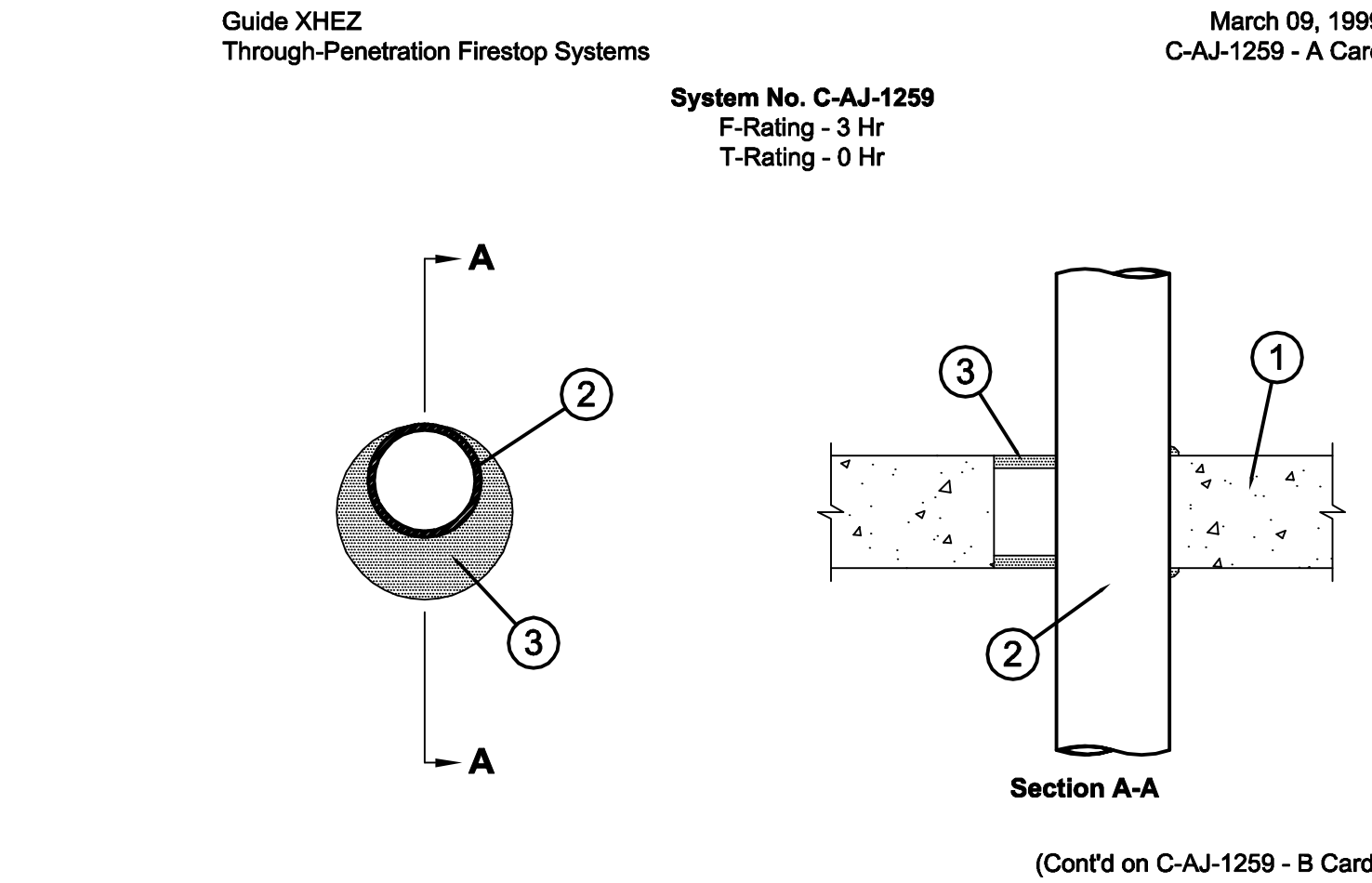


Guide XHEZ (W-J-1025 - B Card)
Through-Penetration Firestop Systems (Cont'd from W-J-1025 - A Card)

