REQUEST FOR BIDS

FOR

FURNISHING, DELIVERY, AND INSTALLATION

OF

AUDIO/VIDEO SYSTEM

FOR

THE CURATORS OF THE UNIVERSITY OF MISSOURI

FOR

THE UNIVERSITY OF MISSOURI ST LOUIS

RFB # 17 4010 HR S

OPENING DATE: APRIL 27, 2017

TIME: 2:00 PM, CT

Prepared by:

Heather Reed, CPPB
Strategic Sourcing Specialist
University of Missouri System Supply Chain
2910 LeMone Industrial Blvd
Columbia, MO 65201

Dated: April 13, 2017

NOTICE TO BIDDERS

The University of Missouri-St. Louis requests bids for Furnishing, Delivery, and Installation of an Audio/Video System for the new College of Business Administration Building, RFB #17 4010 HR S, which will be received by the undersigned at UM System Supply Chain, University of Missouri-Columbia, 2910 LeMone Industrial Blvd, Columbia, MO 65201 until 2:00 p.m., CT, on April 27, 2017. Bids will be opened and identified starting at 2:05 p.m., CT.

Specifications and the conditions of bid together with the printed form on which bids must be made may be obtained from Heather Reed, Strategic Sourcing Specialist, UM System Supply Chain, University of Missouri-Columbia, 2910 Lemone Industrial Blvd, Columbia, MO 65201, phone 573-882-9778, email reedhr@umsystem.edu.

The University reserves the right to waive any informality in bids and to reject any or all bids.

THE CURATORS OF THE
UNIVERSITY OF MISSOURI

By: Heather Reed, CPPB
Strategic Sourcing Specialist
University of Missouri System Supply Chain
2910 LeMone Industrial Blvd
Columbia, MO 65201

Dated: April 13, 2017

UNIVERSITY OF MISSOURI
GENERAL TERMS AND CONDITIONS
AND
INSTRUCTIONS TO BIDDERS
REQUEST FOR BID (RFB)

A. GENERAL TERMS AND CONDITIONS

1. **Purpose:** The purpose of these specifications is to require the furnishing of the highest quality equipment, supplies, material and/or service in accordance with the specifications. These documents, and any subsequent addenda, constitute the complete set of specification requirements and bid response forms.

2. **Governing Laws and Regulations:** Any contract issued as a result of this RFB shall be construed according to the laws of the State of Missouri. Additionally, the contractor shall comply with all local, state, and federal laws and regulations related to the performance of the contract to the extent that the same may be applicable.

3. **Taxes:** The contractor shall assume and pay all taxes and contributions including, but not limited to, State, Federal and Municipal which are payable by virtue of the furnishing and delivery of item(s) specified herein. Materials and services furnished the University are not subject to either Federal Excise Taxes or Missouri Sales Tax.

4. **Sovereign Immunity:** The Curators of the University of Missouri, due to its status as a state entity and its entitlement to sovereign immunity, is unable to accept contract provisions, which require The Curators to indemnify another party (537.600, RSMo). Any indemnity language in proposed terms and conditions will be modified to conform to language that The Curators are able to accept.

5. **Preference for Missouri Firms:** In accordance with University policy, preference shall be given to Missouri products, materials, services and firms when the goods or services to be provided are equally or better suited for the intended purpose and can be obtained without additional cost. Firms are considered "Missouri firms" if they maintain a regular place of business in the State of Missouri.

6. **Equal Opportunity and Non-Discrimination:** In connection with the furnishing of equipment, supplies, and/or services under the contract, the contractor and all subcontractors shall agree not to discriminate against any recipients of services, or employees or applicants for employment on the basis of race, color, religion, national origin, sex, age, disability, or veteran status. The contractor shall comply with federal laws, rules and regulations applicable to subcontractors of government contracts including those relating to equal employment of minorities, women, persons with disabilities, and certain veterans. Contract clauses required by the United Sates Government in such circumstances are incorporated herein by reference.

7. **Supplier Diversity Participation:** It is the policy of the University of Missouri System to ensure full and equitable economic opportunities to all persons and businesses that compete for business with the University. The University's Supplier Diversity effort reflects that.

   Diverse suppliers must be at least 51% owned and controlled by someone in one of the recognized groups (see below). Diverse suppliers should be certified from a recognized certifying agency. These firms can be a sole proprietorship, partnership, joint venture or corporation. Attachment A provides a list of agencies that are recognized as certifying agencies. The definition of what counts as a diverse supplier for the University of Missouri System are: Minority (MBE: African-American, Hispanic, Native-American Asian Indian/Pacific), Women (WBE), Veterans (VBE-Includes Service Disabled) and Disadvantaged Business Enterprises (DBE/SDB). Again, these firms must be certified to be recognized by University of Missouri System Supply Chain (UMSSC).

   Second Tier Diverse Supplier Spending and Reporting: The University strongly encourages Supplier Diversity participation in all of its contracts for goods and services. This may be as the primary supplier/contractor for the awarded business. Diverse suppliers can also be used as subcontractors by a majority-owned supplier to fulfill its contract with the University. This is called 2nd Tier spending. There are two ways this can be accomplished:

   Direct 2nd Tier spending: This is diverse supplier spending by a first tier supplier of goods and/ or services that directly fulfills a UM contract. The principle to follow— if the diverse supplier spending by the first tier supplier can be traced and tracked specifically to the contract, this is direct 2nd tier spending.
   Example: Company A is a prime supplier of office products to UMSSC. Ink pens that are supplied to UMSSC are provided by a minority-owned business. This would be direct 2nd Tier. Dollars that can be tracked and traced to fulfilling the contract.

   Indirect 2nd Tier spending: Calculates the 2nd Tier spending by prorating the prime supplier's company-wide diverse supplier spending with the percentage of its total business represented by the customer company's business.
   Example: Company B spends $100,000 with a Veteran-owned landscaping company. UMSSC comprises 20% of that company's/subsidiary's overall business revenue. Company B can report $20,000 to UMSSC as indirect 2md Tier spending.

   The Director of Supplier Diversity and Small Business Development can provide more detail.

   Bidders must indicate their Supplier Diversity participation levels committed to this contract on the Supplier Diversity Participation Form included in this RFB (see Exhibit B). The Bidder must describe what suppliers and/or how the Bidder will achieve the Supplier Diversity goals.

Suppliers/contractors will be responsible for reporting diverse supplier participation on an agreed upon timing (e.g., quarterly, annually) when business is awarded.

The University will monitor the contractor/supplier's compliance in meeting the Supplier Diversity participation levels committed to in the awarded bid. If the Contractor/supplier's payments to participating diverse suppliers are less than the amount committed to in the contract, the University reserves the right to cancel the contract, suspend and/or debar the contractor/supplier from participating in future contracts. The University may retain payments to the contractor/supplier in an amount equal to the value of the Supplier Diversity participation commitment less actual payments made to diverse suppliers.

If a participating diverse supplier does not retain their certification and/or is unable to satisfactorily perform, the Contractor must obtain other certified diverse suppliers, if available, to fulfill the Supplier Diversity participation requirements committed to in the awarded proposal. The Contractor must obtain the written approval or the Chief Procurement Officer for any new diverse supplier. Additionally, if the Contractor cannot find another diverse supplier replacement, documentation must be submitted to the Chief Procurement Officer detailing all good faith efforts made to find a replacement. The Chief Procurement Officer shall have sole discretion in determining if the actions taken by the Contractor constitute a good faith effort to secure diverse supplier participation and whether the contract will be amended to change the Supplier Diversity participation commitment.

8. **Applicable Laws and Regulations:** The University serves from time to time as a contractor for the United States government. Accordingly, the provider of goods and/or services shall comply with federal laws, rules and regulations applicable to subcontractors of government contracts including those relating to equal employment opportunity and affirmative action in the employment of minorities (Executive Order 11246), women (Executive Order 11375), persons with disabilities (29 USC 706 and Executive Order 11758), and certain veterans (38 USC 4212 formerly [2012]) contracting with business concerns with small disadvantaged business concerns (Publication L. 95-507). Contract clauses required by the Government in such circumstances are incorporated herein by reference.

9. **Appropriation:** The Curators of the University of Missouri is a public corporation and, as such, cannot create an indebtedness in any one year (the fiscal year beginning July 1 to June 30) above what they can pay out of the annual income of said year as set forth in 172.250, RSMo. Therefore, if the University determines it has not received adequate appropriations, budget allocations or income to enable it to meet the terms of this contract, the University reserves the right to cancel this contract with 30 days' notice.

10. **Applicable Health Related Laws and Regulations:** If these specifications or any resulting contract involves health care services or products, the Contractor agrees to maintain, and will further assure such compliance by its employees or subcontractors, the confidential nature of all information which may come to Contractor with regard to patients of the University. All services provided pursuant to this contract shall be provided in

accordance with all applicable federal and state laws including The Health Insurance Portability and Accountability Act of 1996, Public Law 104-191, sections 261-264 (the Administrative Simplification sections) and the regulations promulgated pursuant thereto and regulations of the Joint Commission on Accreditation of Healthcare Organization and the Health Care Financing Administration.

Bidders understand and agree that the Curators of the University of Missouri, in the operation of the University Hospitals and Clinics, is regulated under federal or state laws with regard to contracting with vendors. The Contractor represents that it is not currently excluded or threatened with exclusion from participating in any federal or state funded health care program, including Medicare and Medicaid. Contractor agrees to notify the University of any imposed exclusions or sanctions covered by this representation.

The University will regularly check the "List of Excluded Individuals/Entities" (LEIE), maintained by the Office of Inspector General, United States Department of Health and Human Services ("OIG") to determine if any Bidders/Respondents have been excluded from participation in federal health care programs, as that term is defined in 42 U.S.C. §1320a-7b(f). The University reserves the sole right to reject any bidders who are excluded by the OIG, who have been debarred by the federal government, or who have otherwise committed any act that could furnish a basis for such exclusion or debarment.

11. **Inventions, Patents, and Copyrights:** The Contractor shall pay for all royalties, license fees, patent or invention rights, or copyrights and defend all suits or claims for infringements of any patent or invention right or copyrights involved in the items furnished hereunder. The Contractor shall defend, protect, and hold harmless the University its officers, agents, servants and employees against all suits of law or in equity resulting from patent and or copyright infringement concerning the contractor's performance or products produced under the terms of the contract.

    Copyrights for any item developed for the University shall be the property of the University and inure to its benefit and the Contractor shall execute such documents as the University may require for the perfection thereof.

12. **Insurance:** The Contractor shall purchase and maintain such insurance as will protect the Contractor and the University against any and all claims and demands arising from the execution of the contract. Further, when stated in the Detailed Specifications and Special Conditions, the Contractor shall be required to procure and maintain the types and limits of insurance as specified.

13. **Performance Bond/Irrevocable Letter of Credit:** If a performance bond or irrevocable letter of credit is required in the Detailed Specifications and Special Conditions, the Contractor shall furnish to the University, along with their signed contract, a performance bond or unconditional irrevocable letter of credit payable to the Curators of the University of Missouri in the face amount specified in the Detailed Specifications and Special Conditions as surety for faithful performance under the terms and conditions of the contract.

14. **Debarment and Suspension Certification** - The contractor certifies to the best of its knowledge and belief that it and its principals are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency in accordance with Executive Order 12549 (2/18/86).

B. INSTRUCTIONS TO BIDDERS

1. **Request For Bid (RFB) Document:** Bidders are expected to examine the complete RFB document and all attachments including drawings, specifications, and instructions. Failure to do so is at bidder's risk. It is the bidder's responsibility to ask questions, request changes or clarifications, or otherwise advise the University if any language, specifications or requirements of a RFB appear to be ambiguous, contradictory, and/or arbitrary, or appear to inadvertently restrict or limit the requirements stated in the RFB to a single source.

   Any and all communications from bidders regarding specifications, requirements, competitive bid process, etc., should be directed to the University buyer of record referenced in this RFB. It is the responsibility of the person or organization communicating the request to ensure that it is received. To guarantee a timely response, such communication should be received at least ten calendar days prior to the bid opening date.

   The terms and conditions as distributed by the University or made available on a University website, shall not be modified by anyone submitting a bid. Regardless of any modification to these terms and conditions that may appear in the submitted bid, the original University terms and conditions apply. Any exceptions to the terms and conditions shall be stated clearly and it is at the University's discretion whether the exception shall be accepted or shall invalidate the bid.

   The RFB document and any attachments constitute the complete set of specifications and bid response forms. No verbal or written information that is obtained other than through this RFB or its addenda shall be binding on the University. No employee of the University is authorized to interpret any portion of this RFB or give information as to the requirements of the RFB in addition to that contained in or amended to this written RFB document. In case of any doubt or difference of opinion as to the true intent of the RFB, the decision of the University's Chief Procurement Officer shall be final and binding on all parties.

2. **Preparation of Bids:** All bids must be submitted, in **one (1) original and one (1) electronic format (jump drive)**, on the bid form accompanying these specifications and must be enclosed in a sealed envelope plainly marked: "Bid for Furnishing, Delivery, and Installation of College of Business Audio/Visual System" and addressed, mailed and/or delivered to UM System Supply Chain, University of Missouri-Columbia, 2910 Lemone Industrial Blvd, Columbia, MO 65201 ATTN: Heather Reed, Strategic Sourcing Specialist.

To receive consideration, bids must be received, at the above address, prior to the bid opening time and date stated in this RFB. Bidders assume full responsibility for the actual delivery of bids during business hours at the specified address.

Unless otherwise specifically stated in the RFB, all specifications and requirements constitute minimum requirements. All bids must meet or exceed the stated specifications or requirements. All equipment and supplies offered must be new, of current production, and available for marketing by the manufacturer unless the RFB clearly specifies that used, reconditioned, or remanufactured equipment and supplies may be offered. Unless specifically stated and allowed in the Detailed Specifications and Special Conditions, all pricing submitted in response to this RFB is firm and fixed.

Whenever the name of a manufacturer, trade name, brand name, or model and catalog numbers followed by the words "or equal" or "approved equal" are used in the specifications it is for the purpose of item identification and to establish standards of quality, style, and features. Bids on equivalent items of the same quality are invited. However, to receive consideration, such equivalent bids must be accompanied by sufficient descriptive literature and/or specifications to clearly identify the item and provide for competitive evaluation. The University will be the sole judge of equality and suitability. Whenever the name of a manufacturer is mentioned in the specifications and the words "or equal" do not follow, it shall be deemed that the words "or equal" follow unless the context specifies "no substitution." Unless noted on the bid form, it will be deemed that the article furnished is that designated by the specifications. The University reserves the right to return, at contractor's expense, all items that are furnished which are not acceptable as equals to items specified and contractor agrees to replace such items with satisfactory items at the original bid price.

Time will be of the essence for any orders placed as a result of this RFB. The University reserves the right to cancel any orders, or part thereof, without obligation if delivery is not made in accordance with the schedule specified by the bidder and accepted by the University. Unless otherwise specified in the Detailed Specifications and Special Conditions, all bids shall include all packing, handling, and shipping charges FOB destination, freight prepaid and allowed.

3. **Submission of Bids:** Bidders shall furnish information required by the solicitation in the form requested. The University reserves the right to reject bids with incomplete information or which are presented on a different form. All bids shall be signed, in the appropriate location, by a duly authorized representative of the bidder's organization. Signature on the bid certifies that the bidder has read and fully understands all bid specifications, plans, and terms and conditions.

   By submitting a bid, the bidder agrees to provide the specified equipment, supplies and/or services in the RFB, at the prices quoted, pursuant to all requirements and specifications contained therein. Furthermore, the bidder certifies that: (1) the bid is genuine and is not made in the interest of or on behalf of any undisclosed person, firm, or corporation, and is not submitted in conformity with any agreement or rules of any group, association, or

corporation; (2) the bidder has not directly or indirectly induced or solicited any other bidder to submit a false or sham bid; (3) the bidder has not solicited or induced any person, firm, or corporation to refrain from responding; (4) the bidder has not sought by collusion or otherwise to obtain any advantage over any other bidder or over the University.

Modifications or erasures made before bid submission must be initialed in ink by the person signing the bid. Bids, once submitted, may be modified in writing prior to the exact date and time set for the bid closing. Any such modifications shall be prepared on company letterhead, signed by a duly authorized representative, and state the new document supersedes or modifies the prior bid. The modification must be submitted in a sealed envelope marked "Bid Modification" and clearly identifying the RFB title, RFB number and closing time and date. Bids may not be modified after the bid closing time and date. Telephone and facsimile modifications are not permitted.

Bids may be withdrawn in writing, on company letterhead, signed by a duly authorized representative and received at the designated location prior to the date and time set for bid closing. Bids may be withdrawn in person before the bid closing upon presentation of proper identification. Bids may not be withdrawn for a period of sixty (60) days after the scheduled closing time for the receipt of bids.

All bids, information, and materials received by the University in connection with an RFB response shall be deemed open records pursuant to 610.021 RSMo. If a bidder believes any of the information contained in the bidder's response is exempt from 610.021 RSMo, then the bidder's response must specifically identify the material which is deemed to be exempt and cite the legal authority for the exemption, otherwise, the University will treat all materials received as open records. The University shall make the final determination as to what materials are or are not exempt.

4. **Evaluation and Award:** Any clerical errors, apparent on its face, may be corrected by the Buyer before contract award. Upon discovering an apparent clerical error, the Buyer shall contact the bidder and request clarification of the intended bid. The correction shall be incorporated in the notice of award. The University reserves the right to request clarification of any portion of the bidder's response in order to verify the intent. The bidder is cautioned, however, that its response may be subject to acceptance or rejection without further clarification.

   The University reserves the right to make an award to the responsive and responsible bidder whose product or service meets the terms, conditions, and specifications of the RFB and whose bid is considered to best serve the University's interest. In determining responsiveness and the responsibility of the Bidder, the following shall be considered when applicable: the ability, capacity, and skill of the bidder to perform as required; whether the bidder can perform promptly, or within the time specified without delay or interference; the character, integrity, reputation, judgment, experience and efficiency of the bidder; the quality of past performance by the bidder; the previous and existing compliance by the bidder with related laws and regulations; the sufficiency of the bidder's financial resources; the availability, quality and adaptability of the bidders equipment, supplies and/or services

to the required use; the ability of the bidder to provide future maintenance, service and parts.

The University has established formal protest procedures. For more information about these procedures, contact the Buyer in Campus Procurement Services.

The University reserves the right to accept or reject any or all bids and to waive any technicality or informality.

5. **Contract Award and Assignment:** The successful bidder shall, within ten (10) days after the receipt of formal notice of award of the contract, enter into a contract, in duplicate, prepared by the University. The Contract Documents shall include the Notice to Bidders, Specifications and Addenda, Exhibits, Bid Form, Form of Contract, Letter of Award, University Purchase Order, and Form of Performance Bond, if required.

   The contract to be awarded and any amount to be paid there under shall not be transferred, sublet, or assigned without the prior approval of the University.

6. **Contract Termination for Cause:** In the event the Contractor violates any provisions of the contract, the University may serve written notice upon Contractor and Surety setting forth the violations and demanding compliance with the contract. Unless within ten (10) days after serving such notice, such violations shall cease and satisfactory arrangements for correction be made, the University may terminate the contract by serving written notice upon the Contractor; but the liability of Contractor and Surety for such violation; and for any and all damages resulting there from, as well as from such termination, shall not be affected by any such termination.

7. **Contract Termination for Convenience:** The University reserves the right, in its best interest as determined by the University, to cancel the contract by given written notice to the Contractor thirty (30) days prior to the effective date of such cancellation.

8. **Warranty and Acceptance:** The Contractor expressly warrants that all equipment, supplies, and/or services provided shall: (1) conform to each and every specification, drawing, sample or other description which was furnished or adopted by the University, (2) be fit and sufficient for the purpose expressed in the RFB, (3) be merchantable, (4) be of good materials and workmanship, (5) be free from defect. Such warranty shall survive delivery and shall not be deemed waived either by reason of the University's acceptance of or payment for such equipment, supplies, and/or services.

   No equipment, supplies, and/or services received by the University pursuant to a contract shall be deemed accepted until the University has had a reasonable opportunity to inspect said equipment, supplies and/or services. All equipment, supplies, and/or services which do not comply with specifications and/or requirements or which are otherwise unacceptable or defective may be rejected. In addition, all equipment, supplies, and/or services which are discovered to be defective or which do not conform to any warranty of the Contractor

upon inspection (or at any later time if the defects contained were not reasonably ascertainable upon the initial inspection) may be rejected.

9. **Payment:** Preferred settlement method is through the use of Electronic Accounts Payable solutions. Payment terms associated with these forms of payment will be issued as net 15 after the date of invoice. Payment terms associated with settlement by check will be considered to be net 30 days. Cash discounts for prompt payment may be offered but they will not be considered in determination of award unless specifically stated in the Detailed Specifications and Special Conditions. The University may withhold payment or make such deductions as may be necessary to protect the University from loss or damage on account of defective work, claims, damages, or to pay for repair or correction of equipment or supplies furnished hereunder. Payment may not be made until satisfactory delivery and acceptance by the University and receipt of correct invoice have occurred.

10. **Accounting Practices:** The Contractor shall maintain, during the term of the contract, all books of account, reports, and records in accordance with generally accepted accounting practices and standard for records directly related to this contract. The Contractor agrees to make available to the University, during normal business hours, all book of account, reports and records relating to this contract for the duration of the contract and retain them for a minimum period of one (1) year beyond the last day of the contract term.

UNIVERSITY OF MISSOURI
DETAILED SPECIFICATIONS

Introduction

The Curators of the University of Missouri, a public organization, propose to contract on behalf of the University of Missouri-St. Louis (referred to as "University") with an organization (referred to as "Contractor") to provide an Audio/Video System for the new College of Business Building as described herein.