System No. W-J-1025
December 17, 1996
F Rating - 2 Hr
T Rating - 0 Hr
L Rating At Ambient - Less Than 1 CFM/sq ft
L Rating At 400 F - Less Than 1 CFM/sq ft

- Wall Assembly - Min 6 in. thick reinforced lightweight or normal weight (100-150 pcf) concrete. Wall may also be constructed of any UL Classified Concrete Blocks*. Max diam of opening is 6 in.
See Concrete Blocks (CAZT) category in the Fire Resistance Directory for names of manufacturers.
- Through Penetrants - One metallic pipe, conduit or tubing to be installed either concentrically or eccentrically within the firestop system. The annular space within the firestop system is dependent upon the type of through penetrant, use of the packing material, and type and thickness of fill materials as tabulated in Item 3B. Pipe, conduit or tubing to be rigidly supported on both sides of floor or wall assembly. The following types and sizes of metallic pipes, conduits or tubing may be used:
A. Steel Pipe - Nom 4 in. diam (or smaller) Schedule 10 (or heavier) steel pipe.
B. Iron Pipe - Nom 4 in. diam (or smaller) cast or ductile iron pipe.
C. Conduit - Nom 4 in. diam (or smaller) steel electrical metallic tubing or rigid steel conduit.
D. Copper Tubing - Nom 4 in. diam (or smaller) Type L (or heavier) copper tubing.
E. Copper Pipe - Nom 4 in. diam (or smaller) Regular (or heavier) copper pipe.
- Firestop System - The firestop system shall consist of the following:
A. Packing Material - Pipe and Equipment Covering Materials* - Nom 1 in. thick by min 2-1/2 in. long hollow cylindrical heavy density (min 3.5 pcf) unfaced glass fiber units wrapped around pipe and secured together by means of No. 24 AWG steel tie wire on both sides of the wall. Packing material shall be recessed from both surfaces of wall as required to accommodate the required thickness of fill material. The use of packing material within the firestop system is dependent upon the type of through penetrant and type and thickness of fill material within the firestop system used as tabulated in Item 3B.
See Pipe and Equipment Covering - Materials (BRGU) - category in the Building Materials Directory for names of manufacturers. Any pipe covering material meeting the above specification and bearing the UL Classification Marking with a Flame Spread Index of 25 or less and a Smoke Developed Index of 50 or less may be used.
B. Fill, Void or Cavity Material* - Caulk or Putty - Fill material applied within the annulus, on both surfaces of wall. Additional fill material to be installed such that a min 1/4 in. crown is formed around the through penetrant. At the point contact location between through penetrant and concrete, a min 3/8 in. diam bead of fill material shall be applied at the concrete/through penetrant interface on both surfaces of wall. The type and thickness of fill material is dependent upon the type of through penetrant, annular within the firestop system and use of packing material within the firestop system as tabulated below:

TYPE OF THROUGH PENETRANT	NOM ANNULAR SPACE IN.	MIN. MAX. ANNULAR IN.	USE OF PACKING MTL.	TYPE OF MTL.	MIN THKNS OF FILL MTL IN.
STEEL OR IRON PIPE	---	0, 1-1/2	OPTIONAL	SEALANT	5/8
STEEL OR IRON PIPE	3/4	---	REQUIRED	PUTTY	3/4
STEEL CONDUIT OR TUBING	---	0, 1-1/2	OPTIONAL	SEALANT	5/8



Guide XHEZ (C-AJ-1259 - B Card)
Through-Penetration Firestop Systems (Cont'd from C-AJ-1259 - A Card)

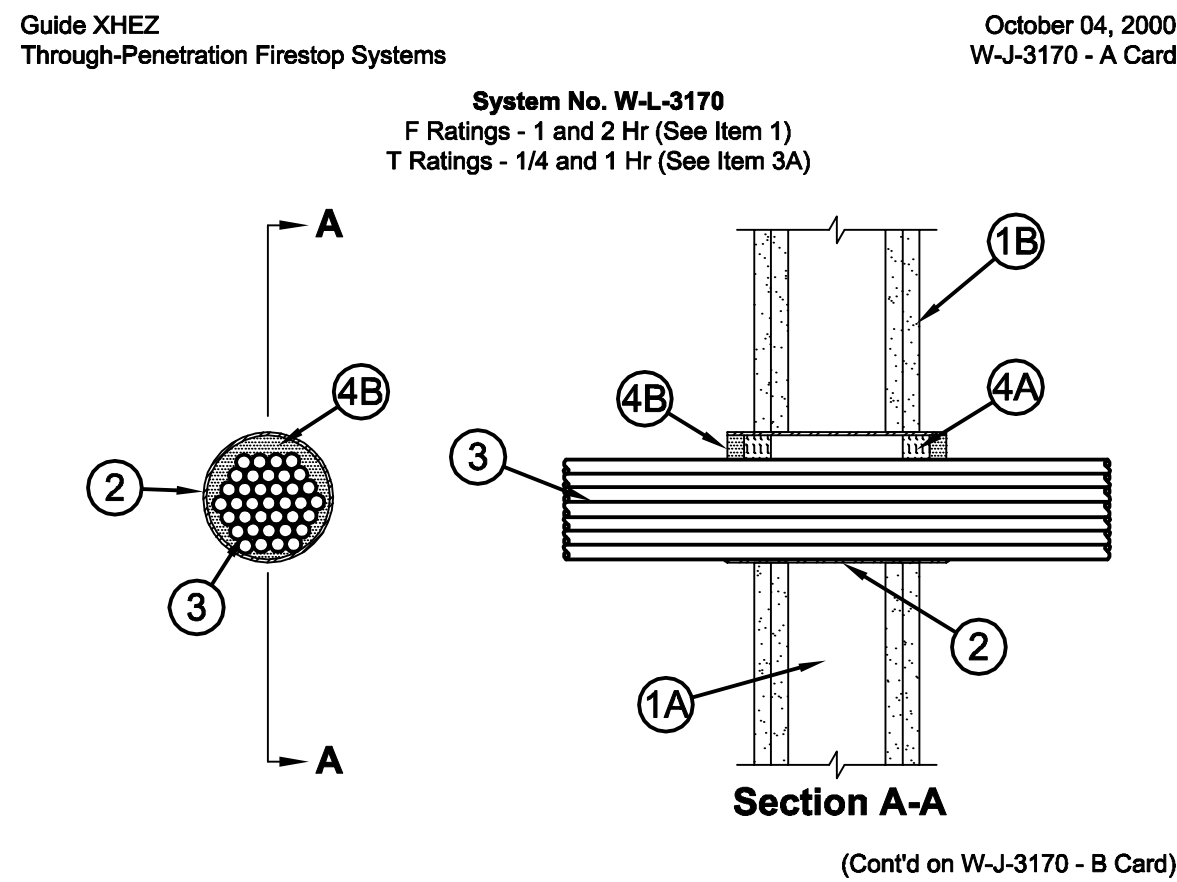
System No. C-AJ-1259
March 09, 1999
F Rating - 3 Hr
T Rating - 0 Hr