Scope of Work

The Contractor shall provide an Audio/Video System in accordance with the attached Exhibit A Project Manual for New College of Business Administration Building-Phase I, Audio/Visual Package Project #S7646 at University of Missouri-St. Louis dated February 3, 2017.

Site Plans are included herein as Attachment #1.

Delivery

All deliveries shall be FOB Destination with all freight charges thereto included and fully prepaid. The seller bears and pays the freight costs.

Project Completion

This project **must** be completed by July 15, 2017.

Insurance

Contractor agrees to maintain, on a primary basis and at its sole expense, at all times during the life of any resulting contract the following insurance coverages, limits, including endorsements described herein. The requirements contained herein, as well as the University's review or acceptance of insurance maintained by Contractor is not intended to and shall not in any manner limit or qualify the liabilities or obligations assumed by Contractor under any resulting contract. Coverage to be provided as follows by a carrier with A.M. Best minimum rating of A- VIII.

Commercial General Liability Contractor agrees to maintain Commercial General Liability at a limit of not less than $1,000,000 Each Occurrence, $2,000,000 Annual Aggregate. Coverage shall not contain any endorsement(s) excluding nor limiting Product/Completed Operations, Contractual Liability or Cross Liability.

Contractor may satisfy the minimum liability limits required for Commercial General Liability or Business Auto Liability under an Umbrella or Excess Liability policy. There is no minimum per occurrence limit of liability under the Umbrella or Excess Liability; however, the Annual Aggregate limit shall not be less than the highest "Each Occurrence" limit for either Commercial General Liability or Business Auto Liability. Contractor agrees to endorse the University as an Additional Insured on the Umbrella or Excess Liability, unless the Certificate of Insurance state the Umbrella or Excess Liability provides coverage on a "Follow-Form" basis.

Note: Anyone who serves alcoholic beverages on a University of Missouri Campus or when contracted for service at a UM event must also provide liquor liability coverage. This should be written on an "occurrence basis" and have limits not less than $1,000,000 each claim or each common cause and at least a $1,000,000 aggregate. The insurance carrier, policy number, effective date and limits should be shown on an insurance certificate provided to the University of Missouri. The Curators of the University of Missouri should be named as an Additional Insured on such policy and a copy of the endorsement should be provided along with the certificate of insurance.

Business Auto Liability (If required in service performance) Contractor agrees to maintain Business Automobile Liability at a limit not less than $1,000,000 Each Occurrence. Coverage shall include liability for Owned, Non-Owned & Hired automobiles. In the event Contractor does not own automobiles, Contractor agrees to maintain coverage for Hired & Non-Owned Auto Liability, which may be satisfied by way of endorsement to the Commercial General Liability policy or separate Business Auto Liability policy.

Workers' Compensation & Employers Liability Contractor agrees to maintain Workers' Compensation in accordance with Missouri State Statutes or provide evidence of monopolistic state coverage. Employers Liability with the following limits: $500,000 each accident, disease each employee and disease policy limit.

Contract Language
The Curators of the University of Missouri, its officers, employees and agents are to be Additional Insured with respect to the project to which these insurance requirements pertain. A certificate of insurance evidencing all coverage required is to be provided at least 10 days prior to the inception date of the contract between the contractor and the University. Contractor/Party is required to maintain coverages as stated and required to notify the University of a Carrier Change or cancellation within 2 business days. The University reserves the right to request a copy of the policy. The University reserves the right to require higher limits on any contract provided notice of such requirement is stated in the request for proposals for such contract.

Indemnification
The Contractor agrees to defend, indemnify, and save harmless The Curators of the University of Missouri, their Officers, Agents, Employees and Volunteers, from and against all loss or expense from any cause of action arising from the Contractor's operations. The contractor agrees to investigate, handle, respond to and provide defense for and defend against any such liability, claims, and demands at the sole expense of the Contractor or at the option of the University, agrees to pay to or reimburse the University for the Defense Costs incurred by the University in connection with any such liability claims, or demands.

The parties hereto understand and agree that the University is relying on, and does not waive or intend to waive by any provision of this Contract, any monetary limitations or any other rights, immunities, and protections provided by the State of Missouri, as from time to time amended, or otherwise available to the University, or its officers, employees, agents or volunteers.

Failure to maintain the required insurance in force may be cause for contract termination. In the event the Agency/Service fails to maintain and keep in force the required insurance or to obtain

coverage from its subcontractors, the University shall have the right to cancel and terminate the contract without notice.

The insurance required by the provisions of this article is required in the public interest and the University does not assume any liability for acts of the Agency/Service and/or their employees and/or their subcontractors in the performance of this contract.

Prevailing Wage

All Bidders must comply with the State of Missouri and University of Missouri Prevailing Wage Law Rules. A complete listing of guidelines, policies, and wage rates for select counties may be found on the University of Missouri website as outlined below.

Prevailing Wage Labor Compliance
https://www.umsystem.edu/ums/fa/facilities/prevailing_wage_labor_compliance

Current Wage Rages for Selected Counties
https://www.umsystem.edu/ums/fa/facilities/wagerates

Pricing Pages

Pricing Pages may be found at the University of Missouri Procurement Web-Site (https://www.umsystem.edu/ums/fa/procurement/bids), under 17 4010 HR S Pricing Pages.

BID FORM

REQUEST FOR BIDS
FOR
FURNISHING AND DELIVERY
OF
AUDIO/VIDEO SYSTEM
FOR
THE CURATORS OF THE UNIVERSITY OF MISSOURI
FOR
THE UNIVERSITY OF MISSOURI-ST LOUIS
RFB # 17 4010 HR S
OPENING DATE: APRIL 27, 2017
TIME: 2:00 PM, CT

The undersigned proposes to furnish the following items and/or services at the prices quoted and agree to perform in accordance with all requirements and specifications contained within this Request For Bid issued by the University of Missouri.

AUTHORIZED BIDDER REPRESENTATION

Number of calendar days delivery after receipt of order	Payment Terms
Authorized Signature	Date
Printed Name	Title
Company Name	
Mailing Address	
City, State, Zip	
Phone No.	Federal Employer ID No.
Fax No.	E-Mail Address
Circle one: Individual Partnership Corporation	
If a corporation, incorporated under the laws of the State of_____	
Licensed to do business in the State of Missouri? ____yes _____no	

This signature sheet must be returned with your bid.

Exhibit A

PROJECT MANUAL FOR: New College of Business Administration Building – Phase 1, Audio / Visual Package

PROJECT NUMBER: S7646

AT
UNIVERSITY OF MISSOURI – ST. LOUIS
ST. LOUIS, MISSOURI

FOR:

THE CURATORS OF THE UNIVERSITY OF MISSOURI

ISSUED FOR BID

Cannon Design Project Number 004348.01

PREPARED BY:

Cannon Design
Contact: Joe Sweitzer
1100 Clark Avenue
St. Louis, Missouri 63102
(P) 314.425.8769
(F) 314.241.2570

DATE: FEBRUARY 3, 2017

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SECTION 012301 - ALTERNATES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for alternates.

1.2 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.3 PROCEDURES

A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate. Include costs of related coordination, modification, or adjustment.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract.

D. Schedule: A Schedule of Alternates is included in Part 3 below. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate Bid AV1: FSR Touch Panels.

1. Base Bid: Provide Touch Panels manufactured by Extron at all locations on the Drawings.
2. Alternate Bid: Provide FSR Touch Panels at the seminar rooms and at the flip-up box locations as shown on the Drawings in lieu of Extron Touch Panels.

B. Alternate Bid AV2: Video Wall Processor.

1. Provide the additional cost to provide the video wall processor for the PMBA room.

C. Alternate Bid AV3: Stock Ticker Extension.

1. Provide the additional cost to extend the stock ticker an additional 22 feet.

END OF SECTION 012300

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SUPPLEMENTAL GENERAL REQUIREMENTS

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General coordination procedures.
2. Coordination drawings.
3. Requests for Information (RFIs).
4. Project meetings.

B. Comply with requirements specified in General Conditions and Special Conditions in lieu of provisions specified in this Section where applicable.

C. Comply with requirements specified in “Consultant Procedures and Guidelines”, by the University of Missouri – St. Louis, and available on their web site.

1.2 DEFINITIONS

A. RFI: Request from Contractor seeking information required by or clarifications of the Contract Documents.

1.3 INFORMATIONAL SUBMITTALS

A. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1. Post copies of list in project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.4 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Priority of Construction Space:

1. Coordinate installation of different components to ensure performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.
2. Following is the Order of Priority of construction space:

    a. First: Ductwork.
    b. Second: Fire protection piping.
    c. Third: Other piping.
    d. Fourth: Conduit.

C. Condition of Contract Drawings for Mechanical and Electrical Work:

1. Drawings contain diagrammatic layouts and indicate general arrangement of systems, piping conduit, etc.
2. Prior to installation of material and equipment, review and coordinate Work with Architectural and Structural Drawings for exact space conditions; where not readily discernable request information from Architect before proceeding.
3. Check Drawings of all other trades to verify extent of material and equipment to be installed in spaces available and consider layout alternatives so that all requirements can be accommodated.
4. Maintain maximum headroom at all locations without finished ceilings.
5. Maintain finished ceiling heights as indicated.
6. Coordinate installations with other trades to prevent conflict with Work of other trades and cooperate in making reasonable modifications in layout as needed.
7. Where conflicts occur with placement of mechanical and electrical materials as they relate to placement of other building materials, the Architect shall be consulted for assistance in coordination of the available space to accommodate all trades.

D. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

E. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

F. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

1.5 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents and it is not possible to request information at Project meetings, Contractor shall prepare and submit an RFI in the form specified. Reference project website per SC21.c.

1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
3. Frivolous RFIs: The Contractor will compensate the Owner for the Architect's time and expenses to process RFIs resulting from the Contractor's lack of studying and comparing the Contract Documents, coordinating their own Work, or repeating previous RFIs.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Owner’s project number.
3. Date.
4. Name of Contractor.
5. Name of Architect.
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: Form bound in Project Manual, submitted by electronic mail (e-mail).

1. Identify each page of attachments with the RFI number and sequential page number.
2. Provide attachments for software-generated forms n Adobe Acrobat PDF format.
3. Provide photographs for software-generated forms in JPG format.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.

1. The following Contractor-generated RFIs will be returned without action:

    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for approval of Contractor's means and methods.
    d. Requests for coordination information already indicated in the Contract Documents.
    e. Requests for adjustments in the Contract Time or the Contract Sum.
    f. Requests for interpretation of Architect's actions on submittals.
    g. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of requested additional information.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to the General Conditions of the Contract for Construction.

    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response in accordance with provisions in the General Conditions of the Contract for Construction.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log. Include the following:

1. Project name and Owner’s project number.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.

1. Identify related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

1.6 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner’s Representative and Architect of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner’s Representative and Architect, within three days of the meeting.

4. Interpretations given by the Architect at Project meetings shall be on behalf of the Owner and shall be conclusive on Contractor affected.

B. Preconstruction Conference: Owner's Representative will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner's Representative and Architect, but no later than 15 days after execution of the Agreement at the Project site or another location convenient to the Owner's Representative and Architect.

1. Conduct the conference to review responsibilities and personnel assignments.
2. Attendees: Authorized representatives of Owner's Representative, Owner's Commissioning Authority, Architect, and their consultants; Contractor and its superintendent; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect progress, including the following:

    a. Tentative construction schedule.
    b. Phasing.
    c. Critical work sequencing and long-lead items.
    d. Designation of key personnel and their duties.
    e. Lines of communications.
    f. Procedures for processing field decisions and Change Orders.
    g. Procedures for RFIs.
    h. Procedures for testing and inspecting.
    i. Procedures for processing Applications for Payment.
    j. Distribution of the Contract Documents.
    k. Submittal procedures.
    l. LEED requirements.
    m. Preparation of record documents.
    n. Use of the premises.
    o. Work restrictions.
    p. Working hours.
    q. Owner's occupancy requirements.
    r. Responsibility for temporary facilities and controls.
    s. Procedures for moisture and mold control.
    t. Procedures for disruptions and shutdowns.
    u. Construction waste management and recycling.
    v. Parking availability.
    w. Office, work, and storage areas.
    x. Equipment deliveries and priorities.
    y. First aid.
    z. Security.
    aa. Progress cleaning.

4. Minutes: Architect will record and distribute meeting minutes.

C. LEED Coordination Conference: Owner's Representative will schedule and conduct a LEED coordination conference before starting construction, at a time convenient to Owner's Representative Architect, and Contractor.

1. Attendees: Authorized representatives of Owner's Representative, Owner's Commissioning Authority, Architect, and their consultants; Contractor and its superintendent and LEED coordinator; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Discuss items of significance that could affect meeting requirements for LEED certification, including the following:

    a. LEED Project Checklist.
    b. General requirements for LEED-related procurement and documentation.
    c. Project closeout requirements and LEED certification procedures.
    d. Role of LEED coordinator.
    e. Construction waste management.
    f. Construction operations and LEED requirements and restrictions.

3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

D. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Scheduling: Schedule preinstallation conferences on same day as progress meetings attended by Architect.
2. Attendees: Contractor, Owner's Representative, Architect, and Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise ArchitectOwner's Representative, and Owner's Commissioning Authority of scheduled meeting dates.
3. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

    a. Contract Documents.
    b. Options.
    c. Related RFIs.
    d. Related Change Orders.
    e. Purchases.
    f. Deliveries.
    g. Submittals.
    h. LEED requirements.
    i. Review of mockups.
    j. Possible conflicts.
    k. Compatibility requirements.
    l. Time schedules.
    m. Weather limitations.
    n. Manufacturer's written instructions.
    o. Warranty requirements.
    p. Compatibility of materials.
    q. Acceptability of substrates.
    r. Temporary facilities and controls.
    s. Space and access limitations.
    t. Testing and inspecting requirements.
    u. Installation procedures.
    v. Coordination with other work.
    w. Required performance results.
    x. Protection of adjacent work.
    y. Protection of construction and personnel.

4. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.

5. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
6. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

E. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner's Representative and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.

1. Conduct the conference to review requirements and responsibilities related to Project closeout.
2. Attendees: Owner's Representative, Owner's Commissioning Authority, Architect, and their consultants; Contractor and its superintendent; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:

    a. Preparation of record documents.
    b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
    c. Submittal of written warranties.
    d. Requirements for completing LEED documentation.
    e. Requirements for preparing operations and maintenance data.
    f. Requirements for delivery of material samples, attic stock, and spare parts.
    g. Requirements for demonstration and training.
    h. Preparation of Contractor's punch list.
    i. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
    j. Submittal procedures.
    k. Coordination of separate contracts.
    l. Owner's partial occupancy requirements.
    m. Installation of Owner's furniture, fixtures, and equipment.
    n. Responsibility for removing temporary facilities and controls.

4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

F. Progress / Coordination Meetings: Conduct progress meetings at biweekly intervals.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to Owner's Representative, Owner's Commissioning Authority and Architect, Contractor, and other entities concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

    a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties

involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

1) Review schedule for next period.

b. Review present and future needs of each entity present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Resolution of BIM component conflicts.
4) Status of submittals.
5) Status of LEED documentation.
6) Deliveries.
7) Off-site fabrication.
8) Access.
9) Site utilization.
10) Temporary facilities and controls.
11) Progress cleaning.
12) Quality and work standards.
13) Status of correction of deficient items.
14) Field observations.
15) Status of RFIs.
16) Status of proposal requests.
17) Pending changes.
18) Status of Change Orders.
19) Pending claims and disputes.
20) Documentation of information for payment requests.

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

Attachments

Request for Information (RFI) Form (SAMPLE)

END OF SECTION 013100

University of Missouri – St. Louis **#S7646**
New College of Business Administration Building – Phase 1
Audio / Visual Package
Cannon Design Project No. 004348.01

REQUEST FOR INFORMATION No. _____

Subject:

To:	CannonDesign	Contractor:
Attention:	**Melissa Pirtle**	Fax:
Email:	**stl-cac@cannondesign.com**	
Discipline:		

Specification Section No. & Paragraph:
Drawing and Details Affected:

REQUEST:
List Attached Referenced Documents:

ARCHITECT'S RESPONSE:
This information is provided as an interpretation of the Contract Documents for implementation. It is not an authorization for change to the Contract Sum or Contract Time. If this information results in a claim for a change to the Contract, the Contractor shall notify the **[Construction Manager][Architect]** of a change through the change process.

CONTRACTOR'S REPRESENTATION:
Undersigned warrants that Contractor has thoroughly researched the documents, and the information requested does not exist or cannot be ascertained from the information given in the documents.

Contractor's Signature: _____ Date: _____

Architect's Signature: _____ Date: _____

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SUPPLEMENTAL GENERAL REQUIREMENTS

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

1. Required Submittals: All required submittals are indicated in each specification section. Do not submit items unless they are required by Specification Section. Submittals which are not required may be discarded without review.
2. Submittals Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.

B. Comply with requirements specified in General Conditions and Special Conditions in lieu of provisions specified in this Section where applicable.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.

D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.3 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.

    a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.

4. Format: Arrange the following information in a tabular format:

    a. Scheduled date for first submittal.
    b. Specification Section number and title.
    c. Submittal category: Action; informational.
    d. Name of subcontractor.
    e. Description of the Work covered.
    f. Scheduled date for Architect's final release or approval.
    g. Scheduled date of fabrication.
    h. Scheduled dates for purchasing.
    i. Scheduled dates for installation.
    j. Activity or event number.

5. The Architect reserves the right to hold all submittals until a complete submittals schedule has been submitted and approved.

6. Package submittals by specification section, except closeout submittals or Work performed by separate trades, in a single delivery to the Architect; failure of the Contractor to package these submittals in a single delivery may cause the Architect to withhold action on submittal(s) until associated submittal(s) required by the particular specification section are received.

7. The review of any submittal without the submission and approval of a submittal schedule does not relieve the Contractor of his responsibility to provide this action submittal for approval. Failure to comply with this action submittal will relieve the Architect of all constraints on review periods.

1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will not be provided by Architect for Contractor's use in preparing submittals.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.

4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

    a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals. For samples and required paper submittals, review time will begin when both the physical submittal and the electronic Submittal Identification Sheet have been received by the Architect.

1. Initial Review: Allow sufficient time for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Resubmittal Review: Allow sufficient time for review of each resubmittal.
3. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow sufficient time for initial review of each submittal.
4. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow sufficient time for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.

D. Paper and Sample Submittals: Place a permanent label or title block on each submittal item for identification

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Transmittal for Paper and Sample Submittal: All submittals shall be accompanied by a completed Submittal Identification Sheet in the form of the sample found at the end of this Section. Submittals lacking this sheet will not be reviewed.

E. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.

    a. File name shall use project identifier, Specification Section number, and item number, followed by REV and the number of the review, then the title. (eg. “PI-05 5100-001 Rev 01 SD-Metal Stairs – Stair 01 & 02” is the appropriate name for the first metal stair shop drawing for stair 01 and 02 review 01).

    b. Project Identifier shall be as follows: **COBA**.

3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
4. Transmittal Form for Electronic Submittals: Use form at the end of this Section and acceptable to Owner**,** containing the following information (Submittals lacking this sheet will be returned as not reviewed):

a. Project name.
b. Date.
c. Name and address of Architect.
d. Name of Contractor.
e. Name of firm or entity that prepared submittal.
f. Names of subcontractor, manufacturer, and supplier.
g. Category and type of submittal.
h. Submittal purpose and description.
i. Specification Section number and title.
j. Specification paragraph number or drawing designation and generic name for each of multiple items.
k. Drawing number and detail references, as appropriate.
l. Location(s) where product is to be installed, as appropriate.
m. Related physical samples submitted directly.
n. Indication of full or partial submittal.
o. Transmittal number, numbered consecutively.
p. Submittal and transmittal distribution record.
q. Other necessary identification.
r. Remarks.

5. Metadata: Include the following information as keywords in the electronic submittal file metadata:

a. Project name.
b. Number and title of appropriate Specification Section.
c. Manufacturer name.
d. Product name.
e. Keynote or finish code.

F. Options: Identify options requiring selection by Architect.

G. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

1. Deviations: Encircle or otherwise specifically identify deviations from the Contract Documents on submittals.

H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked "No Exceptions Taken" or "Make Corrections Noted" , and initialed by Architect

I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, Owner’s Representative and others as necessary for performance of construction activities. Show distribution on transmittal forms.

J. Use for Construction: Use only final submittals with mark indicating "No Exceptions Taken" or "Make Corrections Noted", and initialed by Architect.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit Submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Submit electronic submittals via email as PDF electronic files. E-mail files to Architect's Construction Administrator Coordinator (CAC), with CC to Owner's Representative and Architect. The subject line of the e-mail should contain the project name and the Submittal Identification Number. When files are too large for e-mail, post them to the Architect's project FTP site and e-mail the transmittal to the Architect's CAC as noted above, identifying that the submittal has been uploaded to the FTP site.

    a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

2. Action Submittals: Must be submitted electronically, Architect will return one annotated copy.

3. Informational Submittals: Must be submitted electronically. Architect will not return copies.
4. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

    a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
    b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable to Project.
3. Include the following information, as applicable:

    a. Manufacturer's written recommendations.
    b. Manufacturer's product specifications, including performance characteristics written to match specified terminology for ease of comparison.
    c. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:

        1) Preparation of substrates.
        2) Required substrate tolerances.