- Floor or Wall Assembly - Min 4-1/2 in. thick reinforced lightweight or normal weight (100-150 pcf) concrete. Floor may also be constructed of any min 6 in. thick UL Classified hollow-core Precast Concrete Units*. Wall may also be constructed of any UL Classified Concrete Blocks*. Max diam of opening is 7 in.
See Concrete Blocks (CAZT) and Precast Concrete Units (CFTV) categories in the Fire Resistance Directory for names of manufacturers.
- Through Penetrants - One metallic pipe, conduit or tubing to be installed either concentrically or eccentrically within the firestop system. The annular space between the pipe, conduit or tubing and the periphery of the opening shall be a min of 0 in. (point contact) to a max of 3 in. Pipe, conduit or tubing to be rigidly supported on both sides of floor or wall assembly. The following types and sizes of metallic pipes, conduit or tubing may be used:
A. Steel Pipe - Nom 6 in. diam (or smaller) Schedule 10 (or heavier) steel pipe.
B. Iron Pipe - Nom 6 in. diam (or smaller) cast or ductile iron pipe.
C. Conduit - Nom 4 in. diam (or smaller) steel electrical metallic tubing or steel conduit.
D. Copper Tube - Nom 4 in. diam (or smaller) Type L (or heavier) copper tube.
- Fill, Void or Cavity Material* - Sealant Min 1 in. thickness of fill material applied within the annulus, flush with both surfaces of floor or wall. At the point contact location between penetrating item and concrete, a min 3/8 in. thick bead of fill material shall be applied at the concrete/penetrating item interface and on both surfaces of floor or wall.
SPECIFIED TECHNOLOGIES INC. - SpecSeal 100, 101, 102 or 105 Sealant.
*Bearing the UL Classification Marking

Guide XHEZ (W-L-1029 - B Card)
Through-Penetration Firestop Systems (Cont'd from W-L-1029 - A Card)

System No. W-L-1029
December 16, 1994
(Formerly System No. 467)
F Ratings - 1 and 2 Hr (See Item 1B)
T Rating - 0 Hr
L Rating At Ambient - Less Than 1 CFM/sq ft
L Rating At 400 F - Less Than 1 CFM/sq ft