3) Sequence of installation or erection.
4) Required installation tolerances.
5) Required adjustments.
6) Recommendations for cleaning and protection.

d. Standard color charts.
e. Manufacturer's catalog cuts.
f. Wiring diagrams showing factory-installed wiring and controls.
g. Printed performance curves.
h. Operational range diagrams.
i. Mill reports.
j. Standard product operation and maintenance manuals.
k. Statement of compliance with specified referenced standards.
l. Testing by recognized testing agency.
m. Application of testing agency labels and seals.
n. Notation of coordination requirements.
o. Availability and delivery time information.
p. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
q. Additional information as required by Specifications.
r. LEED submittals.

4. Submit Product Data before or concurrent with Samples.
5. Submit Product Data as a PDF electronic file.

6. Material Safety Data Sheets (MSDSs): Submit information directly to Owner; do not submit to Architect, except as required in "Action Submittals" Article.

a. Architect will not review MSDS sheets and will remove/discard them from the submittal.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

a. Dimensions, at a minimum shall include the same reference points and spans as the Contract Documents.
b. Identification of products.
c. Fabrication and installation drawings.
d. Roughing-in and setting diagrams.
e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
f. Shopwork manufacturing instructions.
g. Templates and patterns.
h. Schedules.
i. Design calculations.
j. Compliance with specified standards.
k. Notation of coordination requirements.
l. Notation of dimensions established by field measurement.
m. Relationship to adjoining construction clearly indicated.
n. Seal and signature of professional engineer if specified.
o. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.

p. Additional information as required by Specifications.
q. Do not include the phrase "by others," except when relating to materials, products or equipment not included under the Work of the Contract.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 42 inches.

a. Submittals shall be clear and legible. The Architect reserves the right to reject in full any submittal due to illegibility, as determined solely by the Architect, without any impact to the allowed review time. All dimensions and text shall be a minimum of 10pt or 0.389 inches in height. Drawings not conforming to this requirement will be rejected without review.

3. Submit Shop Drawings in the following format:

a. PDF electronic file, unless otherwise directed.
b. For 8 1/2 x 11 inch shop drawings in excess of 20 pages, submit two (2) full size hard copies, in addition to the electronic PDF file. Architect will return only the annotated electronic PDF file.
c. For 11 x 17 inch shop drawings in excess of 20 pages submit two (2) full size hard copies, in addition to the electronic PDF file. Architect will return only the annotated electronic PDF file.
d. For shop drawings larger than 11 x 17 inch format, submit two (2) full size hard copies, in addition to the electronic PDF file. Architect will return only the annotated electronic PDF file.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:

a. Generic description of Sample.
b. Product name and name of manufacturer.
c. Sample source.
d. Number and title of appropriate Specification Section.
e. Specification paragraph number and generic name of each item.

3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

a. Number of Samples: Submit two (2) full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return one (1) submittal set with options selected.

6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

   a. Number of Samples: Submit three (3) sets of Samples. Architect will retain two Sample sets; remainder will be returned. Mark up and retain one (1) returned Sample set as a Project Record Sample.

      1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
      2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

7. Field Samples: Erect at project site at location(s) acceptable to Architect.

   a. Construct each field sample complete; including work of all trades required to finish the Work.
   b. When directed by Architect, demolish field sample and remove from Project Site, unless acceptable by Architect as part of the competed.

E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
2. Manufacturer and product name, and model number if applicable.
3. Number and name of room or space.
4. Location within room or space.
5. Submit product schedule as a PDF electronic file.

F. LEED Submittals: Comply with requirements specified in Section 018113.13 "Sustainable Design Requirements - LEED for New Construction and Major Renovations."

G. Material Safety Data Sheets (MSDSs) Safety Data Sheets (SDSs) for LEED Certification: Submit information necessary to show compliance with LEED certification requirements, which will be the limit of the Architect's review.

1. Architect will not review non-LEED submittals that include MSDSs and will remove/discard them from the submittal.

H. Coordination Drawings: Comply with requirements specified in Division 01 Section "Project Management and Coordination."

I. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

J. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

K. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

L. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

M. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

N. Contractor Certification Letter: Where specifically authorized in individual Sections, prepare written certification on Contractor's letterhead indicating that products listed in the Certification Letter will be provided as specified in the Section without modification or deviation from the Contract Documents. See Sample "Contractor's Certification Letter" attached to this Section.

1. Submission of "Contractor's Certification Letter" signifies that Contractor will provide Products and Materials as specified in PART 2 of individual Specification Sections, and negates the requirement to submit the Product Data portion of Action Submittals. However, Product Data specified as part of LEED submittals, and Operation and Maintenance Data shall be submitted as specified in the Specification Section.

O. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

P. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

Q. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

R. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to Owner, that product complies with building code in effect for Project. Include the following information:

1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturers' names.

5. Description of product.
6. Test procedures and results.
7. Limitations of use.

S. Schedule of Tests and Inspections: Comply with requirements specified in Division 01 Section "Quality Requirements."

T. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

U. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

V. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

W. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."

X. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

Y. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

Z. Construction Photographs and Videos: Comply with requirements specified in Division 01 Section "Photographic Documentation."

2.2 DELEGATED DESIGN

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit three paper copies of a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.
2. This submittal shall be made concurrent with the related shop drawing submittal and any other sections which have materials adding load and or stresses to the design.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

1. Verify:

a. Field Measurements.
b. Field Construction Criteria.
c. Catalog Numbers and Similar Data.
d. Quantities.

2. Contractor’s responsibility regarding errors and omissions in submittals is not relieved by Architect’s review of submittals.
3. Contractor's responsibility regarding deviations in submittals from requirements of Contract Documents is not relieved by Architect's review of submittals, unless Architect gives written acceptance of specific deviations as approved by Owner’s Representative.
4. When work is directly related and involves more than one trade, coordinate submittal with other trades and submit under one cover.
5. After a submittal has been submitted for review, no changes may be made to that Submittal other than changes resulting from review notes made by the Architect unless such changes are clearly identified and circled before being resubmitted. Any failure to comply with this requirement shall nullify and invalidate the Architect's review.

B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."

C. Approval Stamp: Stamp each submittal identification sheet with Contractor's stamp certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:

1. Stamped Reviewed "No Exceptions Taken":

   a. No corrections or resubmissions required, fabrication may proceed.

2. Stamped Reviewed "Make Corrections Noted":

   a. If Contractor complies with noted corrections, fabrication may proceed and resubmission is not required, unless otherwise noted.
   b. If for any reason the Contractor cannot comply with the noted corrections, fabrication shall not proceed and Contractor shall resubmit, following procedures outlined hereinbefore.

3. Stamped Reviewed "Revise and Resubmit":

   a. Contractor shall revise and resubmit for review. Fabrication shall not proceed.

4. Stamped "Rejected":

   a. Submittal is not in compliance with the Contract Documents, and is not acceptable. Resubmit Contract compliant material.

5. Stamped "For Record Only":

   a. Submittal has been received and will be retained for record keeping purposes.

C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

D. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

E. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

F. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

3.3 DISTRIBUTION OF SUBMITTALS BY ORIGINAL SUBMITTER, AFTER ARCHITECT’S REVIEW

A. Make and distribute copies of submittal which have been accepted by the Architect to the following:

1. Contractor.
2. Related Contractor(s).
3. Supplier.
4. Fabricator.
5. Owner's representative.
6. Job-site file (record copy).

B. Produce and distribute additional copies as required.

END OF SECTION 013300

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CANNONDESIGN

SUBMITTAL IDENTIFICATION SHEET

To be completed by Contractor/CM

PROJECT NAME

ADDRESS

NUMBER

OWNER

ARCHITECT / ENGINEER

SUBMITTED BY

CONTRACTOR / CM SUBMITTAL NO. | CANNON DESIGN SUBMITTAL NO.

DRAWING / DETAIL REFERENCE | SPECIFICATION SECTION / PARAGRAPH

MANUFACTURER / SUPPLIER | ITEM / PRODUCT ID

REQUIRED DATE | PRIORITY | ◯ CRITICAL

ITEM BEING SUBMITTED (check only one)

- ◯ Shop Drawings
- ◯ Samples (_____ copies)
- ◯ LEED Submittal
- ◯ Certification / Qualifications
- ◯ Record Documents
- ◯ Product Data
- ◯ Coordination Drawing
- ◯ Calculations
- ◯ Schedules
- ◯ O&M Manuals
- ◯ Other _____

ITEM BEING SUBMITTED FOR (check only one)

◯ Action ◯ Information Only ◯ Record

REMARKS OR DEVIATIONS

CONTRACTOR / CM CERTIFICATION
(SUBMITTALS NOT CERTIFIED WILL BE RETURNED WITHOUT REVIEW)

REVIEWED BY | DATE

To be completed by Reviewer

CANNON DESIGN SUBMITTAL NUMBER

RECEIVED DATE

◯ A. No Exceptions Taken
No further review of submittal is required.

◯ B. Make Corrections Noted
Incorporate corrections in work; resubmission is not required.

◯ C. Revise and Resubmit
Revise as noted, and resubmit for review.

◯ D. Rejected
Submittal is not in compliance with Contract Documents; provide new submittal.

◯ E. For Record / Information Only
Submittal was reviewed for Record / Information purposes only.

◯ F. Not Required for Review
Submittal is not required by Contract Documents and has not been reviewed.

Review is for conformance with the design concept of this project and for general compliance with contract documents. Contractor is responsible for quantities, dimensions and compliance with contract documents and for information that pertains to fabrication processes, construction techniques and coordination of this work with all trades which will be affected thereby. This review is null and void if submittal deviates from contract documents and does not indicate or note deviations.

A/E COMMENTS ◯ See attached sheet(s) for additional comments

REVIEWED BY | DATE

(Contractor's typical letterhead format is preferred)

Contractor Name/Address

Date:

Re: Project Name: University of Missouri St. Louis, New College of Business Administration Building
Design Project No.: S7646

I certify that the manufacturer and products listed below are specified by the Contract Documents and will be provided per manufacturer's recommendations and per Contract Documents. This materials certification is in lieu of submitting any further shop drawing/ submittal documentation for this particular product.

(Example):

Specification Section:	09 2900 – Gypsum Board
Paragraph Number:	2.2 A.2 Interior Gypsum Board
Manufacturer:	National Gypsum Company
Manufacturer's Product Designation:	Gold Bond Fire-Shield Gypsum Board

(Several Specification Sections/Products can be listed on single Certification Letter. Applicable to Specification Section that requires certifications only.)

Specification Section: _____

Paragraph Number: _____

Manufacturer: _____

Manufacturer's Product Designation: _____

Specification Section: _____

Paragraph Number: _____

Manufacturer: _____

Manufacturer's Product Designation: _____

Contractor's Signature and Date: _____

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SSECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for quality assurance and quality control.

1. Comply with requirements specified in General Conditions and Special Conditions in lieu of provisions specified in this Section where applicable.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
3. Services of testing laboratories and Special Inspectors as specified are intended for the Owner’s Representative’s verification of the Contractor’s compliance with the requirements of the Contract Documents. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements or relieve the Contractor of the responsibility for compliance with the Contract Document requirements.
4. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner’s Representative, and Commissioning Authority are not limited by provisions of this Section.
5. The services and quantities of testing specified are approximate and may vary. Actual services and quantities of testing will be determined by the Owner’s Representative, and/or Architect , and Commissioning Authority during the construction period.
6. Specific test and inspection requirements are not specified in this Section.

1.2 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

C. Mockups: Full-size, physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on Project site, consisting of multiple products, assemblies, and subassemblies.

D. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.

E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to O, to establish product performance and compliance with industry standards.

F. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.

J. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated.

1.3 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.4 ACTION SUBMITTALS

A. Shop Drawings: For integrated exterior mockups, provide plans, sections, and elevations, indicating materials and size of mockup construction.

1. Indicate manufacturer and model number of individual components.
2. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

1.5 INFORMATONAL SUBMITTALS

A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.

B. Qualification Data: For Contractor's quality-control personnel.

C. Contractor's Statement of Responsibility: When required by Owner, submit copy of written statement of responsibility sent to Owner before starting work on the following systems:

1. Designated seismic system, or component listed in the designated seismic system quality-assurance plan prepared by Architect.

D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Description of test and inspection.
3. Identification of applicable standards.
4. Identification of test and inspection methods.
5. Number of tests and inspections required.
6. Time schedule or time span for tests and inspections.
7. Entity responsible for performing tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

1.6 CONTRACTOR'S QUALITY-CONTROL PLAN

A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.

B. Quality-Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.

1. Project quality-control manager shall not have other Project responsibilities.

C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.

D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:

1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.
2. Special inspections required by Owner and indicated on the "Statement of Special Inspections."
3. Owner-performed tests and inspections indicated in the Contract Documents, including tests and inspections indicated to be performed by the Commissioning Authority.

E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.

F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of Owner.

1.7 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.8 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or products that are similar to those indicated for this Project in material, design, and extent.

F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirement for specialists shall not supersede building codes and regulations governing the Work.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and where required by Owner, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:

a. Provide test specimens representative of proposed products and construction.
b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
f. When testing is complete, remove test specimens, assemblies, and mockups; do not reuse products on Project.
g. When requested by the Architect, testing agency, or Special Inspector, immediately provide copies of mill reports, cutting lists, material bills, shipping bills, time and place of shipment of materials to shop, and any relevant data on previous testing and investigations of materials.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, Owner’s Representative and Commissioning Authority , with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
3. Demonstrate the proposed range of aesthetic effects and workmanship.
4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.

    a. Allow seven days for initial review and each re-review of each mockup.

5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
6. Demolish and remove mockups when directed, unless otherwise indicated.

L. Integrated Exterior Mockups: Construct integrated exterior mockup as indicated on Drawings. Coordinate installation of exterior envelope materials and products for which mockups are required in individual Specification Sections, along with supporting materials.

1.9 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner’s Representative will engage a qualified testing agency and/or Special Inspector to perform these services.

1. Owner’s Representative will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
2. Costs for retesting and reinspecting construction due to the following reasons will be charged to Contractor:

    a. Additional testing required after correction of defective materials or workmanship to verify compliance with Contract Documents.
    b. Materials or practices not complying with the Contract Documents that could possibly result in defective work rendering it necessary or advisable to perform additional testing to determine if the work is acceptable.
    c. Changes in source, quality or characteristics of materials.
    d. Site-cured cylinders requested by the Contractor.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform quality-control services required of Contractor by Owner, whether specified or not.

1. Unless otherwise indicated, provide quality-control services specified and those required by Owner

2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.

    a. Contractor shall not employ same entity engaged by Owner’s Representative, unless agreed to in writing by Owner’s Representative.

3. Notify testing agencies at least 72 hours in advance of time when Work that requires testing or inspecting will be performed.
4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service. Submit copies of reports within 24 hours to Owner's Representative and Architect.
5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
6. Submit additional copies of each written report when directed.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section "Submittal Procedures."

D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports. All inspections and test reports must be submitted to the Owner's Representative and Architect within 24 hours of test or inspection.

E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

1. The Contractor shall bear all costs associated with retesting and reinspecting after the work has been corrected to further verify compliance with the Contract Documents.

F. Testing Agency Responsibilities: Cooperate with Architect, Commissioning Agent and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect, Owner's Representative, Commissioning Agent, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine from the Architect the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor. Reports must be submitted to Owner's Representative and Architect within 24 hours.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Cooperation and access to the Work, including (but not limited to) cooperation with testing agency personnel and Special Inspectors by providing proper facilities for access including scaffolding, temporary work platforms, and hoisting facilities required for inspections in the shop or in the field.

2. Incidental labor and facilities necessary to facilitate tests and inspections, including (but not limited to) providing access to the work to be inspected or tested, obtaining and handling samples at the Site, and facilitating inspections and tests.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.
8. A complete set of shop drawings for the items being tested and inspected.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Coordinate and submit schedule concurrently with Contractor's construction schedule . Update as the Work progresses.

1. Distribution: Distribute schedule to Owner’s Representative, Architect, Commissioning Agent, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes to the satisfaction of the Architect.

1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
2. Comply with the Contract Document requirements for Division 01 Section "Cutting and Patching."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SUPPLEMENTAL GENERAL REQUIREMENTS

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Comply with requirements specified in General Conditions and Special Conditions in lieu of provisions specified in this Section where applicable.

1.2 USE CHARGES

A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow all other entities to use temporary services and facilities without cost, including, but not limited to, Owner's Representative, Architect, occupants of Project, and testing agencies.

1.3 INFORMATIONAL SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

B. LEED Submittals:

1. Erosion- and Sedimentation-Control Plan (Prerequisite SS-1): Show compliance with requirements of EPA Construction General Permit. MSD and MO DNR if disturbed site is one acre or more.

C. Fire-Safety Program: Show compliance with requirements of NFPA 241. Indicate Contractor personnel responsible for management of fire-prevention program.

D. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage.

1. Describe delivery, handling, and storage provisions for materials subject to water absorption or water damage.
2. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
3. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.

E. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:

1. Locations of dust-control partitions at each phase of work.
2. HVAC system isolation schematic drawing.
3. Location of proposed air-filtration system discharge.
4. Waste handling procedures.
5. Other dust-control measures.

1.4 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for to test and inspection each temporary utility before use. Obtain required certifications and approval of Owner’s Representative.

C. Accessible Temporary Egress: Comply with applicable provisions in the Americans with Disabilities Act Accessibility Guidelines and American National Standards Institute ANSI A117.1.

1.5 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's Representative acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Pavement: Comply with requirements specified in Division 32.

B. Fencing: Comply with requirements specified in Special Conditions.

C. Lumber and Plywood: Comply with requirements in Division 06 Section " Miscellaneous Rough Carpentry."

D. Gypsum Board: Minimum 1/2 inch thick by 48 inches wide by maximum available lengths; regular-type panels with tapered edges. Comply with ASTM C 36/C 36M.

E. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less per ASTM E 84 and passing NFPA 701 Test Method 2.

F. Dust-Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60 inches.

G. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

H. Paint: Comply with requirements in Division 09 painting Sections.

2.2 TEMPORARY FACILITIES

A. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

1. Store combustible materials apart from building.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. HVAC Equipment: Unless Owner's Representative authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to Owner's Representative, and marked for intended location and application.
3. Permanent HVAC System: If Owner's Representative authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return air grille in system and remove at end of construction and clean HVAC system as required in Division 01 Section "Closeout Procedures".
4. Provide the following temporary filtration and pressure systems:

    a. Maintain work site under negative pressure at all times. Test pressure differential at beginning of construction each day with manometer, vanometer, or other such device. Do not proceed with work until negative pressure relationship has been.
    b. Exhaust air directly to the exterior or into an existing return air system through portable HEPA filters.

C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work. Obtain Owner's Representative approval for location and relocation of facilities.

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with Owner's Representative for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities as addressed in the special conditions.

1. Connect temporary sewers as directed by Owner's Representative.

C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction where water service cannot be obtained from existing system.

D. Water Service: Use of Owner's existing water service facilities may be permitted if available and approved by the Owner's Representative. Clean and maintain in a condition acceptable to Owner's Representative. At Substantial Completion, restore these facilities to condition existing before initial use.

1. Where installations below an outlet might be damaged by spillage or leakage, provide a drip pan of suitable size to minimize water damage. Drain accumulated water promptly from pans.
2. Where required by code, provide backflow preventers.

E. Sanitary Facilities: Comply with requirements specified in Special Conditions.

F. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations and existing conditions or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

G. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.

1. Prior to commencing work, isolate the HVAC system in area where work is to be performed according to coordination drawings.

a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
b. Maintain negative air pressure within work area using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.

2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

H. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.

I. Electric Power Service: Use of Owner's existing electric power service may be permitted if available and approved by Owner's Representative. As long as equipment is maintained in a condition acceptable to Owner's Representative. Where electric power cannot be obtained from existing system, provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations. All work must be coordinated with and authorized in advance by Owner's Representative.

J. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
2. Install lighting for Project identification sign.
3. Provide the following minimum lighting levels:

    a. Corridor and Stairhalls: 1 foot candle.
    b. Unoccupied Work Spaces: 1 foot candle.
    c. Occupied Work Spaces and Storage Spaces: 5 to 10 foot candles.
    d. Work Areas: 30 foot candles.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Provide incombustible construction for offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
2. Maintain support facilities until Substantial Completion or otherwise approved by Owner's Representative. Contractor personnel may be permitted to use permanent facilities if considered to be in the best interest of the project and approved by the Owner's Representative.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas in same location as permanent roads and paved areas. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.

1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Division 31.
3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.

4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course according to Division 32.

C. Traffic Controls: Comply with requirements of Owner's Representative.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.
3. Pedestrian and vehicular access outside the construction site limits must be safely maintained and not be disrupted without the prior approval of the Owner's Representative. The Contractor is responsible for all appropriate safety and warning provisions.

D. Parking: Comply with provisions in Special Conditions.

E. Dewatering Facilities and Drains: Comply with requirements of 'Owner's Representative. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

F. Project Signs: Provide Project signs. Install signs where indicated to inform public and individuals seeking entrance to Project. Unauthorized signs are not permitted. Comply with requirements specified in Special Conditions.

1. Identification Signs: Provide Project identification signs as indicated on Drawings.
2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project. Locations to be approved by Owner's Representative.

    a. Provide temporary, directional signs for construction personnel and visitors.

3. Maintain and touchup signs so they are legible at all times.

G. Waste Disposal Facilities: Comply with requirements specified in Division 01 Section "Construction Waste Management and Disposal."

H. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

I. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.

J. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

B. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to adjacent properties and walkways, according to requirements of 2003 EPA Construction General Permit, MSD, and MoDNR if disturbed site is one acre or more.

1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant- protection zones.
2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
3. Clean, repair, and restore adjoining areas and roads affected by erosion and sedimentation from Project site during the course of Project.
4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

C. Stormwater Control: Comply with requirements of Owner's Representative. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater.

D. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Obtain extended warranty for Owner. Perform control operations lawfully, using environmentally safe materials.

E. Security Enclosure and Lockup: Install appropriate temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.

F. Barricades, Warning Signs, and Lights: Comply with requirements of Owner's Representative for erecting adequate barricades, including warning signs and lighting.

G. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated on drawings and as required by Owner's Representative.

H. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner from fumes and noise.

1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant plywood on construction operations side.
2. Construct dustproof partitions with 2 layers of 3-mil polyethylene sheet on each side. Cover floor with 2 layers of 3-mil polyethylene sheet, extending sheets 18 inches up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant plywood.

    a. Construct vestibule and airlock at each entrance through temporary partition with not less than 48 inches between doors. Maintain water-dampened foot mats in vestibule.

3. Insulate partitions to provide noise protection to occupied areas.
4. Seal joints and perimeter. Equip partitions with dustproof doors and security locks.
5. Protect air-handling equipment.

6. Weather strip openings.
7. Provide walk-off mats at each entrance through temporary partition.

I. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.

1. Prohibit smoking in all areas of the Site.
2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition.
3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.5 MOISTURE AND MOLD CONTROL

A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.

B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:

1. Protect porous materials from water damage.
2. Protect stored and installed material from flowing or standing water.
3. Keep porous and organic materials from coming into prolonged contact with concrete.
4. Remove standing water from decks.
5. Keep deck openings covered or dammed.

C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
2. Keep interior spaces reasonably clean and protected from water damage.
3. Periodically collect and remove waste containing cellulose or other organic matter.
4. Discard or replace water-damaged material.
5. Do not install material that is wet.
6. Discard, replace, or clean stored or installed material that begins to grow mold.
7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Use permanent HVAC system to control humidity.
3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.

a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective.
b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
c. Remove materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.6 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Operate Project-identification-sign lighting daily from dusk until 12:00 midnight.

D. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

E. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner’s Representative reserves right to take possession of Project identification signs.
2. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by Owner’s Representative.
3. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures."

END OF SECTION 015000

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SUPPLEMENTAL GENERAL REQUIREMENTS

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.

B. Comply with requirements specified in General Conditions and Special Conditions in lieu of provisions specified in this Section where applicable.

1.2 DEFINITIONS

A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility, except that products containing material with recycled-content are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.

B. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.3 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.

1. If a dispute arises over concurrently selectable but incompatible products, Architect will determine which products shall be used.

B. Asbestos Content: All products furnished and/or installed for this Project must be 100 percent free of asbestos containing materials.

C. Electrical Products and Materials: All electrical products and materials furnished and/or installed for this Project must bear the Underwriter's Laboratories (U.L.), or other accepted agencies listing label. Any Project-related modification to these products must be in compliance with the National Electrical Code requirements and listed by U.L.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions and requirements specified in General Conditions and Special Conditions.

1. Coordinate deliveries to the site with the Owner's Representative, Architect, Construction Manager so as to allow for inspection by these parties prior to incorporation in the Work.
2. Any materials which the Owner's Representative, Architect determines cannot be received on site may be stored off-site in a secure location, in compliance with special conditions, at no additional cost to the Contract, until they can be received at the site. Contractor must insure off-site storage against damage or loss and provide record of material insurance to the Owner's Representative.
3. Be prepared to provide signed material receipts to the Owner's Representative upon request.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

C. Storage:

1. Contractor is responsible for designating and allotting on-site storage space. Any relocation of stored materials necessitated by Work progress will be accomplished promptly without additional cost to the Contract.
2. Except as otherwise specified, Contractor is responsible for its tools, equipment, materials, and supplies on the Site whether just stored or incorporated into the Work until building is accepted by the Owner's Representative.
3. Store products to allow for inspection and measurement of quantity or counting of units.
4. Store materials in a manner that will not endanger Project structure.
5. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
6. Store cementitious products and materials on elevated platforms.
7. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
8. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
9. Protect stored products from damage and liquids from freezing.

1.5 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.
3. Refer to Divisions 02 through 49 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner’s Representative reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.

B. Product Selection Procedures:

1. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in General Conditions and Special Conditions for consideration of an unnamed product by the other named manufacturers.

C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

1. If no product available within specified category matches and complies with other specified requirements, comply with provisions in General Conditions and Special Conditions for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with requirements.

1. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
2. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SUPPLEMENTAL GENERAL REQUIREMENTS

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Coordination of Owner-installed products.
5. Progress cleaning.
6. Starting and adjusting.
7. Protection of installed construction.
8. Correction of the Work.

B. Comply with requirements specified in General Conditions and Special Conditions in lieu of provisions specified in this Section where applicable.

1.2 SUBMITTALS

A. Qualification Data: For land surveyor.

B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.

C. Certified Surveys: Submit two copies signed by land surveyor.

D. Final Property Survey: Submit 10 copies showing the Work performed and record survey data. Also submit .pdf and CADD electronic versions.

1.3 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is licensed in the State of Missouri and who is experienced in providing land-surveying services of the kind indicated.

B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of all utilities and structures that may affect the Work.

1. Before construction, verify the location and points of connection of utility services.

B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
2. Furnish location data for work related to Project that may be performed by others serving Project site.

C. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
2. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
3. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
4. Verify field dimensions.
5. Test surfaces where the surface dryness is in question with a current moisture-indicating device.

D. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

1. Description of the Work.
2. List of detrimental conditions, including substrates.
3. List of unacceptable installation tolerances.
4. Recommended corrections.

E. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions and the responsibility for any corrective work required due to faulty base surfaces or improper conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with Owner's Representative.

B. Space Requirements: Verify space requirements and dimensions of items shown on Drawings.

C. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Division 01 Section "Project Management and Coordination." Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
4. Maintain headroom clearances indicated on drawings, but not less than 96 inches in occupied spaces and 90 inches in unoccupied spaces.
5. Install materials, products and equipment such that manufacturer’s labels do not appear on exposed surfaces of the finished work, except in unfinished portions of the building such as mechanical equipment rooms.
6. Install materials, products and equipment so they are readily accessible for operation, maintenance and repair. Minor deviations from Drawings may be made to accomplish required accessibility, but changes involving extra cost shall not be made without prior written approval.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Tools and Equipment: Do not use tools or equipment that produces harmful noise levels.

G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.

3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.4 OWNER-INSTALLED PRODUCTS

A. Owner-Furnished Owner-Installed Products:

1. Products indicated as "O.F.O.I." (Owner Furnished, Owner Installed) will be furnished and installed by the Owner. Mechanical and electrical service lines and support systems for such products, where indicated, shall be included in the Contract Sum. Final connections from service lines to the equipment will be provided by the Owner, unless otherwise indicated.

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction forces. Refer to General Conditions and Supplemental Conditions.

3.5 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
3. Place waste materials in containers provided for this purpose.
4. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

    a. Use containers intended for holding waste materials of type to be stored.

5. Provide sufficient quantity of waste containers on Site and on each floor of building and in each work area for collection of waste materials, rubbish and debris.

    a. Refer to Division 01 Section "Construction Waste Management" for additional requirements for waste containers for recycling of waste materials.

6. Lower waste materials from building in a controlled manner; do not drop or throw materials from heights.
7. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal:

1. Contractor shall remove his own waste and surplus materials without interference with others at least once per week or more often if waste and surplus materials interfere with the work of others or present a fire or safety hazard.
2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.
3. Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
4. Refer to Division 01 Section "Construction Waste Management" for additional requirements for waste disposal and recycling.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

K. Cost of Progress Cleaning:

1. Cost of providing containers, placing waste materials in containers and disposing of waste in containers is the responsibility of the Contractor.

3.6 STARTING AND ADJUSTING

A. Coordinate startup and adjusting of equipment and operating components with requirements in Division 01 Section "General Commissioning Requirements."

B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

C. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.

D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 01 Section "Quality Requirements."

3.7 PROTECTION OF INSTALLED CONSTRUCTION

A. Contractor is responsible for protection and safekeeping of his materials, products, and equipment stored on the premises or incorporated into the construction until his contract is complete and accepted by the Owner’s Representative.

B. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

C. Comply with manufacturer's written instructions for temperature and relative humidity.

3.8 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300

SECTION 017329 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

B. Contractor is responsible for all cutting, fitting and patching required to correct or modify newly installed construction, including but not limited to:

1. Coordination between all trades.
2. Performing sequential excavation and backfill.
3. Completing the Work or making its several parts fit together properly or integrate with other Work.
4. Uncovering portions of the Work to provide for installation of ill-timed Work.
5. Removing and replacing defective Work.
6. Removing and replacing Work not conforming to requirements of Contract Documents.
7. Removing samples of installed Work as specified for testing.
8. Providing routine penetrations of non-structural surfaces for installation of materials such as piping and electrical conduit.

1.2 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.

B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.3 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with requirements in Section 018113.13 "Sustainable Design Requirements - LEED for New Construction and Major Renovations,"

B. In-Place Materials: Use materials identical to in-place materials.

1. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
2. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

C. Materials used for sealing openings shall have a fire rating equal to or greater than the rating of the floor, ceiling or partition and shall comply with applicable codes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Adjacent Occupied Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
2. Restore Work and surfaces with new products in accordance with requirements of the Contract Documents.

B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. Employ original Installer for cutting and patching of newly installed construction; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

    a. Refinish entire surfaces as necessary to provide an even new finish.
    b. For continuous surfaces, refinish to nearest intersection.
    c. For assemblies, entirely refinish.
    d. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    e. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

    a. In renovated rooms/areas to receive new floor finishes, remove existing finish flooring and related materials and prepare subfloor by cutting back, applying concrete fill or other acceptable leveling fill as necessary to provide subfloor that is level and properly prepared to receive new floor finish as required by Room Finish Schedule and material manufacturers written recommendations.
    b. In renovated rooms/areas to receive new wall finishes, those portions of existing walls that remain shall have their surfaces patched, cut back, or brought forward as necessary, and prepared as required to receive the new finishes per Room Finish Schedule.
    c. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for the substrate over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
    d. In rooms or areas where patching is required on one wall only, that entire wall is to be refinished to match the existing finish and color, including existing painted doors, door frames and window frames if they occur in that wall.
    e. In rooms or areas where patching is required on two or more walls, all walls, including painted doors, door frames and painted window frames, are to be refinished.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.

    a. In rooms or areas where patching is required in an existing plaster or gypsum wallboard ceiling, the entire ceiling is to be repainted. In rooms where patching is required in existing acoustic tile ceilings, patch ceilings with matching type and pattern of acoustic tile, clean all remaining tile and apply one coat of white latex paint by roller over all tile surfaces. Clean all exposed metal suspension system.

5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
6. Openings created as a result of removal of materials must be patched to match adjacent construction as to materials and finishes, unless otherwise indicated.

a. Contractor responsible for cutting and patching shall also be responsible for furnishing and installing lintels where openings are cut through existing masonry or concrete walls. Refer to Lintel Schedule in Division 05 Section ”Metal Fabrications” for sizing of lintels, unless lintels are shown on Drawings.

7. Where existing equipment is removed and new equipment is installed in the existing opening, the Contractor installing the new equipment shall close up the unused portion of the opening with materials matching adjacent construction.
8. Paint all exposed insulated or non-insulated pipes and ducts in finished rooms or areas.
9. Where existing equipment or assemblies are removed, the Contractor removing the equipment shall patch and repair the floor, walls and ceiling.

D. Roofing:

1. Before commencing with cutting and patching of roofing, consult with the Owner regarding the existence of an outstanding roofing warranty. If such a warranty exists, obtain written approval of the methods to be used from the roofing manufacturer who issued the warranty so as not to affect the value of the warranty.
2. If necessary, cutting and patching of roofing to be performed by roofing manufacturer authorized personnel only.
3. Cut, patch, repair and extend roofing and insulation as follows:

a. Where disturbed or damaged by alteration Work or activities related to same.
b. Where new Work connects to existing construction.

4. Roof areas penetrated for alterations shall be protected against damage and leakage by the Contractor performing the Work. Roof openings shall not be left uncovered or unprotected overnight or during any periods of rainy or inclement weather.
5. Remove loose aggregate, if applicable, and store away from work area.
6. Work shall be performed in a manner to provide for permanent water-tight splice or repair.
7. Roof repair and alteration Work and materials shall match existing roofing materials and construction.
8. Upon completion and inspection of splice or repair Work, remove debris from the roof and replace the aggregate as required.
9. Protect undisturbed existing and newly repaired roofing subject to traffic and damage.

3.4 CLEANING

A. Clean areas and spaces where cutting and patching are performed.

B. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 017329

SUPPLEMENTAL GENERAL REQUIREMENTS

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for the following:

1. Salvaging nonhazardous demolition and construction waste.
2. Recycling nonhazardous demolition and construction waste.
3. Disposing of nonhazardous demolition and construction waste.

B. Comply with requirements specified in General Conditions and Special Conditions in lieu of provisions specified in this Section where applicable.

1.2 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to Owner.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.3 PERFORMANCE REQUIREMENTS

A. General: Achieve end-of-Project rates for salvage/recycling of 50 percent by weight of total non-hazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials , including the following:

1. Demolition Waste:

a. Asphaltic paving.
b. Concrete.
c. Concrete reinforcing steel.
d. Brick.
e. Concrete masonry units.
f. Wood studs.
g. Wood joists.
h. Plywood and oriented strand board.
i. Wood paneling.
j. Wood trim.
k. Structural and miscellaneous steel.
l. Rough hardware.
m. Roofing.
n. Insulation.
o. Doors and frames.
p. Door hardware.
q. Windows.
r. Glazing.
s. Metal studs.
t. Gypsum board.
u. Acoustical tile and panels.
v. Carpet.
w. Carpet pad.
x. Demountable partitions.
y. Equipment.
z. Cabinets.
aa. Plumbing fixtures.
bb. Piping.
cc. Supports and hangers.
dd. Valves.
ee. Sprinklers.
ff. Mechanical equipment.
gg. Refrigerants.
hh. Electrical conduit.
ii. Copper wiring.
jj. Lighting fixtures.
kk. Lamps.
ll. Ballasts.
mm. Electrical devices.
nn. Switchgear and panelboards.
oo. Transformers.

2. Construction Waste:

a. Masonry and CMU.
b. Lumber.
c. Wood sheet materials.
d. Wood trim.
e. Metals.
f. Roofing.
g. Insulation.
h. Carpet and pad.
i. Gypsum board.
j. Piping.

k. Electrical conduit.
l. Packaging: Regardless of salvage/recycle goal indicated above, salvage or recycle 100 percent of the following uncontaminated packaging materials:

1) Paper.
2) Cardboard.
3) Boxes.
4) Plastic sheet and film.
5) Polystyrene packaging.
6) Wood crates.
7) Plastic pails.

1.4 ACTION SUBMITTALS

A. Waste Management Plan: Submit plan within 7 days of date established for the Notice to Proceed .

1.5 INFORMATIONAL SUBMITTALS

A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Use Form CWM-7 for construction waste and Form CWM-8 for demolition waste . Include the following information:

1. Material category.
2. Generation point of waste.
3. Total quantity of waste in tons .
4. Quantity of waste salvaged, both estimated and actual in tons.
5. Quantity of waste recycled, both estimated and actual in tons.
6. Total quantity of waste recovered (salvaged plus recycled) in tons.
7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

B. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.

C. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

D. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

E. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

F. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

G. LEED Submittal: LEED letter template for Credit MR 2, signed by Contractor, tabulating total waste material, quantities diverted and means by which it is diverted, and statement that requirements for the credit have been met.

H. Qualification Data: For Waste Management Coordinator and refrigerant recovery technician.

I. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.6 QUALITY ASSURANCE

A. Waste Management Coordinator Qualifications: Experienced firm, with a record of successful waste management coordination of projects with similar requirements, that employs a LEED-Accredited Professional, accredited by the USGBC, as waste management coordinator. Waste management coordinator may also serve as LEED coordinator.

B. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

C. Regulatory Requirements: Comply with hauling and disposal regulations of Owner.

D. Waste Management Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:

1. Review and discuss waste management plan including responsibilities of Waste Management Coordinator.
2. Review requirements for documenting quantities of each type of waste and its disposition.
3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
5. Review waste management requirements for each trade.

1.7 WASTE MANAGEMENT PLAN

A. General: Develop a waste management plan according to ASTM E 1609 and requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of demolition, site-clearing, and construction waste generated by the Work. Use Form CWM-1 for construction waste and Form CWM-2 for demolition waste. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Use Form CWM-3 for construction waste and Form CWM-4 for demolition waste. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.

D. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Use Form CWM-5 for construction waste and Form CWM-6 for demolition waste. Include the following:

1. Total quantity of waste.
2. Estimated cost of disposal (cost per unit). Include hauling and tipping fees and cost of collection containers for each type of waste.
3. Total cost of disposal (with no waste management).
4. Revenue from salvaged materials.
5. Revenue from recycled materials.
6. Savings in hauling and tipping fees by donating materials.
7. Savings in hauling and tipping fees that are avoided.
8. Handling and transportation costs. Include cost of collection containers for each type of waste.
9. Net additional cost or net savings from waste management plan.

PART 2 - PRODUCTS - (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

1. Comply with Division 01 Section "Temporary Facilities and Controls" for operation, termination, and removal requirements and with requirements of General Conditions and Special Conditions.

B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at Project site full time for duration of Project.

C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.

1. Distribute waste management plan to everyone concerned within three days of submittal return.
2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
2. Comply with Division 01 Section "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 SALVAGING DEMOLITION WASTE

A. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
3. Store items in a secure area until installation.
4. Protect items from damage during transport and storage.
5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.

B. Salvaged Items for Sale and Donation: Not permitted on Project site.

C. Salvaged Items for Owner's Use:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner’s Representative.
5. Protect items from damage during transport and storage.

D. Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.

E. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.

F. Plumbing Fixtures: Separate by type and size.

G. Lighting Fixtures: Separate lamps by type and protect from breakage.

H. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Owner .

C. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.

D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.

1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.

    a. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste off Owner's property and transport to recycling receiver or processor.

3.4 RECYCLING DEMOLITION WASTE

A. Asphaltic Concrete Paving: Break up and transport paving to asphalt-recycling facility.

B. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.

1. Pulverize concrete to maximum 4-inch size.

C. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.

1. Pulverize masonry to maximum 4-inch size.
2. Clean and stack undamaged, whole masonry units on wood pallets.

D. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.

E. Metals: Separate metals by type.

1. Structural Steel: Stack members according to size, type of member, and length.
2. Remove and dispose of bolts, nuts, washers, and other rough hardware.

F. Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, staples, and accessories.

G. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.

H. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.

I. Metal Suspension System: Separate metal members including trim, and other metals from acoustical panels and tile and sort with other metals.

J. Carpet: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.

1. Store clean, dry carpet in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.

K. Carpet Tile: Remove debris, trash, and adhesive.

1. Stack tile on pallet and store clean, dry carpet in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.

L. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.

M. Conduit: Reduce conduit to straight lengths and store by type and size.

3.5 RECYCLING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

C. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location.

1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.

3.6 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to Owner.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Burning: Burning of waste materials is permitted only at designated areas on Owner's property, provided required permits are obtained. Provide full-time monitoring for burning materials until fires are extinguished.

D. Disposal: Transport waste materials and dispose of at designated spoil areas on Owner's property.

E. Disposal: Transport waste materials off Owner's property and legally dispose of them.

Attachments:

Form CWM-1 for construction waste identification.
Form CWM-2 for demolition waste identification.
Form CWM-3 for construction waste reduction work plan.
Form CWM-4 for demolition waste reduction work plan.
Form CWM-5 cost/revenue analysis of construction waste reduction work plan.
Form CWM-6 cost/revenue analysis of demolition waste reduction work plan.
Form CWM-7 for construction waste
Form CWM-8 for demolition waste.

END OF SECTION 017419

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FORM CWM-1: CONSTRUCTION WASTE IDENTIFICATION

Project Name: New College of Business Administration Building
Project Location: University of Missouri – St. Louis
Owner's Project No. #S7646

MATERIAL CATEGORY	GENERATION POINT	EST. QUANTITY OF MATERIALS RECEIVED* (A)	EST. WASTE - % (B)	TOTAL EST. QUANTITY OF WASTE* (C = A x B)	EST. VOLUME CY (CM)	EST. WEIGHT TONS (TONNES)	REMARKS AND ASSUMPTIONS
Packaging: Cardboard							
Packaging: Boxes							
Packaging: Plastic Sheet or Film							
Packaging: Polystyrene							
Packaging: Pallets or Skids							
Packaging: Crates							
Packaging: Paint Cans							
Packaging: Plastic Pails							
Site-Clearing Waste							
Masonry or CMU							
Lumber: Cut-Offs							
Lumber: Warped Pieces							
Plywood or OSB (scraps)							
Wood Forms							
Wood Waste Chutes							
Wood Trim (cut-offs)							
Metals							

Insulation							
Roofing							
Joint Sealant Tubes							
Gypsum Board (scraps)							
Carpet and Pad (scraps)							
Piping							
Electrical Conduit							
Other:							
* Insert units of measure.							