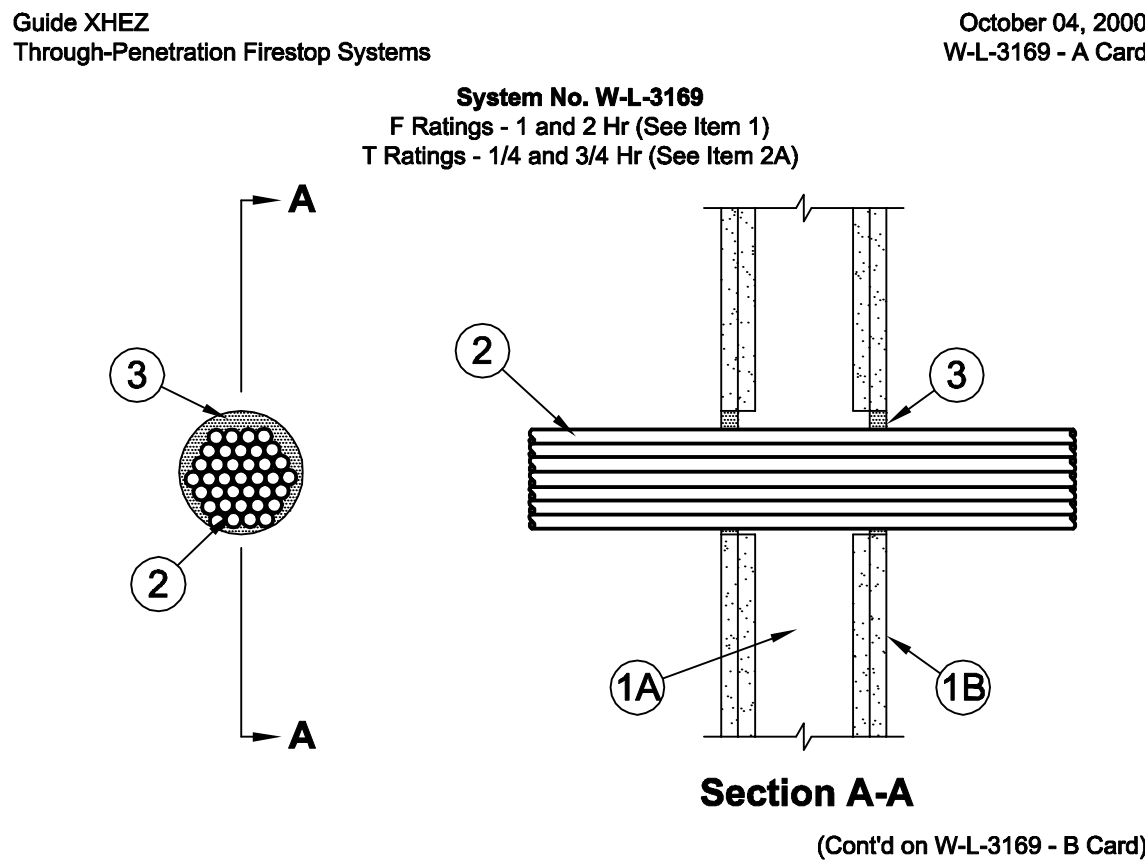
- Wall Assembly - The 1 or 2 h fire rated gypsum wallboard/stud wall assembly shall be constructed of the materials and in the manner described in the individual U300 and U400 Series Wall and Partition Designs in the UL Fire Resistance Directory and shall include the following construction features:
A. Studs - Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. lumber spaced 16 in. OC. Steel studs to be min 2-1/2 in. wide and spaced max 24 in. OC.
B. Gypsum Board* - 5/8 in. thick, 4 ft wide with square or tapered edges. The gypsum wallboard type, thickness, number of layers, fastener type and sheet orientation shall be as specified in the individual U300 or U400 Series Design in the UL Fire Resistance Directory. Max diam of opening is 6 in.
The hourly F Rating of the firestop system is equal to the hourly fire rating of the wall assembly in which it is installed.
- Through Penetrants - One metallic pipe, conduit or tubing to be centered within the firestop system. A nom annular space of 3/4 in. is required within the firestop system. Pipe, conduit or tubing to be rigidly supported on both sides of floor or wall assembly. The following types and sizes of metallic pipes, conduits or tubing may be used:
A. Steel Pipe - Nom 4 in. diam (or smaller) Schedule 5 (or heavier) steel pipe.
B. Conduit - Nom 4 in. diam (or smaller) steel electrical metallic tubing or steel conduit.
C. Copper Tubing - Nom 4 in. diam (or smaller) Type L (or heavier) copper tubing.
D. Copper Pipe - Nom 4 in. diam (or smaller) Regular (or heavier) copper pipe.
- Firestop System - The firestop system shall consist of the following:
A. Packing Material - Min 1 in. thickness of min 3.5 pcf fiberglass insulation shall be wrapped around the through-penetrant and secured together by means of No. 24 AWG steel tie wire. Packing material shall be centered at mid-depth of opening and recessed from both surfaces of wall assembly required to accommodate the required thickness of fill material.
B. Fill, Void or Cavity Material* - Caulk or Putty - In 2 hr fire rated assemblies min 3/4 in. thickness fill material applied within the annulus, flush both surfaces of wall. Additional fill material to be installed such that a min 1/4 in. crown is formed around the penetrating item. In 1 h fire-rated assemblies, min 5/8 in. thickness of fill material applied within annulus on both surfaces of wall. Additional fill material to be installed such that a min 3/8 in. crown is formed around the penetrating item and lapping 1 in. beyond the periphery of the opening.
SPECIFIED TECHNOLOGIES INC. - SpecSeal 100, 101 or 105 Sealant and SpecSeal Putty
*Bearing the UL Classification Marking



Guide XHEZ (W-L-3170 - B Card)
Through-Penetration Firestop Systems (Cont'd from W-L-3170 - A Card)

System No. W-L-3170
October 04, 2000
F Ratings - 1 and 2 Hr (See Item 1)
T Ratings - 1/4 and 1 Hr (See Item 3A)