FORM CWM-2: DEMOLITION WASTE IDENTIFICATION				**Project Name: New College of Business Administration Building** **Project Location: University of Missouri – St. Louis** **Owner's Project No. #S7646**
MATERIAL DESCRIPTION	EST. QUANTITY	EST. VOLUME CY (CM)	EST. WEIGHT TONS (TONNES)	REMARKS AND ASSUMPTIONS
Asphaltic Concrete Paving				
Concrete				
Brick				
CMU				
Lumber				
Plywood and OSB				
Wood Paneling				
Wood Trim				
Miscellaneous Metals				
Structural Steel				
Rough Hardware				
Insulation				
Roofing				
Doors and Frames				
Door Hardware				
Windows				
Glazing				
Acoustical Tile				
Carpet				
Carpet Pad				
Demountable Partitions				
Equipment				
Cabinets				
Plumbing Fixtures				

Piping				
Piping Supports and Hangers				
Valves				
Sprinklers				
Mechanical Equipment				
Electrical Conduit				
Copper Wiring				
Light Fixtures				
Lamps				
Lighting Ballasts				
Electrical Devices				
Switchgear and Panelboards				
Transformers				
Other:				

FORM CWM-3: CONSTRUCTION WASTE REDUCTION WORK PLAN

Project Name: New College of Business Administration Building
Project Location: University of Missouri – St. Louis
Owner's Project No. #S7646

MATERIAL CATEGORY	GENERATION POINT	TOTAL EST. QUANTITY OF WASTE TONS (TONNES)	DISPOSAL METHOD AND QUANTITY			HANDLING AND TRANSPORTION PROCEDURES
			EST. AMOUNT SALVAGED TONS (TONNES)	EST. AMOUNT RECYCLED TONS (TONNES)	EST. AMOUNT DISPOSED TO LANDFILL TONS (TONNES)	
Packaging: Cardboard						
Packaging: Boxes						
Packaging: Plastic Sheet or Film						
Packaging: Polystyrene						
Packaging: Pallets or Skids						
Packaging: Crates						
Packaging: Paint Cans						
Packaging: Plastic Pails						
Site-Clearing Waste						
Masonry or CMU						
Lumber: Cut-Offs						
Lumber: Warped Pieces						
Plywood or OSB (scraps)						
Wood Forms						
Wood Waste Chutes						
Wood Trim (cut-offs)						
Metals						
Insulation						
Roofing						
Joint Sealant Tubes						

Gypsum Board (scraps)						
Carpet and Pad (scraps)						
Piping						
Electrical Conduit						
Other:						

FORM CWM-4: DEMOLITION WASTE REDUCTION WORK PLAN						Project Name: New College of Business Administration Building Project Location: University of Missouri – St. Louis Owner's Project No. #S7646
MATERIAL CATEGORY	GENERATION POINT	TOTAL EST. QUANTITY OF WASTE TONS (TONNES)	DISPOSAL METHOD AND QUANTITY			HANDLING AND TRANSPORTION PROCEDURES
			EST. AMOUNT SALVAGED TONS (TONNES)	EST. AMOUNT RECYCLED TONS (TONNES)	EST. AMOUNT DISPOSED TO LANDFILL TONS (TONNES)	
Asphaltic Concrete Paving						
Concrete						
Brick						
CMU						
Lumber						
Plywood and OSB						
Wood Paneling						
Wood Trim						
Miscellaneous Metals						
Structural Steel						
Rough Hardware						
Insulation						
Roofing						
Doors and Frames						
Door Hardware						
Windows						
Glazing						

Acoustical Tile						
Carpet						
Carpet Pad						
Demountable Partitions						
Equipment						
Cabinets						
Plumbing Fixtures						
Piping						
Supports and Hangers						
Valves						
Sprinklers						
Mechanical Equipment						
Electrical Conduit						
Copper Wiring						
Light Fixtures						
Lamps						
Lighting Ballasts						
Electrical Devices						
Switchgear and Panelboards						
Transformers						

Other:						

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FORM CWM-5: COST/REVENUE ANALYSIS OF CONSTRUCTION WASTE REDUCTION WORK PLAN								Project Name: New College of Business Administration Building Project Location: University of Missouri – St. Louis Owner's Project No. #S7646
MATERIALS	TOTAL QUANTITY OF MATERIALS (VOL. OR WEIGHT) (A)	EST. COST OF DISPOSAL (B)	TOTAL EST. COST OF DISPOSAL (C = A x B)	REVENUE FROM SALVAGED MATERIALS (D)	REVENUE FROM RECYCLED MATERIALS (E)	LANDFILL TIPPING FEES AVOIDED (F)	HANDLING AND TRANSPORTATION COSTS AVOIDED (G)	NET COST SAVINGS OF WORK PLAN (H = D+E+F+G)
Packaging: Cardboard								
Packaging: Boxes								
Packaging: Plastic Sheet or Film								
Packaging: Polystyrene								
Packaging: Pallets or Skids								
Packaging: Crates								
Packaging: Paint Cans								
Packaging: Plastic Pails								
Site-Clearing Waste								
Masonry or CMU								
Lumber: Cut-Offs								
Lumber: Warped Pieces								
Plywood or								

OSB (scraps)								
Wood Forms								
Wood Waste Chutes								
Wood Trim (cut-offs)								
Metals								
Insulation								
Roofing								
Joint Sealant Tubes								
Gypsum Board (scraps)								
Carpet and Pad (scraps)								
Piping								
Electrical Conduit								
Other:								

FORM CWM-6: COST/REVENUE ANALYSIS OF DEMOLITION WASTE REDUCTION WORK PLAN								**Project Name: New College of Business Administration Building** **Project Location: University of Missouri – St. Louis** **Owner's Project No. #S7646**
MATERIALS	TOTAL QUANTITY OF MATERIALS (VOL. OR WEIGHT) (A)	EST. COST OF DISPOSAL (B)	TOTAL EST. COST OF DISPOSAL (C = A x B)	REVENUE FROM SALVAGED MATERIALS (D)	REVENUE FROM RECYCLED MATERIALS (E)	LANDFILL TIPPING FEES AVOIDED (F)	HANDLING AND TRANSPORTATION COSTS AVOIDED (G)	NET COST SAVINGS OF WORK PLAN (H = D+E+F+G)
Asphaltic Concrete Paving								
Concrete								
Brick								
CMU								
Lumber								
Plywood and OSB								
Wood Paneling								
Wood Trim								
Miscellaneous Metals								
Structural Steel								
Rough Hardware								
Insulation								
Roofing								
Doors and Frames								
Door Hardware								
Windows								
Glazing								

Acoustical Tile								
Carpet								
Carpet Pad								
Demountable Partitions								
Equipment								
Cabinets								
Plumbing Fixtures								
Piping								
Supports and Hangers								
Valves								
Sprinklers								
Mech. Equipment								
Electrical Conduit								
Copper Wiring								
Light Fixtures								
Lamps								
Lighting Ballasts								
Electrical Devices								
Switchgear and Panelboards								
Transformers								

Other:								

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FORM CWM-7: CONSTRUCTION WASTE REDUCTION PROGRESS REPORT

Project Name: New College of Business Administration Building
Project Location: University of Missouri – St. Louis
Owner's Project No. #S7646

MATERIAL CATEGORY	GENERATION POINT	TOTAL QUANTITY OF WASTE TONS (TONNES) (A)	QUANTITY OF WASTE SALVAGED		QUANTITY OF WASTE RECYCLED		TOTAL QUANTITY OF WASTE RECOVERED TONS (TONNES) (D = B + C)	TOTAL QUANTITY OF WASTE RECOVERED % (D / A x 100)
			ESTIMATED TONS (TONNES)	ACTUAL TONS (TONNES) (B)	ESTIMATED TONS (TONNES)	ACTUAL TONS (TONNES) (C)		
Packaging: Cardboard								
Packaging: Boxes								
Packaging: Plastic Sheet or Film								
Packaging: Polystyrene								
Packaging: Pallets or Skids								
Packaging: Crates								
Packaging: Paint Cans								
Packaging: Plastic Pails								
Site-Clearing Waste								
Masonry or CMU								
Lumber: Cut-								

Offs								
Lumber: Warped Pieces								
Plywood or OSB (scraps)								
Wood Forms								
Wood Waste Chutes								
Wood Trim (cut-offs)								
Metals								
Insulation								
Roofing								
Joint Sealant Tubes								
Gypsum Board (scraps)								
Carpet and Pad (scraps)								
Piping								
Electrical Conduit								
Other:								

FORM CWM-8: DEMOLITION WASTE REDUCTION PROGRESS REPORT							Project Name: New College of Business Administration Building Project Location: University of Missouri – St. Louis Owner's Project No. #S7646	
MATERIAL CATEGORY	GENERATION POINT	TOTAL QUANTITY OF WASTE TONS (TONNES) (A)	QUANTITY OF WASTE SALVAGED		QUANTITY OF WASTE RECYCLED		TOTAL QUANTITY OF WASTE RECOVERED TONS (TONNES) (D = B + C)	TOTAL QUANTITY OF WASTE RECOVERED % (D / A x 100)
			ESTIMATED TONS (TONNES)	ACTUAL TONS (TONNES) (B)	ESTIMATED TONS (TONNES)	ACTUAL TONS (TONNES) (C)		
Asphaltic Concrete Paving								
Concrete								
Brick								
CMU								
Lumber								
Plywood and OSB								
Wood Paneling								
Wood Trim								
Miscellaneous Metals								
Structural Steel								
Rough Hardware								
Insulation								
Roofing								
Doors and Frames								
Door Hardware								
Windows								

Glazing								
Acoustical Tile								
Carpet								
Carpet Pad								
Demountable Partitions								
Equipment								
Cabinets								
Plumbing Fixtures								
Piping								
Supports and Hangers								
Valves								
Sprinklers								
Mechanical Equipment								
Electrical Conduit								
Copper Wiring								
Light Fixtures								
Lamps								
Lighting Ballasts								
Electrical Devices								
Switchgear and Panelboards								
Transformers								

Other:								

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SUPPLEMENTAL GENERAL REQUIREMENTS

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Warranties.
2. Final cleaning.
3. Repair of the Work.

B. Comply with requirements specified in General Conditions and Special Conditions in lieu of provisions specified in this Section where applicable.

1.2 ACTION SUBMITTALS

A. Product Data: For cleaning agents.

B. Contractor's List of Incomplete Items (Punch List): Initial submittal at Substantial Completion.

C. Certified List of Incomplete Items (Punch List): Final submittal at Final Completion.

1.3 CLOSEOUT SUBMITTALS

A. Certificate of Insurance: For continuing coverage.

B. Field Report: For pest control inspection.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:

    a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
    d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    e. Remove snow and ice to provide safe access to building.
    f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
    g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
    h. Sweep concrete floors broom clean in unoccupied spaces.
    i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
    j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
    k. Remove labels that are not permanent.
    l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

        1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

m. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
n. Replace parts subject to unusual operating conditions.
o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
q. Clean ducts, blowers, and coils if units were operated without filters during construction.

1) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report on completion of cleaning.

r. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
s. Leave Project clean and ready for occupancy.

C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Comply with pest control requirements in Division 01 Section "Temporary Facilities and Controls." Prepare a written report.

D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

E. Construction Waste Disposal: Comply with waste disposal requirements in Division 01 Section "Construction Waste Management and Disposal."

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.

a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.

3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 017700

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for instructing Owner's Representative, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Training in operation and maintenance of systems, subsystems, and equipment.
3. Demonstration and training video recordings.

1.2 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit two copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

B. Attendance Record: For each training module, submit list of participants and length of instruction time.

C. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.3 CLOSEOUT SUBMITTALS

A. Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.

1. Identification: On each copy, provide an applied label with the following information:

a. Name of Project and Owner’s project number.
b. Name and address of videographer.
c. Name of Architect.
d. Name of Contractor.
e. Date of video recording.

2. Transcript: Prepared on 8-1/2-by-11-inch paper, punched and bound in heavy-duty, 3-ring, vinyl-covered binders. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding videotape. Include name of Project and date of video recording on each page.

3. Transcript: Prepared in PDF electronic format. Include a cover sheet with same label information as the corresponding video recording and a table of contents with links to corresponding training components. Include name of Project and date of video recording on each page.
4. At completion of training, submit complete training manual(s) for Owner's use prepared and bound in format matching operation and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 01 Section "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Videographer Qualifications: A professional videographer who is experienced photographing construction projects.

D. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:

1. Inspect and discuss locations and other facilities required for instruction.
2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
3. Review required content of instruction.
4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.5 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for operation, adjustment and maintenance of each system and equipment required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. Use the operating and maintenance manuals required by the Contract Documents as the basis for instruction, including a full detailed review of them manual's contents including explanation of all aspects of operation and maintenance. Prepare and include additional data when the need for additional data becomes apparent during the training sessions. For each module, include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

    a. System, subsystem, and equipment descriptions.
    b. Performance and design criteria if Contractor is delegated design responsibility.
    c. Operating standards.
    d. Regulatory requirements.
    e. Equipment function.
    f. Operating characteristics.
    g. Limiting conditions.
    h. Performance curves.

2. Documentation: Review the following items in detail:

    a. Emergency manuals.
    b. Operations manuals.
    c. Maintenance manuals.
    d. Project record documents.
    e. Identification systems.
    f. Warranties and bonds.
    g. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:

    a. Instructions on meaning of warnings, trouble indications, and error messages.
    b. Instructions on stopping.
    c. Shutdown instructions for each type of emergency.
    d. Operating instructions for conditions outside of normal operating limits.
    e. Sequences for electric or electronic systems.
    f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:

    a. Startup procedures.
    b. Equipment or system break-in procedures.
    c. Routine and normal operating instructions.
    d. Regulation and control procedures.
    e. Control sequences.
    f. Safety procedures.
    g. Instructions on stopping.
    h. Normal shutdown instructions.
    i. Operating procedures for emergencies.

j. Operating procedures for system, subsystem, or equipment failure.
k. Seasonal and weekend operating instructions.
l. Required sequences for electric or electronic systems.
m. Special operating instructions and procedures.

5. Adjustments: Include the following:

a. Alignments.
b. Checking adjustments.
c. Noise and vibration adjustments.
d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

a. Diagnostic instructions.
b. Test and inspection procedures.

7. Maintenance: Include the following:

a. Inspection procedures.
b. Types of cleaning agents to be used and methods of cleaning.
c. List of cleaning agents and methods of cleaning detrimental to product.
d. Procedures for routine cleaning
e. Procedures for preventive maintenance.
f. Procedures for routine maintenance.
g. Instruction on use of special tools.

8. Repairs: Include the following:

a. Diagnosis instructions.
b. Repair instructions.
c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
d. Instructions for identifying parts and components.
e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual organized in coordination with requirements in Division 01 Section "Operation and Maintenance Data."

B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner's Representative for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
2. Owner will furnish Contractor with names and positions of participants.

C. Scheduling: Provide instruction at mutually agreed on times after all final inspections, tests, and repairs have been completed. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with Owner's Representative with at least seven days' advance notice.
2. Schedule training during Contractor's normal week and daily hours. The Owner's Representative shall have the responsibility of scheduling Owner's shift work personnel accordingly.

D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

E. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of an oral, a written, or a demonstration performance-based test.

F. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

3.3 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

1. At beginning of each training module, record each chart containing learning objective and lesson outline.

B. Video: Provide minimum 640 x 480 video resolution converted to format file type acceptable to Owner, on electronic media.

1. Electronic Media: Read-only format compact disc acceptable to Owner's Representative, with commercial-grade graphic label.
2. File Hierarchy: Organize folder structure and file locations according to project manual table of contents. Provide complete screen-based menu.
3. File Names: Utilize file names based upon name of equipment generally described in video segment, as identified in Project specifications.

4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the Equipment Demonstration and Training DVD that describes the following for each Contractor involved on the Project, arranged according to Project table of contents:

    a. Name of Contractor/Installer.
    b. Business address.
    c. Business phone number.
    d. Point of contact.
    e. E-mail address.

C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.

1. Film training session(s) in segments not to exceed 15 minutes.

    a. Produce segments to present a single significant piece of equipment per segment.
    b. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.
    c. Where a training session on a particular piece of equipment exceeds 15 minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.

D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.

1. Furnish additional portable lighting as required.

E. Narration: Describe scenes on video recording by audio narration by microphone while video recording is recorded or dubbing audio narration off-site after video recording is recorded. Include description of items being viewed.

F. Transcript: Provide a transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.

G. Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

END OF SECTION 017900

SUPPLEMENTAL GENERAL REQUIREMENTS

SECTION 018113 - SUSTAINABLE DESIGN REQUIREMENTS - LEED FOR NEW CONSTRUCTION AND MAJOR RENOVATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general requirements and procedures for compliance with certain USGBC LEED prerequisites and credits needed for Project to obtain LEED Gold certification based on USGBC's "LEED 2009 for New Construction & Major Renovations."

1. Other LEED prerequisites and credits needed to obtain LEED certification depend on product selections and may not be specifically identified as LEED requirements. Compliance with requirements needed to obtain LEED prerequisites and credits may be used as one criterion to evaluate substitution requests and comparable product requests.
2. Additional LEED prerequisites and credits needed to obtain the indicated LEED certification depend on Architect's design and other aspects of Project that are not part of the Work of the Contract.
3. A copy of the LEED Project checklist is attached at the end of this Section for information only.
4. Specific requirements for LEED are included in greater detail in other Sections.

1.2 DEFINITIONS

A. Chain-of-Custody Certificates: Certificates signed by manufacturers certifying that wood used to make products was obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship." Certificates shall include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body.

B. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.

C. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.

1. "Post-consumer" material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose.
2. "Pre-consumer" material is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials such as rework, regrind, or scrap generated in a process and capable of being reclaimed within the same process that generated it.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Respond to questions and requests from Architect and the USGBC regarding LEED credits that are the responsibility of the Contractor, that depend on product selection or product qualities, or that depend on Contractor's procedures until the USGBC has made its determination on the project's LEED certification application. Document responses as informational submittals and on the USGBC's online documentation site.

B. Contractor shall designate one representative to have access to the USGBC online documentation site. This person shall have authority to provide and verify information relevant to the project on behalf of the Contractor. Contractor's representative shall upload all data and fill out and sign all forms required to complete documentation for each of the credits designated as the Contractor's responsibility.

C. Credits that are the responsibility of the Contractor are those indicated in the Action Submittals portion of this specification.

1.4 ACTION SUBMITTALS

A. General: Submit additional LEED submittals required by other Specification Sections.

B. LEED submittals are in addition to other submittals. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance with indicated LEED requirements.

C. LEED Documentation Submittals:

1. Prerequisite SS Prereq 1: Provide information describing implementation of the erosion control plan.
2. Credit MR 2: Comply with Division 01 Section "Construction Waste Management and Disposal."
3. Credit MR 4: Product data and certification letter indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content. Include statement indicating cost for each product having recycled content.
4. Credit MR 5: Product data for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
5. Credit MR 7: Product data and chain-of-custody certificates for products containing certified wood. Include statement indicating cost for each certified wood product.
6. Credit EQ 3.1:

    a. Construction indoor-air-quality management plan.
    b. Product data for temporary filtration media.
    c. Product data for filtration media used during occupancy.
    d. Construction Documentation: Six photographs at three different times during the construction period, along with a brief description of the SMACNA approach employed, documenting implementation of the indoor-air-quality management measures, such as protection of ducts and on-site stored or installed absorptive materials.

7. Credit IEQ 3.2:

a. Signed statement describing the building air flush-out procedures including the dates when flush-out was begun and completed and statement that filtration media was replaced after flush-out.
b. Product data for filtration media used during flush-out and during occupancy.
c. Report from testing and inspecting agency indicating results of indoor-air-quality testing and documentation showing compliance with indoor-air-quality testing procedures and requirements.

8. Credit IEQ 4.1: Product data for adhesives and sealants used inside the weatherproofing system indicating VOC content of each product used.
9. Credit IEQ 4.2: Product data for paints and coatings used inside the weatherproofing system indicating VOC content of each product used.
10. Credit IEQ 4.3: Product data for carpet indicating compliance with CRI Green Label Plus Program and Floor Score standard including VOC content of each product used.
11. Credit IEQ 4.4: Product data for products containing composite wood or agrifiber products or wood glues indicating that they do not contain urea-formaldehyde resin.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For LEED coordinator.

B. Project Materials Cost Data: Provide statement indicating total cost for materials used for Project. Costs exclude labor, overhead, and profit. Include breakout of costs for the following categories of items:

1. Furniture.
2. Plumbing.
3. Mechanical.
4. Electrical.
5. Specialty items such as elevators and equipment.
6. Wood-based construction materials.

C. LEED Action Plans: Provide preliminary submittals within seven days of date established for the Notice to Proceed indicating how the following requirements will be met:

1. Credit MR 2: Waste management plan complying with Division 01 Section "Construction Waste Management and Disposal."
2. Credit MR 3: List of proposed salvaged, refurbished, and reused materials. Identify each material that will be salvaged, refurbished, or reused, including its source, cost, and replacement cost if the item was to be purchased new.
3. Credit MR 4: List of proposed materials with recycled content. Indicate cost, post-consumer recycled content, and pre-consumer recycled content for each product having recycled content.
4. Credit MR 5: List of proposed regional materials. Identify each regional material, including its source, cost, and the fraction by weight that is considered regional.
5. Credit MR 7: List of proposed certified wood products. Indicate each product containing certified wood, including its source and cost of certified wood products.
6. Credit IEQ 3.1: Construction indoor-air-quality management plan.

D. LEED Progress Reports: Concurrent with each Application for Payment, submit reports comparing actual construction and purchasing activities with LEED action plans for the following:

1. Credit MR 2: Waste reduction progress reports complying with Division 01 Section "Construction Waste Management and Disposal."
2. Credit MR 4: Recycled content.
3. Credit MR 5: Regional materials.
4. Credit MR 7: Certified wood products.

1.6 QUALITY ASSURANCE

A. LEED Coordinator: Engage an experienced LEED-Accredited Professional to coordinate LEED requirements. LEED coordinator may also serve as waste management coordinator.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Provide products and procedures necessary to obtain LEED credits required in this Section. Although other Sections may specify some requirements that contribute to LEED credits, the Contractor shall determine additional materials and procedures necessary to obtain LEED credits indicated.

2.2 RECYCLED CONTENT OF MATERIALS

A. Credit MR 4: Building materials shall have recycled content such that post-consumer recycled content plus one-half of pre-consumer recycled content for Project constitutes a minimum of 10 percent of cost of materials used for Project.

1. Cost of post-consumer recycled content plus one-half of pre-consumer recycled content of an item shall be determined by dividing weight of post-consumer recycled content plus one-half of pre-consumer recycled content in the item by total weight of the item and multiplying by cost of the item.
2. Do not include furniture, plumbing, mechanical and electrical components, and specialty items such as elevators and equipment in the calculation.

2.3 REGIONAL MATERIALS

A. Credit MR 5: Not less than 10 percent of building materials (by cost) shall be regional materials.

2.4 CERTIFIED WOOD

A. Credit MR 7: Not less than 50 percent (by cost) of wood-based materials shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

1. Wood-based materials include, but are not limited to, the following materials when made from wood, engineered wood products, or wood-based panel products:

a. Rough carpentry.
b. Miscellaneous carpentry.
c. Heavy timber construction.
d. Wood decking.
e. Metal-plate-connected wood trusses.
f. Structural glued-laminated timber.
g. Finish carpentry.
h. Architectural woodwork.
i. Wood paneling.
j. Wood veneer wall covering.
k. Wood flooring.
l. Wood lockers.
m. Wood cabinets.
n. Furniture.

2.5 LOW-EMITTING MATERIALS

A. Credit IEQ 4.1: For field applications that are inside the weatherproofing system, adhesives and sealants shall comply with the following VOC content limits when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Wood Glues: 30 g/L.
2. Metal-to-Metal Adhesives: 30 g/L.
3. Adhesives for Porous Materials (Except Wood): 50 g/L.
4. Subfloor Adhesives: 50 g/L.
5. Plastic Foam Adhesives: 50 g/L.
6. Carpet Adhesives: 50 g/L.
7. Carpet Pad Adhesives: 50 g/L.
8. VCT and Asphalt Tile Adhesives: 50 g/L.
9. Cove Base Adhesives: 50 g/L.
10. Gypsum Board and Panel Adhesives: 50 g/L.
11. Rubber Floor Adhesives: 60 g/L.
12. Ceramic Tile Adhesives: 65 g/L.
13. Multipurpose Construction Adhesives: 70 g/L.
14. Fiberglass Adhesives: 80 g/L.
15. Contact Adhesive: 80 g/L.
16. Structural Glazing Adhesives: 100 g/L.
17. Wood Flooring Adhesive: 100 g/L.
18. Structural Wood Member Adhesive: 140 g/L.
19. Single-Ply Roof Membrane Adhesive: 250 g/L.
20. Special-Purpose Contact Adhesive (contact adhesive that is used to bond melamine-covered board, metal, unsupported vinyl, rubber, or wood veneer 1/16 inch or less in thickness to any surface): 250 g/L.
21. Top and Trim Adhesive: 250 g/L.
22. Plastic Cement Welding Compounds: 250 g/L.
23. ABS Welding Compounds: 325 g/L.
24. CPVC Welding Compounds: 490 g/L.
25. PVC Welding Compounds: 510 g/L.
26. Adhesive Primer for Plastic: 550 g/L.
27. Sheet-Applied Rubber Lining Adhesive: 850 g/L.
28. Aerosol Adhesive, General-Purpose Mist Spray: 65 percent by weight.
29. Aerosol Adhesive, General-Purpose Web Spray: 55 percent by weight.
30. Special-Purpose Aerosol Adhesive (All Types): 70 percent by weight.

31. Other Adhesives: 250 g/L.
32. Architectural Sealants: 250 g/L.
33. Nonmembrane Roof Sealants: 300 g/L.
34. Single-Ply Roof Membrane Sealants: 450 g/L.
35. Other Sealants: 420 g/L.
36. Sealant Primers for Nonporous Substrates: 250 g/L.
37. Sealant Primers for Porous Substrates: 775 g/L.
38. Modified Bituminous Sealant Primers: 500 g/L.
39. Other Sealant Primers: 750 g/L.

B. Credit IEQ 4.2: For field applications that are inside the weatherproofing system, paints and coatings shall comply with the following VOC content limits when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Flat Paints and Coatings: VOC not more than 50 g/L.
2. Nonflat Paints and Coatings: VOC not more than 150 g/L.
3. Dry-Fog Coatings: VOC not more than 400 g/L.
4. Primers, Sealers, and Undercoaters: VOC not more than 200 g/L.
5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
6. Zinc-Rich Industrial Maintenance Primers: VOC not more than 340 g/L.
7. Pretreatment Wash Primers: VOC not more than 420 g/L.
8. Clear Wood Finishes, Varnishes: VOC not more than 350 g/L.
9. Clear Wood Finishes, Lacquers: VOC not more than 550 g/L.
10. Floor Coatings: VOC not more than 100 g/L.
11. Shellacs, Clear: VOC not more than 730 g/L.
12. Shellacs, Pigmented: VOC not more than 550 g/L.
13. Stains: VOC not more than 250 g/L.

C. Credit IEQ 4.3: Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Credit IEQ 4.4: Composite wood, agrifiber products, and adhesives shall not contain urea-formaldehyde resin.

PART 3 - EXECUTION

3.1 MEASUREMENT AND VERIFICATION

A. Credit EA 5: Implement measurement and verification plan consistent with Option B: Energy Conservation Measure Isolation or Option D: Calibrated Simulation, Savings Estimation Method 2 in the EVO's "International Performance Measurement and Verification Protocol (IPMVP), Volume III: Concepts and Options for Determining Energy Savings in New Construction."

B. If not already in place, install metering equipment to measure energy usage. Monitor, record, and trend log measurements.

C. Evaluate energy performance and efficiency by comparing actual to predicted performance.

D. Measurement and verification period shall cover at least one year of post-construction occupancy.

3.2 CONSTRUCTION WASTE MANAGEMENT

A. Credit MR 2: Comply with Division 01 Section "Construction Waste Management and Disposal."

3.3 CONSTRUCTION INDOOR-AIR-QUALITY MANAGEMENT

A. Credit IEQ 3.1: Comply with SMACNA's "SMACNA IAQ Guideline for Occupied Buildings under Construction."

1. If Owner authorizes use of permanent heating, cooling, and ventilating systems during construction period as specified in Division 01 Section "Temporary Facilities and Controls," install filter media having a MERV 8 according to ASHRAE 52.2 at each return-air inlet for the air-handling system used during construction.
2. Replace all air filters immediately prior to occupancy.

B. Credit IEQ 3.2: Comply with one of the following requirements:

1. After construction ends, prior to occupancy and with all interior finishes installed, perform a building flush-out by supplying a total volume of 14000 cu. ft. of outdoor air per sq. ft. of floor area while maintaining an internal temperature of at least 60 deg F and a relative humidity no higher than 60 percent.

a. .

2. If occupancy is desired prior to flush-out completion, the space may be occupied following delivery of a minimum of 3500 cu. ft. of outdoor air per sq. ft. of floor area to the space. Once a space is occupied, it shall be ventilated at a minimum rate of 0.30 cfm per sq. ft. of outside air or the design minimum outside air rate determined in Prerequisite EQ 1, whichever is greater. During each day of the flush-out period, ventilation shall begin a minimum of three hours prior to occupancy and continue during occupancy. These conditions shall be maintained until a total of 14000 cu. ft./sq. ft. of outside air has been delivered to the space.

3. Air-Quality Testing:

a. Conduct baseline indoor-air-quality testing, after construction ends and prior to occupancy, using testing protocols consistent with the EPA's "Compendium of Methods for the Determination of Air Pollutants in Indoor Air," and as additionally detailed in the USGBC's "Green Building Design and Construction Reference Guide."
b. Demonstrate that the contaminant maximum concentrations listed below are not exceeded:

1) Formaldehyde: 27 ppb.
2) Particulates (PM10): 50 micrograms/cu. m.
3) Total Volatile Organic Compounds (TVOC): 500 micrograms/cu. m.
4) 4-Phenylcyclohexene (4-PH): 6.5 micrograms/cu. m.
5) Carbon Monoxide: 9 ppm and no greater than 2 ppm above outdoor levels.

c. For each sampling point where the maximum concentration limits are exceeded, conduct additional flush-out with outside air and retest the specific parameter(s) exceeded to indicate the requirements are achieved. Repeat procedure until all requirements have been met. When retesting non-complying building areas, take samples from same locations as in the first test.

d. Air-sample testing shall be conducted as follows:

1) All measurements shall be conducted prior to occupancy but during normal occupied hours, and with building ventilation system starting at the normal daily start time and operated at the minimum outside air flow rate for the occupied mode throughout the duration of the air testing.
2) Building shall have all interior finishes installed including, but not limited to, millwork, doors, paint, carpet, and acoustic tiles. Nonfixed furnishings such as workstations and partitions are encouraged, but not required, to be in place for the testing.
3) Number of sampling locations varies depending on the size of building and number of ventilation systems. For each portion of building served by a separate ventilation system, the number of sampling points shall not be less than one per 25,000 sq. ft. or for each contiguous floor area, whichever is larger, and shall include areas with the least ventilation and greatest presumed source strength.
4) Air samples shall be collected between 3 and 6 feet from the floor to represent the breathing zone of occupants, and over a minimum four-hour period.

END OF SECTION 018113

SECTION 024119 - SELECTIVE STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.

1.2 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.

1.3 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.4 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.

1.5 INFORMATIONAL SUBMITTALS

A. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting individuals and property , for environmental protection , for dust control and , for noise control. Indicate proposed locations and construction of barriers.

B. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

C. Inventory: Submit a list of items to be removed and salvaged and deliver to Owner prior to start of demolition.

D. Predemolition Photographs or Video: Submit before Work begins.

1.6 CLOSEOUT SUBMITTALS

A. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.7 QUALITY ASSURANCE

1.8 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. If suspected hazardous materials are encountered, do not disturb; immediately notify Owner’s Representative. Hazardous materials will be removed by Owner under a separate contract.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

PART 2 - PRODUCTS

2.1 PEFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA regulations. Comply with hauling and disposal regulations in St. Louis County.

B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Review record documents of existing construction provided by Owner's Representative. Owner does not guarantee that existing conditions are same as those indicated in record documents.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to the Owner’s Representative and Architect.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Owner's Representative will arrange to shut off indicated services/systems when requested by Contractor.
2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.

3.3 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Comply with requirements for access and protection specified in Division 01 Section "Temporary Facilities and Controls."

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to & from occupied portions of building.
2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Division 01 Section "Temporary Facilities and Controls."

C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

3.4 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.

4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
9. Dispose of demolished items and materials promptly.
    a. Do not bury waste materials from selective demolition activities.
    b. Do not dispose of waste materials resulting from selective demolition activities into watercourses, storm drainage system, or sanitary sewer system.
    c. Do not discharge water containing suspended materials into watercourses, storm drainage system, sanitary sewers, or onto adjacent property.
10. Ensure selective demolition operations do not adversely affect adjacent watercourse, groundwater or wildlife and do not contribute to air and noise pollution.
11. Cover or dampen dry materials and waste sufficient to prevent blown dust or debris.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch (19 mm) at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.

B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.

C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.

E. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight. See Section 075323 "Ethylene-Propylene-Diene-Monomer (EPDM) Roofing" for new roofing requirements.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
4. Comply with requirements specified in Division 01 Section "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.7 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119

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SECTION 270010 - BASIC DIVISION 27 REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes general administrative, material, and procedural requirements for Division 27 installations to expand the requirements specified in Division 01:

1. Communications systems, product general requirements, and accesses.
2. Substitutions.
3. Submittals.
4. Coordination drawings.
5. Record documents.
6. Maintenance manuals.
7. Rough-ins.
8. Communications installations.
9. Cutting and patching.

B. Related Sections: The following sections contain requirements that relate to this section:

1. Requirements of Division 20 Section "Common Work Results, Division 21 through 28" apply to this Division.
2. Division 26 Section "Conduit Rough-In Systems" for rough-in requirements.
3. Division 26 Section "Grounding and Bonding."
4. Division 26 Section "Raceways."
5. Division 26 Section "Boxes and Cabinets."
6. Division 26 Section "Electrical Identification."

1.2 REGULATORY REQUIREMENTS

A. Work and materials shall conform to and be executed, inspected and tested in accordance with the latest edition of the National Electric Code and with the governing rules and regulations of federal, state and local governmental agencies. References to "NEC" within the Division 27 Sections shall be considered synonymous to this electrical code.

B. Other codes which will apply to this installation include the current editions of:

1. ANSI C2 - National Electrical Safety Code.
2. NFPA 70E – Standard for Electrical Safety Requirements for Employee Workspaces.
3. NFPA 101 - Life Safety Code.

C. Where governing codes indicate the Drawings and Specifications do not comply with the minimum requirements of applicable codes, be responsible for either notifying the Architect in writing during the bidding period of the revisions required to meet code requirements, or providing an installation which will comply with the code requirements.

1.3 REFERENCES

A. Abbreviations and Acronyms:

1. A/E - Architect / Engineer (designer).
2. AHJ - Authority Having Jurisdiction.
3. ANSI - American National Standards Institute.
4. AWG - American Wire Gauge.
5. BICSI - Building Industry Consulting Service International.
6. BDF - Building Distribution Facility; space within a building that is the nexus of LAN distribution for that particular building.
7. Broadband - Wide bandwidth equipment or systems that can carry signals occupying in the frequency range of 54 to 1002 MHz.
8. Cat – Category; based on numerical value of structured cabling performance.
9. CAT 3 - Category 3 performance as defined by ANSI/TIA/EIA-568-B.2.
10. CAT 5E - Category 5e performance as defined by ANSI/TIA/EIA-568-B.2.
11. CAT 6 - Category 6 performance as defined by ANSI/TIA/EIA-568-B.2-1.
12. CAT 6A - Augmented Category 6 performance as defined by ANSI/TIA/EIA 568-B.2-10.
13. CATV - Community Antenna Television.
14. CTS – Certified Technology Specialist.
15. DC - Data Center.
16. EIA - Electronics Industry Alliance.
17. ELFEXT - Equal Level far End Cross Talk.
18. ER - Equipment Room.
19. EOR - Engineer of Record.
20. FOTP - Fiber Optic Test Procedure.
21. ILEC/LEC – Incumbent / Local Exchange Carrier.
22. IR – Infra-Red.
23. ISP - Inside Plant cabling.
24. IT - Information Technology.
25. IDF - Intermediate Distribution Frame.
26. ICC – Intermediate Cross Connect.
27. LOMMF - Laser Optimized Multimode Fiber.
28. LV - Low Voltage Room, Intermediate Distribution Facility; station and backbone cable concentration point on a particular floor for specific use on that same floor.
29. MCC – Main Cross Connect.
30. MDF - Main Distribution Frame.
31. MATV - Master Antenna Television.
32. Main Low Voltage Room - Main Distribution Facility; space within a building that is the main point of LAN distribution for that building or to other buildings.
33. MMF - Multimode Fiber.
34. MPOE - Main Point of Entry.
35. MHz – Megahertz.
36. NEXT - Near End Cross Talk.
37. NECA - National Electrical Contractors Association.
38. NEMA - National Electrical Manufacturers Association.
39. OSP - Outside Plant cabling.
40. OTDR - Optical Time Domain Reflectometer.
41. PSELFEXT - Power Sum Equal Level far End Cross Talk.
42. PSNEXT - Power Sum Near End Cross Talk.
43. PTZ – Pan/Tilt/Zoom.
44. RCDD - Registered Communications Distribution Designer.
45. RF - Radio Frequency.

46. ScTP - Screened Twisted Pair.
47. SCS - Structured Cabling System.
48. SMF - Single-Mode Fiber.
49. STP – Shielded Twisted Pair
50. TCIM - Telecommunication Cabling Installation Manual.
51. TDMM - Telecommunications Distribution Methods Manual.
52. Technology Outlet - Voice/data/video/other interface outlet located at workstation.
53. Telecom Spaces - Include all areas where cable or equipment will be placed, including IT resources, Engineering resources, and user stations.
54. TIA - Telecommunications Industry Association.
55. TBB – Telecommunications Bonding Backbone.
56. TSER - Telecommunications Service Entry Room.
57. TDR - Time Domain Reflectometer.
58. TGB - Telecommunications Ground Bus Bar.
59. TMGB - Telecommunications Main Ground Bus Bar.
60. TR – Telecommunications Room.
61. UTP - Unshielded Twisted Pair cabling.
62. UL - Underwriters Laboratory.
63. UNO - Unless Noted Otherwise.
64. UPS - Uninterruptible Power Supply.
65. WAP - Wireless Access Point.

B. Definitions:

1. In addition to those Definitions listed in Division 01, the following list of terms shall be defined as follows:

    a. Connect - To install required patch cords, equipment cords, cross-connect wire, etc. to complete an electrical or optical circuit.
    b. Cabling - A combination of cables, wire, cords, and connecting hardware e.g., cables, conductor terminations, connectors, outlets, patch panels, blocks, and labeling.
    c. Identifier - A unique code assigned to an element of the telecommunications infrastructure that links it to its corresponding record.
    d. Open Cabling - Cabling run horizontally within a pathway supported by cable tray, J-hooks, D-hooks, etc. that is installed above an accessible ceiling. This installed cabling is considered concealed.
    e. Exposed Cabling – Cabling that is not concealed by an accessible pathway, conduit, etc. Cabling installed open below an exposed structure.
    f. Concealed Cabling – Cabling rendered inaccessible by the structure or finish of the building.
    g. Pathway - Routing of cabling from work area outlet box to telecommunications room. Pathways may consist of conduit, conduit stub, conduit sleeve(s), cable tray, J-Hooks, etc.
    h. Telecom Cabling/Datacom Cabling – Low voltage extended frequency signal and communications cabling. Category 5e, 5E, 6, augmented 6 and fiber optic cabling.
    i. System Cabling – Low voltage signal and control cabling. System cabling is designated by the manufacturer for a particular system in each specification section.

1.4 SUBSTITUTIONS

A. The materials, products and equipment described in the Bidding Documents establish a standard of required functions, dimensions, appearance and quality to be met by any proposed substitution.

B. Refer to Division 01 for instructions on substitutions.

1.5 PERMIT AND INSPECTIONS

A. Permits: Obtain and pay for all permits, bonds, licenses, tap-in fees, etc., required by the City, State or other authority having jurisdiction over the work, as a part of the work of the affected sections.

B. Inspections: Arrange and pay for all inspections required by the above when they become due as part of the work of the sections affected. Conceal no work until approved by these governing authorities. Coordinate inspection period with the AHJ and Engineer through Construction Manager. Present the Engineer with properly signed certificate of final inspection.

1.6 SUBMITTAL PROCEDURES

A. General: Submit the following in accordance with Division 27 Section "Basic Division 27 Requirements".

1. Include and execute additional items as defined in Part 3.

B. Submit informational submittal coordination drawings for the areas specified and those areas defined as "problem" coordination areas during construction without additional cost to the Owner.

C. Definitions:

1. Submittals: A written or graphical expression of the Contractor’s interpretation of requirements in the Contract Documents to show how the Contractor intends to fulfill those requirements and identifying deviations from contract.
2. Action Submittals: Required submittal which Engineer reviews and approves or takes other appropriate action to communicate to the Contractor the status if the submittal and subsequent action are required.
3. Other (Information, Closeout, and Maintenance and Material) Submittals: Required submittals which Engineer reviews and may elect to respond. If rejected by Engineer for not complying with requirements, resubmittal or other action may be required on the part of the Contractor.
4. Layout Drawings: Drawings assembled by the Contractor consisting of to-scale architectural floor plans with room numbers and elevations of the actual facility being constructed or renovated with equipment symbols utilized to represent the size, shape and location of equipment.
5. Riser Drawings: By means of single lines and graphic symbols, drawings assembled by the Contractor depicting devices provided and their functions with connectivity to associated equipment. Locations shall be identified using room numbers.

D. Failure to Submit:

1. Contractor's failure to provide submittals does not alleviate the responsibility to provide the requirements in the Contract Documents as interpreted by the Engineer. Correct Non-compliant items.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with Architecture specifications Division 01 Section "Product Requirements."

B. Deliver products to the project site properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification.

C. Provide all documentation identifying authorized distribution of the products.

1.8 QUALITY ASSURANCE

A. General: Follow the procedures specified in Division 01 Section "Quality Requirements," Source Limitations.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction and marked for intended use.

C. Obtain similar products through one source from a single manufacturer.

D. Manufacturers of equipment shall be firms regularly engaged in manufacturing factory fabricated systems and equipment whose products have been in satisfactory use in similar service for not less than three (3) years.

E. All equipment shall be provided by an authorized dealer or distributor of the manufacturer to ensure authentic product and warranty will be provided. Provide all necessary documentation at time of delivery.

F. Provide equipment as required by and/or listed in the specifications for a complete and operational system.

1.9 CONFLICTS

A. If this document and any referenced documents are in conflict, the more stringent requirement shall apply.

B. Identify all references and observe the most recent update, addenda, bulletins, etc. to properly perform the work.

1.10 WARRANTY

A. All equipment, software, services, and programming shall be covered by a one (1) year parts and labor warranty from date of acceptance. Acceptance will be provided in writing by Engineer after system is installed, programmed, and tested to the satisfaction of the Owner.

B. All manufacturer product warranties shall be transferable to the Owner upon substantial completion of the project for the full term of the warranty.

C. All warranties shall be standard manufacturer agreements. "Special" project warranties are not acceptable.

1.11 COORDINATION

A. Coordinate all programming components, device designations, and labels to match the final room numbers of the completed project. The room numbers on the Drawings may not be the final room numbers and may be finalized after system components are installed.