- Wall Assembly - The 1 or 2 hr fire-rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300 or U400 Series Wall or Partition Design in the UL Fire Resistance Directory and shall include the following construction features:
A. Studs - Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. lumber spaced 16 in. OC. Steel studs to be min 3-5/8 in. wide and spaced max 24 in. OC.
B. Gypsum Board* - Thickness, type, number of layers and fasteners as specified in the individual Wall and Partition Design. Max diam of opening is 6 in.
The hourly F Rating of the firestop system is equal to the hourly fire rating of the wall assembly in which it is installed.
- Steel Sleeve - Cylindrical sleeve fabricated from 0.0125 in. thick (30 gauge) galv sheet steel and having a min 2 in. lap along the longitudinal seam. Length of the sleeve to be equal to or max 2 in. greater than the thickness of the wall. Sleeve installed by coiling the sheet steel to a diam smaller than the through opening, inserting the coil through the opening and releasing the coil to let it uncoil against the circular cutouts in the gypsum wallboard layers. The ends of the steel sleeve shall be flush with or extend a max 1 in. beyond each surface of the wall.
As an alternate, steel sleeve may consist of nom 6 in. diam (or smaller) Schedule 5 (or heavier) steel pipe sleeve friction-fitted into circular cutouts in the gypsum board layers. The ends of the steel sleeve shall be flush with or extend a max 1 in. beyond each surface of the wall.
- Cables - Max 4-1/2 in. diam tight bundle of cables to be installed eccentrically or concentrically within the opening. The annular space between the cables and the periphery of the opening shall be min 0 in. (point contact) to max 1-1/2 in. Cable bundle to be rigidly supported on both sides of the wall assembly. The following types and sizes of cables may be used:
A. Max 200 pair No. 24 AWG (or smaller) copper conductor with polyvinyl chloride (PVC) insulation and jacketing material.
B. Max 1/C No. 350 kcmil (or smaller) copper conductor cable with cross-linked polyethylene (XLPE) jacket.
C. Max 7/C No. 12 AWG (or smaller) copper conductor power and control cables with XLPE or PVC insulation with XLPE or PVC jacket.
D. Max 3/C No. 2/0 AWG (or smaller) copper or aluminum conductor SER cables with PVC insulation and jacket.
E. Max 3/C No. 2/0 AWG (or smaller) copper conductor PVC jacketed aluminum clad or steel clad TEK cable.
F. Max 110/125 fiber optic (F.O.) cable with PVC insulation and jacket.
G. Max 3/C with ground No. 8 AWG (or smaller) copper conductor NM cable (Romex) with PVC insulation and jacket.
H. Max RG/U coaxial cable with fluorinated ethylene insulation and jacket.
I. Max 4 pair No. 24 AWG (or smaller) copper conductor data cable with Hylar jacket and insulation.
3A. Through Penetrating Product* - As an alternate to the cables (Item 3), max 4-1/2 in. diam tight bundle of max 4/C No. 2/0 AWG (or smaller) aluminum or steel Armored Cable+ or Metal Clad Cable+ installed within the opening. Annular space between through-penetrating products and periphery of opening to be min 0 in. (point contact) to max 1-1/2 in. Through penetrating product rigidly supported on both sides of wall assembly. When Armored Cable or Metal Clad Cable is used, T Rating is 1/4 hr.
AFC CABLE SYSTEMS INC.
- Firestop System - The firestop system shall consist of the following:
A. Packing Material - Min 1 in. thickness of 4 pcf mineral wool batt insulation compressed and tightly packed into each end of sleeve. Recess packing material as required to accommodate fill material (Item 4B).
B. Fill, Void or Cavity Material* - Sealant - Min 1/2 in. thickness of fill material applied within annulus, flush with each end of steel sleeve. At point contact location, min 1/4 in. diam bead of fill material applied at cable bundle/steel sleeve interface on both sides of wall.
SPECIFIED TECHNOLOGIES INC. - SpecSeal LCI Sealant
*Bearing the UL Classification Marking



Guide XHEZ (W-L-3169 - B Card)
Through-Penetration Firestop Systems (Cont'd from W-L-3169 - A Card)