B. Coordinate arrangement, mounting, and support of Division 27 equipment.

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
3. To allow right of way for piping and conduit installed at required slope.
4. So connecting raceways, cables, wireways, cable trays, and pathways will be clear of obstructions and of the working and access space of other equipment.

C. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

D. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Frames."

1. Submit coordination drawings indicating proposed access door locations for review per Division 27 Section "Basic Division 27 Requirements."
2. Ensure access doors are sized to permit complete access for any concealed and/or inaccessible junction boxes, control and monitoring devices, elevator shaft and other items of equipment requiring access, maintenance, and/or operation.

    a. Assure access to devices per codes and local authorities having jurisdiction.

E. Coordinate installation of all devices operating in radio frequency ranges with all devices such that interference between systems/devices does not occur and cause system/devices to malfunction or fail. Revise operation of system or replace system as required. Coordinate RF ranges with all equipment provided in other divisions or by Owner.

F. Coordination with Campus Telecommunication Utilities and Services:

1. Coordinate connection of telecommunication systems with exterior underground and overhead utilities and services and meet all of their schedules so that the services

proceed in a timely and orderly fashion. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.

2. Locations and details required by Division 27 for the service rough-in shall be the responsibility of Division 27.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Products and the terms materials, equipment, devices, components, assemblies and systems are considered synonymous.

B. All materials, unless otherwise specified, shall be new and be the standard products of the manufacturer. Seconds, rejects, or damaged materials will be rejected.

C. The equipment to be provided under these Specifications shall be essentially the standard commercial grade product of the manufacturer. Where two or more units of the same class of equipment are required, these units shall be products of a single manufacturer.

D. The listing of a manufacturer for certain equipment and systems does not indicate acceptance of a standard or catalogued item of equipment. All equipment and systems shall conform to the Specifications and the requirements listed.

E. All equipment and materials specified shall be products currently in production.

1. If the specified item is not available or is discontinued, a similar product with the same features and functionality shall be provided from the same manufacturer in the newer/upgraded series of product.

a. Provide information as to the anticipated availability of the provided products at the time of submission and installation. No products shall be provided that will be discontinued within the warranty period of the system.

2. Equipment and/or devices discovered to be discontinued after submission approval will not be accepted and will require resubmittal for an approved replacement.

F. Product Selection for Restricted Space: Drawings indicated maximum dimensions for products including clearances between products and adjacent surfaces and other items. Comply with indicated maximum product dimensions.

1. Assembly Selection: The Drawings indicate sizes, profiles and dimensional requirements of assembly equipment. Equipment having equal performance characteristics and complying with indicated maximum dimensions and profiles may be considered, provided deviations do not change the design concept intended performance, or code/future extension provision clearances. The burden of proof of equality is on the proposer a minimum of 10 days prior to bid.

2.2 U.L. LISTING

A. All equipment shall bear the Underwriter's Laboratories (UL), or other approved agency, listing label. Acceptable alternates include:

1. Intertek Testing Service NA, Inc. (ITSNA) (formerly ETL).
2. Wherein an item of equipment is specified to be U.L. Listed, the entire assembly shall be listed by Underwriters Laboratories, Inc. Any modifications to suit the intent of the Specifications shall be performed in accordance with the National Electrical Code and listed by U.L.

B. Definitions:

1. Listed: Equipment or materials included in a list published by an organization acceptable to the authority having jurisdiction and concerned with product evaluation, that maintain periodic inspection of production of listed equipment or materials, and whose listing states either that the equipment or material meets appropriate designated standards or has been tested and found suitable for use in a specified manner.
2. Labeled: Equipment or materials to which has been attached a label, symbol or other identifying mark of an organization that is acceptable to the authority having jurisdiction and concerned with product evaluation that maintains periodic inspection of production of labeled equipment or materials and by whose labeling the manufacturer indicated compliance with appropriate standards or performance in a specified manner.

2.3 SOFTWARE PROTECTION

A. All software supplied with new equipment shall be warranted against leap year program disruption or failure. Refer to Division 01 Section "Warranties and Supplementary Conditions for Requirements."

B. All software supplied with new equipment shall be warranted against Daylight Savings Time program disruption or failure. Refer to Division 01 Section "Warranties and Supplementary Conditions for Requirements."

C. All software shall be the most current release of the latest available software of the equipment provided.

1. BETA software versions will not be accepted.

2.4 LABELS

A. Nameplates: Utilize laminated phenolic resin with white core to enable engraved white lettering 1/4 inch high. Color shall be identifiable to system type.

B. Tags: Utilize laminated phenolic resin with white core to enable engraved white lettering 1/4 inch high. Color shall be identifiable to system type. Provide nylon cable tie to secure to device as required.

C. Faceplate Labels:

1. Utilize adhesive vinyl labels with laser printed, smudge resistant lettering. Size incorporated to affix to device plate or cable as appropriate.
2. Laser engrave faceplates utilizing 1/8 inch high lettering.

PART 3 - EXECUTION

3.1 PREPARATION

A. General:

1. Comply with ANSI/NECA 1, Standard for Good Workmanship in Electrical Contracting.
2. Comply with ANSI/NECA/BICSI 568, Standard for Installing Commercial Building Telecommunications Cabling.

B. Examination:

1. Verification of Conditions:

   a. Examine areas and conditions under which work is to be performed. Verify that site conditions are satisfactory for installation of cable and components.
   b. Ensure components and conditions are in compliance with manufacturer's requirements, installation tolerances and other conditions affecting performance.

2. Pre-Installation Testing:

   a. Identify conditions detrimental to proper or timely completion.

3. Evaluation and Assessment:

   a. Correct unsatisfactory conditions.
   b. Do not proceed until unsatisfactory conditions have been corrected.

4. Review Drawings for device locations, telecommunication room locations, routings, trunk risers, cable trays, details, and special features. Coordinate requirements with appropriate Divisions.

C. Protection of In-Place Conditions:

1. Handle components to be re-used carefully to avoid breakage, dents, scoring finishes, and impacts.
2. Take precautions to protect any surfaces already in-place before continuing with work.
3. Protect everything in existing space from dust and debris in an acceptable manner.
4. Notify Engineer, in writing, of any damage to surrounding areas or surfaces already in place.
5. Keep hands clean when handling ceiling tiles to avoid fingerprints and smudges on the finished installation. Use clean cotton gloves for maximum protection. Ceiling tiles should be handled carefully to protect the face and edges of the tile from damage.
6. Old ceiling tiles can remain in the grid system by being moved to one side and then replaced. Avoid scratching or jamming the tiles.

D. Rough-In:

1. Verify final locations for rough-ins with field measurements and with the requirements and dimensions of the actual equipment to be installed and connected.
2. Coordinate cabling installation requirements with installation of all pathways, raceways, outlet boxes, etc. as listed in Division 26 Section "Conduit Rough-In Systems."
3. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
4. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
5. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
6. Right of Way: Give to piping systems installed at a required slope.
7. Refer to equipment specifications in Divisions 02 through 28 for rough-in requirements.

E. Manufacturer's Directions and Supervision:

1. Where supervision by a manufacturer is specified, follow all instructions, recommended manufacturer and specified field tests, and other recommendations of the manufacturer. The manufacturer shall supervise the installation, connection, start-up, testing, adjustment, instruction of the Owner, and final tests of such equipment or system. Where two or more manufacturer's equipment are interrelated, take responsibility to coordinate their work and provide supervision.
2. Have the manufacturer instruct the Owner in the proper operation and maintenance techniques of all equipment, systems, etc., at the time of completion of all work.
3. Prior to final acceptance by the Owner prepare and submit to the Architect for review 3 copies of operation and maintenance (O and M) instructions in printed form for each item of equipment or system installed in the building. Complete instructions for each system shall be assembled and bound in a brochure. Detailed contents of the O and M manuals are as hereinafter specified. Refer to appropriate Division 01 sections for general requirements affecting this work.

3.2 COMMUNICATIONS AND SYSTEMS INSTALLATIONS

A. General: Sequence, coordinate, and integrate the various elements of communications, telecommunications, audio/visual systems, materials, and equipment. Comply with the following requirements:

1. The Architect shall control the placement of wall and ceiling mounted communications systems devices and outlets. The intent is to aesthetically locate equipment/outlets by providing rough-in hardware, boxes and/or mounting plates, as required, when stud or furring may not be readily available for direct mounting. When drawing details or elevations are not available, consult with Architect's representative for actual placement.
2. Coordinate communications systems, equipment, and materials installation with other building components. Be responsible for any changes in openings and locations necessitated by the equipment installed.
3. Verify all dimensions by field measurements.
4. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for communications systems installations.
5. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.

6. Sequence, coordinate, and integrate installations of communications materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.
7. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible. Coordinate with system maximum cable lengths and address Engineer with conflicts.
8. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements shown on Drawings recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Architect.
9. Communications Equipment Assembly Selection: The Drawings indicate sizes, profiles, and dimensional requirements of assembly equipment. Equipment having equal performance characteristics and complying with indicated maximum dimensions and profiles may be considered, provided deviations do not change the design concept, intended performance, or code/future extension provision clearances. The burden of proof of equality is on the proposer a minimum of 10 days prior to bid.
10. Protect all equipment and materials from the elements, dirt and other damage from the time it is removed from the point of storage until final acceptance.
11. Equipment shall include the component parts thereof such as wiring/cabling guards necessary to the satisfactory and safe operation of the equipment.
12. Installation shall include setting equipment to accurate line and grade, leveling equipment, aligning equipment components, providing and installing couplings, bolts, guards, and anchor bolts.
13. All tolerances in alignment and leveling, and the quality of workmanship for each class and stage of work shall be subject to manufacturer's installation instructions.
14. All manufacturers' finished equipment surfaces damaged during construction shall be brought to an "as new" condition by touch up or repainting so that the repaired areas are not obvious. Any rust shall be completely removed and the surface primed prior to repainting.
15. Provide all scaffolding, rigging, hoisting and services necessary for erection and delivery of equipment and apparatus furnished into the premises. These items shall be removed from the premises when no longer required.
16. No communications systems equipment or other work of any kind shall be covered up or hidden from view before it has been examined and approved. Any unsatisfactory work or materials shall be removed and corrected immediately.
17. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components.
18. Install communications systems equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
19. Install systems, materials, and equipment giving right of way priority to systems required to be installed at a specified slope.
20. Match room numbers for labels, programming, etc. with existing/final room numbers approved by the Owner’s Representative upon completion of this project. The room numbers on the drawings are not necessarily the actual room numbers.
21. All screws, bolts, nuts, clamps, fittings, or other fastening devices shall be tightened in accordance with manufacturer instructions.
22. When field cutting hangers or supports with corrosion protection, apply approved sealant to restore corrosion protection.
23. Plaster debris and residue shall be thoroughly cleaned and vacuumed from boxes before cables are terminated.
24. Cables shall not be supported by their terminals.

25. When several devices are wall mounted in the same area, care shall be taken to align them horizontally and vertically.
26. Verify all conduits are reamed and bushed prior to pulling cable. Do not pull cable if field manufactured bends reduce the recommended bending radius.
27. Provide cabinets and associated raceway/pathway installations including special wire management auxiliaries.
28. Meet with the Owner's Telecommunications representatives prior to each of the following installation tasks:

    a. Mounting cabinets, and equipment grounds.
    b. Telecommunications room raceway installations.
    c. Pulling cable.
    d. Terminating cable.
    e. Labeling of cable and equipment.
    f. Testing cable.
    g. As-built documentation completion.

29. Pull all cabling to rack or equipment backboard in telecommunications room from outlet boxes as shown on Drawings.
30. Conceal all cabling in the facility except where specifically indicated otherwise. Surface raceway allowed only where specifically shown on Drawings or approved by Engineer.
31. Do not employ pulling lubricants as they can degrade cable performance.
32. Install horizontal cabling open in accessible ceiling spaces. Install each cabling system in separate pathway from other cabling systems.
33. Coordinate cabling installation such that it is not supported from new or existing conduits, piping, ductwork, etc. Cabling shall not lie directly on ceiling or be supported by ceiling tie-wires.
34. Install all cabling parallel and perpendicular to building lines.
35. Install cabling tight to building steel. Avoid locating cabling within 12 inches of lay-in ceilings or access panels.
36. Support vertically routed cabling at each floor. Attach supports such as wire mesh grips as recommended by manufacturer and required by local codes.
37. Traverse common system cables along the same pathway. Multiple runs of cabling terminated at roughly the same geographic area shall traverse the same path whenever possible.
38. Install cable bundles level, taught and tight to building steel. Provide caution during installation so as to not stress or provide excessive tension on the cable.

    a. Pulling tension shall not exceed 25 lbs. on a single cable or bundle.
    b. Avoid unnecessary bends and do not exceed a 90 degree bend for any cable.
    c. Do not exceed manufactures bend radius requirements.

39. Route cabling to avoid elevator shafts, elevator equipment rooms or any areas that contain or store hazardous materials.
40. Avoid sources of electromagnetic interface (EMI) for all voice/data/system equipment and cables.

    a. Maintain 5 inch minimum from lighting ballast.
    b. Maintain 4 foot minimum from all transformers.
    c. Maintain 1 foot minimum from electric power conductors.
    d. Distances may be reduced if sufficient EMI isolation is provided and prior approval is given by the Engineer.

41. Avoid routing cabling in areas subject to excessive environmental conditions.

    a. Refer to Division 26 Section "Conduit Rough-In Systems" for environmental requirements.

42. Replace entirely any cable jacket that is cut or scored.
43. Replace entirely any cable that has jacket painted.
44. Terminate all horizontal and backbone cabling at each cable end as indicated in these specifications.
45. Test all cabling as indicated in these Specifications.
46. Label all cabling as indicated in these Specifications.
47. Provide all support devices to mount supplied and installed equipment at the appropriate device height. Conceal furring as required.

3.3 INSTALLATION OF EQUIPMENT

A. Install systems and components in accordance with equipment manufacturer's written instructions, in compliance with National Electrical Code, and with recognized industry practices, to ensure that each system complies with requirements and serves intended purposes.

B. Install equipment properly to avoid causing mechanical stresses, twisting or misalignment of equipment being exerted by clamps, supports, and cabling.

C. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Standards 486A and B, and the National Electrical Code.

D. Provide branch circuit and power connection to equipment as required to support the system being installed. Indicate additional power requirements on wiring diagrams at submittal stage for approval by Engineer.

E. Remove all dirt, dust and construction debris from all system equipment. Touch-up scratched and marred surfaces to match original finishes to the satisfaction of the Owner and Engineer.

3.4 PAINTING

A. Provide the prime painting of all equipment and materials furnished under Division 27 specifications, unless specifically stated otherwise. In general, all equipment except raceways and galvanized boxes that are not provided with a factory-applied final finish shall be delivered to the job site with a shop-applied prime coat of paint. Refer to Division 09 Sections "Interior Painting" and "Exterior Painting."

1. Provide touch-up painting services for any equipment as required and approved by the Engineer.
2. Replace any damaged equipment that cannot be returned to a "Like New" condition/finish.

3.5 CUTTING AND PATCHING

A. General: Perform cutting and patching in accordance with Division 01 Section "Cutting and Patching." In addition to the requirements specified in Division 01, the following requirements apply:

1. Perform cutting, fitting, and patching of equipment and materials required to:

a. Uncover Work to provide for installation of ill-timed Work.
b. Remove and replace defective Work.
c. Remove and replace Work not conforming to requirements of the Contract Documents.
d. Remove samples of installed Work as specified for testing.
e. Install equipment and materials in existing structures.
f. Upon written instructions from the Architect, uncover and restore Work to provide for Architect observation of concealed Work.

2. Cut, remove, and legally dispose of selected equipment, components, and materials as indicated, including but not limited to removal of electrical items indicated to be removed and items made obsolete by the new Work.
3. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.
4. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.
5. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.
6. Patch finished surfaces and building components using new materials specified for the original installation and experienced Installers. Installers' qualifications refer to the materials and methods required for the surface and building components being patched.

a. Refer to Division 01 Section "Definitions and Standards" for definition of experienced "Installer."

3.6 LABELING

A. Labels shall be applied by the installer at a visible location on all end-user device faceplates per Owner requirements and verbiage shall clearly identify device, use, destination and location per Division 26 Section "Electrical Identification."

1. Provide engraved faceplates for devices without a designated label location or means of protecting/securing the label.

a. Colors shall be black on stainless steel faceplates or white on black faceplates.

2. Standard manufacturer device plates shall provide engraved supplementary information as noted above.

B. Engrave label all keys provided to the Owner for system cabinets and devices.

1. Label with system name as required by the Owner.

3.7 SUBMITTALS

A. General: Refer to Division 01 for quantities and types of shop drawings.

3.8 ACTION SUBMITTALS

A. Required submittals shall be submitted in groups by specification number. For example, all structured cabling equipment identified within that section number, including cabling, components, faceplates and accessories shall be submitted simultaneously in one package.

1. Equipment submitted from multiple sections under a single cover, will not be reviewed.

B. Provide a complete submittal list with dates for submission of documentation to Engineer. Identify any submittals requiring priority processing and review based on equipment lead times or fast track construction. Ensure submittals that contain information that transcends section numbers are submitted simultaneously so that review is not delayed waiting for concurring information. Submit in hard copy and Microsoft Excel format.

C. Each System Submittal shall contain the following minimum information in addition to the information requested in the individual section:

1. Section number and equipment/device type in a bound submission.
2. Table of Contents identifying equipment lists with numbered pages identifying equipment/ device locations within submittal.
3. System Scope of Work narrative.
4. Equipment/device quantities.
5. Equipment/device product information sheets with submission designated, installation information, color/finish options, etc.
6. Program information sheets.
7. Coordination requirements with all trades.
8. Program layout diagrams, riser diagrams, wiring diagrams, rack elevations, seismic requirements, etc. Utilize Architectural, Electrical, and Communication symbology and room numbers to be consistent with Owner's standards.
9. Training outline.
10. Sample testing reports.
11. Deviations from specifications, if any, highlighted with specific explanation and identification requiring Architect/Engineer specific approval.
12. Identify any products that will no longer be available or will be discontinued by the manufacturer prior to the completion of the warranty period.
13. Estimated equipment heat loads and power requirements. List and tabulate equipment specifically required in Data Rooms. Coordinate with Division 28 equipment as applicable.
14. Submit qualifications based on quality assurance requirements.
15. Provide secondary submittal for systems requiring programming and Owner input, review, and approval after Programming meeting, sequence of operations review, etc. Provide all information in spreadsheet format in electronic and hardcopy.
16. Manufacturer required information for base and extended warranties including submission requirements and timeframes.
17. Provide copies of manufacturer's warranty information to Owner that is submitted directly to manufacturer.
18. Identify any additional power requirements, communications connections or alterations needed to support the proposed equipment.

D. Division 27 Shop Drawings Required:

1. Structured Telecommunications Cabling System.
2. Broadband Video Distribution Systems.
3. Audio/Visual Equipment.
4. Financial Services Stock Ticker.
5. Video Wall Systems.

E. Action submittals submitted for other than those listed above or not specifically required in the appropriate Specification Section will not be reviewed or returned.

3.9 INFORMATIONAL SUBMITTALS

A. Coordination Drawings:

1. Prepare coordination drawings in accordance with Division 01 Section "Project Management Coordination ," to a scale of 1/4"=1'-0" or larger; detailing major elements, components, and systems of electrical equipment and materials in relationship with other systems, installations, and building components. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the Work, including (but not necessarily limited to) the following:

    a. Indicate the proposed locations of major raceway systems, equipment, and materials. Include the following:

        1) Clearances for servicing equipment, including space for equipment disassembly required for periodic maintenance.
        2) Exterior wall and foundation penetrations.
        3) Wall and floor sleeve penetrations.
        4) Floor box and poke-through assembly installations.
        5) Equipment connections and support details.
        6) Sizes and location of required concrete pads and bases.
        7) Location of cable tray.

2. Submit the following coordination drawings and others as defined in other Division 27 Sections:

    a. Access door locations and sizes (for installation by Division 08).
    b. Head-end equipment.
    c. Equipment rack elevations.
    d. Telecommunications rooms.
    e. Vestibules containing system devices.

3. Indicate scheduling, sequencing, movement, and positioning of large equipment into the building during construction.
4. Prepare floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.
5. Coordination drawings do not omit the required submission of layout and plan drawings identified in other specification sections for review and approval.

6. Contract Document Drawing copies may be used as base for coordination drawings, then marked to depict actual equipment sizes and other requirements of coordination drawings. Those not marked will be rejected.

3.10 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data:

1. Prepare and submit operation and maintenance manuals in accordance with Division 01 Section "Project Closeout." In addition to the requirements specified in Division 01, include specific Division 27 Section requirements, and the following information for equipment items:

   a. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
   b. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
   c. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
   d. Servicing instructions and lubrication charts and schedules, software release update and patch criteria.
   e. Individual characteristics for trouble shooting sequences for each item of each communications systems.

2. The minimum information that shall be furnished in the maintenance manual shall include the following:

   a. Title, table of contents, tabbed sections for each installed system in an organized 3-ring binder labeled with the project name and date.
   b. Emergency and warranty contact names and numbers for the contractor and vendor of each installed system.
   c. Final submittal copy with catalog cut sheets for every item for which a submittal was provided.
   d. Contract modifications and actual equipment and materials installed.
   e. Model numbers and serial numbers for all provided equipment.
   f. Provide a digital color photo (8-1/2 x 11 minimum) and .TIFF file on DVD-Rom of the following areas:

      1) All head-end equipment (racks) showing model numbers and final connectivity.
      2) All telecom equipment.
      3) All sound and video equipment racks and portable equipment.
      4) Interiors of manholes.

   g. On-hand spare parts list and complete parts list for each communication system.
   h. Manufacturers' recommended cleaning intervals and special procedures for each communications system device.
   i. Calibration and exercise procedures for each communications system device.
   j. Approved special construction details that differ from the details shown on Drawings.

k. Testing and troubleshooting procedures unique to special systems. For example:

1) Water tightness tests for manholes and handholes.

l. Test reports; sign off and acceptance of manufacturer, vendor, etc.
m. Inspection reports.
n. Warranty information for all systems including individual manufacturer product warranties and system extended manufacturer warranty certificate where applicable.
o. Provide an additional engraved spare key for each system with documentation.
p. Required software/programming/information.