System No. W-L-3169
October 04, 2000
F Ratings - 1 and 2 Hr (See Item 1)
T Ratings - 1/4 and 3/4 Hr (See Item 2A)

- Wall Assembly - The 1 or 2 hr fire-rated gypsum board/stud wall assembly shall be constructed of the materials and in the manner specified in the individual U300 or U400 Series Wall or Partition Design in the UL Fire Resistance Directory and shall include the following construction features:
A. Studs - Wall framing may consist of either wood studs or steel channel studs. Wood studs to consist of nom 2 by 4 in. lumber spaced 16 in. OC. Steel studs to be min 3-5/8 in. wide and spaced max 24 in. OC.
B. Gypsum Board* - Thickness, type, number of layers and fasteners as specified in the individual Wall and Partition Design. Max diam of opening is 5 in.
The hourly F Rating of the firestop system is equal to the hourly fire rating of the wall assembly in which it is installed.
- Cables - Max 4-1/2 in. diam tight bundle of cables to be installed eccentrically or concentrically within the opening. The annular space between the cables and the periphery of the opening shall be min 0 in. (point contact) to max 1/2 in. Cable bundle to be rigidly supported on both sides of the floor or wall assembly. The following types and sizes of cables may be used:
A. Max 200 pair No. 24 AWG (or smaller) copper conductor with polyvinyl chloride (PVC) insulation and jacketing material.
B. Max 1/C No. 350 kcmil (or smaller) copper conductor cable with cross-linked polyethylene (XLPE) jacket.
C. Max 7/C No. 12 AWG (or smaller) copper conductor power and control cables with XLPE or PVC insulation with XLPE or PVC jacket.
D. Max 3/C No. 2/0 AWG (or smaller) copper or aluminum conductor SER cables with PVC insulation and jacket.
E. Max 3/C No. 2/0 AWG (or smaller) copper conductor PVC jacketed aluminum clad or steel clad TEK cable.
F. Max 110/125 fiber optic (F.O.) cable with PVC insulation and jacket.
G. Max 3/C with ground No. 8 AWG (or smaller) copper conductor NM cable (Romex) with PVC insulation and jacket.
H. Max RG/U coaxial cable with fluorinated ethylene insulation and jacket.
I. Max 4 pair No. 24 AWG (or smaller) copper conductor data cable with Hylar jacket and insulation.
2A. Through Penetrating Product* - As an alternate to the cables (Item 2), max 4 in. diam tight bundle of max 4/C No. 2/0 AWG (or smaller) aluminum or steel Armored Cable+ or Metal Clad Cable+ installed within the opening. Annular space between through-penetrating products and periphery of opening to be min 0 in. (point contact) to max 1 in. Through penetrating product rigidly supported on both sides of floor or wall assembly. When Armored Cable or Metal Clad Cable is used, T Rating is 1/4 hr.
AFC CABLE SYSTEMS INC.
- Fill, Void or Cavity Material* - Sealant - Min 5/8 in. thickness of fill material applied within annulus, flush with both surfaces of wall assembly. Sealant to be forced into interstices of cable bundle to max extent possible. At point contact location, min 1/4 in. diam bead of fill material applied at cable bundle/gypsum board interface on both surfaces of wall.
SPECIFIED TECHNOLOGIES INC. - SpecSeal LCI Sealant
*Bearing the UL Classification Marking

KEY PLAN

NO	REVISION DESCRIPTION	DATE

PROJECT
UC DAVIS GRADUATE SCHOOL OF MANAGEMENT AND CONFERENCE CENTER

SHEET
DETAILS - THROUGH PENETRATION SEALANT

SCALE NONE	FOR 30" x 42" SHEET
JOB NUMBER 2000466B	DRAWING
DRAWN BY IK, DB	AV9.04
DESIGNED BY PAM	
DATE 10/05/09	SHEET OF

REFER TO ARCHITECTURAL PLANS. FOR
FIRE RATED SURFACES.