1) Provide system programming design manual with Owner sign-off and associated Meeting minutes.
2) Provide software documentation and licensing information.

q. Training documentation and DVDs.

3. Drawings:

a. Major cabling systems (trunk risers), size and location, for both interior and exterior; locations of control devices and distribution boxes.
b. Major equipment locations (exposed and concealed), dimensioned from prominent building lines.
c. In slab conduit routings.
d. Outlet devices with final outlet nomenclature identified at each device.

3.11 MAINTENANCE MATERIAL SUBMITTALS

A. Extra Material:

1. Provide four (4) keys for every different piece of equipment which is equipped with a lock.

a. Coordinate similar locks/keys for like equipment. Verify with Owner.
b. Stamp keys with system name.

2. Provide all other loose equipment specified/supplied for use with all systems.

3.12 PROGRAMMING DESIGN MEETINGS AND MANUAL

A. Meet with Owner's Representative to develop a system programming design to function for the operations needed. Document all meetings for review by the Engineer.

B. Provide sample programming requirements, system features, etc. for review by Owner and coordinate correspondence with other facility representatives that have installed similar systems.

C. Provide a customized Programming Manual identifying the project name/job number and date of installation.

1. Provide all documentation in spreadsheet format on CD-Rom and hardcopy.
2. Provide features utilized and identification.

3. Identify features available per the specifications and the product not required based on Owner requirements.

    a. Features not identified to the Owner as available and not listed may be required by Owner after initial use and operation of the system is found to be inadequate without such feature(s). It will be required to have the necessary features installed and programmed for use at no additional cost to the Owner.

4. Provide alterations/configurations based on time of day, day of week, holiday, etc.

3.13 LICENSES

A. Provide the necessary licenses for all devices and equipment to operate for the life of the product.

1. Equipment/devices shall not require licenses to operate with the current or any updated/upgraded software release or version.

3.14 FIELD QUALITY CONTROL

A. Test and Inspection:

1. Submit a detailed test plan prior to start of testing. Test plan shall provide for Owner to witness test.

    a. The following will be witnessed by the Owner:

        1) As-Built Drawings will be verified with actual installation.
        2) Workmanship of installation of equipment.
        3) All systems are fully programmed and functional, including interconnections with other systems.

    b. Any electrical equipment in vicinity of cabling or devices shall be on and operational during testing, including luminaires, elevators, HVAC units, and wireless devices.

B. Upon completion of the work, notify the Architect in writing, that each entire system installation has been examined, inspected, tested, calibrated or adjusted as specified and that it is ready for final inspection. Work to be connected prior to final inspection and also to include all of the work specified for "Manufacturers' Directions and Supervision." Include documentation of specified testing and inspection.

C. Prior to each inspection, provide a written certification that each system or piece of equipment to be operated during that test has been tested and does meet design performance criteria of the Contract Documents.

1. Provide final written certification, dated and signed, prior to final punchlist and include copy in O&M Manuals.

D. Upon completion of the work, obtain Certificates of Compliance, and approval or acceptance from all authorities having jurisdiction over the work, and deliver these certificates to the

Architect. The work shall not be deemed to have reached a state of completion until the certificates have been delivered.

3.15 TRAINING

A. Provide a training outline for distribution to the Owner for all required training and the necessary personnel required for operation, maintenance and service (warranty) notification. Include instructors' qualifications.

1. Training shall be provided in session increments of at maximum eight (8) hours. Minimum of two (2) hours.
2. Coordinate all training to best service participants based on job description.
3. Provide several sessions as required to meet participants' schedules, etc. Coordinate dates and times with Owner's representative three (3) months prior to start of training.
4. Training shall be completed at the Owners facility and all necessary devices, equipment and training aids shall be provided. Training aids shall include approved maintenance manual.
5. Provide a refresher training session of at minimum (2) two hours 30 days after original training has been completed.

B. Provide PowerPoint presentation and handouts for all training. Class sizes shall be appropriate for the system to allow hands on instruction.

C. Record each training session and provide an edited DVD of each training session to be turned over to the Owner.

D. Off-Site Training:

1. If required by the specification section, provide factory training for designated Owner personnel at the manufacturer’s training facility.
2. Include all associated costs including transportation, lodging, meals, etc.

3.16 SOFTWARE TURNOVER

A. All software for system operation including source code for proper operation, reconfiguring and/or reworking of systems in future implementations shall be provided to the Owner by the manufacturer and/or vendor for the Owner’s future use.

1. This shall include any license agreements, associated costs, and fees for turnover of this information.
2. The provided programming and source code shall become the intellectual property of the Owner.
3. Supply on CD-ROM and format required by equipment for re-installation and re-programming.

END OF SECTION 270010

SECTION 274111 – INTEGRATED AUDIO VISUAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. New audio visual systems for use in new presentation spaces throughout the Facility to display scaled source video and audio from the local computer, Apple TV, document camera, portable BYOD source, or video camera onto available projection screen, flat panel monitor, or video wall, and inputs into Owner-provided Panopto Lecture Capture Solution.

1. Control all A/V equipment by media controllers with integrated touch panel including control of all projectors, projection screens, monitors, audio visual switchers, amplifiers, and source equipment/inputs.
2. Include comprehensive A/V systems consisting of modern solid state type equipment providing the following functionality:
    a. High quality sound reinforcement for CD/DVD, Blu-Ray, PC, iPod, cable TV, and audio and video conference feeds.
    b. Audio/Video integration with media control of projectors, projection screens, monitors, audio/visual inputs, and volume.
    c. Flexibility to accommodate various uses of the room and various presentation types.
    d. Power all devices via rack mount power supplies such that local power is not required at the units; i.e. transmitters, receivers, cameras, etc.
3. Be responsible for interfacing the systems with each required sub-system. Continually employ interfacing methods that are approved by the original equipment manufacturer and industry best practices. At a minimum, the acceptable interfacing method requires not only a physical and mechanical connection; but also a matching of signal, voltage, and processing levels, with regard to signal quality and impedance.
4. Coordinate installation of equipment such that the University network usage is limited. Equipment shall not be connected to the University network for system connectivity unless indicated on the Drawings.
5. Alternate Bid AV-1: Provide FSR touch panels, controllers, and interface equipment in lieu of Extron devices to reduce cost of project.

B. This Section includes requirements for A/V system components including, but not limited to, the following:

1. A/V Sources; Blu-Ray Player, cable TV, PC, iPod, Video Conference, Apple TV, document cameras, Barco Clickshare, HDMI camera, USB web camera, etc.
2. A/V Switcher.
3. Equipment Cabinets and Racks.
4. Speakers.
5. Projectors.
6. Media Controllers.
7. Microphones.
8. Amplifiers.
9. Audio Mixers.
10. Mounting Brackets.
11. Equipment Cabling.
12. Document Camera.
13. Antenna.
14. Projection Screens.
15. Flat Panel Monitors.

16. Video Conference System.

C. Products Installed but Furnished by the Owner or Products furnished and not installed.

1. Owner-provided PC (small form factor) with Panopto Lecture Capture software shall be installed by the integrator.
2. Owner-provided keyboard, mouse, and monitor for PC shall be installed by the integrator.

D. Requirements specified in the following Divisions and sections apply to this section:

1. Division 07 Section "Penetration Firestopping."
2. Division 09 Section "Painting."
3. Division 09 Section "Ceiling Access Panels."

E. Requirements specified in the following Division 26 sections apply to this Section.

1. Section "Basic Division 26 Requirements."
2. Section "Raceways."
3. Section "Sleeves and Sleeve Seals."
4. Section "Hangers and Supports."
5. Section "Electrical Identification."
6. Section "Grounding and Bonding."
7. Section "Conduit Rough-In Systems."

F. Requirements specified in the following Division 27 sections apply to this Section.

1. Section "Basic Division 27 Requirements."
2. Section "Assistive Listening Systems."
3. Section "Video Conferencing System."

1.2 REFERENCES

A. Abbreviations and Acronyms:

1. RCDD – Registered Communications Distribution Designer.
2. TR – Telecom Room.
3. CTS – Certified Technology Specialist.
4. SEI / ASCE.
5. A/E - Architect / Engineer (designer).
6. AHJ - Authority Having Jurisdiction.
7. ANSI - American National Standards Institute.
8. AWG - American Wire Gauge.
9. BICSI - Building Industry Consulting Service International.
10. BDF - Building Distribution Facility; space within a building that is the nexus of LAN distribution for that particular building.
11. Broadband - Wide bandwidth equipment or systems that can carry signals occupying in the frequency range of 54 to 1002 MHz.
12. BYOD – Bring Your Own Device.
13. CAT 3 - Category 3 performance as defined by ANSI/TIA/EIA-568-B.2.
14. CAT 5E - Category 5e performance as defined by ANSI/TIA/EIA-568-B.2.
15. CAT 6 - Category 6 performance as defined by ANSI/TIA/EIA-568-B.2-1.
16. CAT 6A - Augmented Category 6 performance as defined by ANSI/TIA/EIA 568-B.2-10.
17. CATV - Community Antenna Television.
18. DC - Data Center.
19. EIA - Electronics Industry Alliance.
20. ELFEXT - Equal Level Far End Cross Talk.
21. ER - Equipment Room.
22. EOR - Engineer of Record.

23. FOTP - Fiber Optic Test Procedure.
24. ILEC/LEC - Incumbent Local Exchange Carrier.
25. IR – Infra-Red.
26. ISP - Inside Plant; cable and equipment within a building.
27. IT - Information Technology.
28. IDF - Intermediate Distribution Frame.
29. LOMMF - Laser Optimized Multimode Fiber.
30. LV - Low Voltage Room, Intermediate Distribution Facility; station and backbone cable concentration point on a particular floor for specific use on that same floor.
31. MDF - Main Distribution Frame.
32. MATV - Master Antenna Television.
33. Main Low Voltage Room - Main Distribution Facility; space within a building that is the main point of LAN distribution for that building or to other buildings.
34. MMF - Multimode Fiber.
35. MPOE - Minimum Point of Entry; main entry point for all incoming building circuits, also serves as the primary demarcation point.
36. MHz – Megahertz.
37. NEXT - Near End Cross Talk.
38. NECA - National Electrical Contractors Association.
39. NEMA - National Electrical Manufacturers Association.
40. OSP - Outside Plant; cable and equipment exterior to a building.
41. OTDR - Optical Time Domain Reflectometer.
42. PSELFEXT - Power Sum Equal Level Far End Cross Talk.
43. PSNEXT - Power Sum Near End Cross Talk.
44. RCDD - Registered Communications Distribution Designer.
45. RF - Radio Frequency.
46. SMF - Single-Mode Fiber.
47. ScTP - Screened Twisted Pair.
48. SCS - Structured Cabling System.
49. TCIM - Telecommunication Cabling Installation Manual.
50. TDMM - Telecommunications Distribution Methods Manual.
51. Technology Outlet - Voice/data/video/other interface outlet located at workstation.
52. Telecom Spaces - Include all areas where cable or equipment will be placed, including IT resources, Engineering resources and user stations.
53. TIA - Telecommunications Industry Association.
54. TSER - Telecommunications Service Entry Room; Houses MPOE, above.
55. TDR - Time Domain Reflectometer.
56. TGB - Telecommunications Ground Bus Bar.
57. TMGB - Telecommunications Main Ground Bus Bar.
58. UTP - Unshielded Twisted Pair copper network and/or low voltage signal cable.
59. UL - Underwriters Laboratory.
60. UNO - Unless Noted Otherwise.
61. UPS - Uninterruptible Power Supply.
62. WAP - Wireless Access Point.

B. Definitions:

1. In addition to those Definitions listed in Division 01, the following list of terms shall be defined as follows:

    a. Connect: To install required patch cords, equipment cords, cross-connect wire, etc. to complete an electrical or optical circuit.
    b. Cabling: A combination of cables, wire, cords, and connecting hardware e.g., cables, conductor terminations, connectors, outlets, patch panels, blocks, and labeling.

c. Identifier: A unique code assigned to an element of the telecommunications infrastructure that links it to its corresponding record.
d. Open Cabling: Cabling run horizontally within a pathway supported by cable tray, J-hooks, D-hooks, etc. that is installed above an accessible ceiling. This installed cabling is considered concealed.
e. Exposed Cabling: Cabling that is not concealed by an accessible pathway, conduit, etc. Cabling installed open below an exposed structure.
f. Concealed Cabling.
g. Pathway: Routing of cabling from work area outlet box to telecommunications room. Pathways may consist of conduit, conduit stub, conduit sleeve(s), cable tray, J-hooks, etc.
h. Telecom Cabling/Datacom Cabling: Low voltage extended frequency signal and communications cabling. Category 5e, 5E, 6, augmented 6 and fiber optic cabling.
i. System Cabling: Low voltage signal and control cabling. System cabling is designated by the manufacturer for a particular system in each specification section.

C. Standards:

1. If this document and any of the documents listed herein are in conflict, then the more stringent requirement shall apply. All documents listed are believed to be the most current releases of the documents; this Division is responsible to determine and adhere to the most recent release when developing the proposal for installation.

a. NFPA 70 – National Electrical Code.
b. ANSI/TIA/EIA 568C – Commercial Building Telecommunications Cabling Standard.
c. Technical Service Bulletin - Cabling Wireless Access Points.
d. ANSI/EIA/TIA 569-B – Commercial Building Standard for Telecommunication Pathways and Spaces – October 2004.
e. ANSI/EIA/TIA 606A – Administrative Standard for Telecommunications Infrastructure - May 2002.
f. ANSI-J-STD 607A – Commercial Building Grounding, Earthing, and Bonding Requirements for Telecommunications – October 2002.
g. ANSI/NEC/BICSI 568-2001 – Installing Commercial Building Telecommunications Cabling.
h. BICSI – Telecommunications Distribution Methods Manual (TDMM) 12th Edition – 2009.
i. IEEE 802.3af Standard for Power Over Ethernet Requirements for Distributing Power via Low Voltage Structured Cabling Devices - June 2003.
j. IEEE 802.3at-2009 Standard for Power Over Ethernet Plus Standard Requirements for Distributing Power (25W) via Low Voltage Structured Cabling Devices.
k. Federal Communications Commission (FCC) Rules: Part 21 and Part 94.
l. National Electrical Manufacturers Association (NEMA): Standard for Low-Loss Extended Frequency Premises Telecommunications Cable.
m. Underwriters Laboratories (UL): UL 444 Standard for Safety for Communications Cable.
n. Underwriters Laboratories (UL): UL 1666 Vertical Flame Tests for Plenum Applications.
o. BICSI – Wireless Design Reference Manual.
p. InfoComm/BICSI – AV Design Reference Manual.
q. BICSI – Information Transport Systems Installation Methods Manual, 5th Edition.
r. ANSI/NECA 1-2006 – Standard Practice of Good Workmanship in Electrical Contracting.

2. If a conflict exists between applicable documents, then the order in the list above shall dictate the order of precedence in resolving conflicts. This order of precedence shall be maintained unless a lesser order document has been adopted as code by a local, state or federal entity, and is therefore enforceable as law by a local, state or federal inspection agency.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate with other work, including electrical wiring work, cabinet and rack placement, casework / millwork and structured telecommunications cabling, as necessary to properly interface installation of this system with other work.
2. Coordinate all work with Division 26 for proper pathways and rough-in requirements; including but not limited to, size and bend radius.

B. Pre-Installation Meetings:

1. Meet with Owner for detailed system design and configuration review. Meeting to explain features, functionality and operability of system. Provide four (4) 4-hour sessions.

C. Sequencing:

1. Sequence system installation work with other work to minimize possibility of damage and soiling system during remainder of construction period.

D. Scheduling:

1. This work is being provided at a different schedule than other work. Be prepared to provide coordination with other trades to allow construction to progress based on the building schedule.

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract, Division 01 Specification Sections, and Division 27 Section "Basic Division 27 Requirements."

B. Submittals shall be provided based on specification number and be inclusive of the equipment within that section. Equipment submitted from multiple sections under a single cover, will not be reviewed.

1. Provide six (6) copies of all submittal information for review.
2. Provide electronic copy of all submittal information in PDF Format/Microsoft Word/Excel Format.

1.5 ACTION SUBMITTALS

A. Product Data: Submit for each type of product specified.

1. Provide manufacturer’s literature to include all information necessary to confirm that the proposed system is in complete compliance with the Specifications.
2. Provide all information in a single, complete bound submission.
3. Table of Contents identifying equipment lists with numbered pages corresponding to equipment/device locations within submittal for quick reference.
4. System Scope of Work narrative including Owner meetings, Owner reviews, programming approval, milestones, and testing.
5. Equipment Information:

a. All equipment shall be specific to this section only unless required for integration.

1) Manufacturer’s specifications and descriptive literature.

2) Manufacturer's recommended installation procedures.
3) Equipment/device quantities.
4) Equipment/device product information sheets with submission designated, installation information, color/finish options, etc.
5) Program information sheets.
6) Coordination requirements with all trades.
7) Program layout diagrams, riser diagrams, wiring diagrams, rack elevations, seismic requirements, etc. Utilize architectural, electrical, and communication symbology to be consistent with Owner's standards.
8) Deviations from specifications, if any, highlighted with specific explanation and identification requiring Architect/Engineer specific approval.
9) Manufacturer required information for base and extended warranties including submission requirements and timeframes.
10) Estimated equipment heat loads and power requirements. List and tabulate equipment specifically required in telecommunications rooms and equipment rooms.
11) Submit qualifications based on quality assurance requirements for manufacturer, supplier, installer, trainer, etc.
12) Provide secondary submittal for systems requiring programming and Owner input, review, and approval after programming meeting, sequence of operations review, etc. Provide all information in spreadsheet format in electronic and hardcopy.
13) Training outline.
14) Sample test reports.

b. Provide a list with references of at least three (3) installations of equivalent or larger systems installed within the last two (2) years with the specified products.

1) Provide Facility location and name.
2) Owner's or User's name, address, and telephone (including fax) numbers.
3) Date of Project Start and Date of Final Acceptance by Owner.
4) System Project Number.
5) Brief (three paragraphs minimum) description of each system's function, operation, and installation.

c. Provide certification with data substantiating that products comply with requirements of the Contract Documents. Furnish UL File number with product data as submitted.

B. Shop Drawings (Submit for each):

1. Layout Drawings:

a. Submit scaled system layout drawings using architectural floor plans indicating head end equipment layout and dimensions. Include layout of equipment in relation to room size and other existing and new system equipment in that room. Include equipment layout and rack elevations.

1) Indicate connections to equipment supplied by others.

b. Submit scaled system layout drawings using architectural floor plans for system equipment indicating cable types, amplifiers, electrical connections, taps, etc., as designed for this project.

1) Include tap values, dB levels and other important system configuration values.
2) Include lengths of all trunk cables, feeder cables, and horizontal cables.
3) Provide building room numbers and diagrams specific to this project.

4) All panels, plates and designation strips, including details relating to terminology, engraving, finish and color.
5) Detailed wiring for connectivity of other interfaces. Differentiate clearly intersystem connections.
6) Wiring Diagrams detailing wiring for power, signal, and control differentiating clearly between manufacturer-installed wiring and field-installed wiring. Identify terminal numbers and wiring color codes to facilitate installation, operation, and maintenance.
7) Remote control panel design (to include "live" interactive electronics format).
8) All equipment racks, cabinets, consoles, tables, carts, support bases and shelves.
9) Schematic drawings (A/V and Control Signal flows).
10) All non-factory equipment modifications.
11) Front mechanical drawings of each equipment rack.
12) System functional block drawings, including those for audio and video subsystems.
13) Cable labeling plan.
14) Grounding: Identify grounding requirements and connections to Telecommunications Grounding Busbar.
15) Differentiate between portions of equipment that are factory/vendor assembled and that which are field-installed.

C. Coordination Drawings (1):

1. Details of system including but not limited to the following:

a. Console layouts.
b. Control panels.
c. Rack arrangements.
d. Interface method to other systems or equipment.

2. Integration: Detail interconnections to other systems.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data:

1. Source Quality Control Reports:

a. Submit factory test report from each reel of preterminated cable.

2. Special Warranty:

a. All items of equipment must be new, in current production, currently eligible for warranty and maintenance coverage and have guaranteed availability for a minimum of five (5) years from the Substantial Completion date.

3. Supplier Qualifications:

a. Certification signed by officer of installation company attesting that proposed system complies with specification requirements:

1) For multiple firms, an officer from each firm must sign.

b. For AHJ requirement:

1) Copy of jurisdiction electrical license or permit.

4. Installer Qualifications:

    a. Provide documentation of certification of manufacturer, supplier, installers, Project Managers and instructors to be utilized on this project. Documentation to include the following:

        1) Manufacturer Training and Certifications:

            a) Submit contractual relationship or technical certification by the respective equipment manufacturers that installer is authorized by that equipment manufacturer to pass through the manufacturer's certification and equipment warranty to the Owner. Additionally, the equipment manufacturer and Contractor shall accept complete responsibility for the design, installation, certification, operation, and physical support for the system.

        2) Industry Training and Certifications:

            a) The Audio Visual Technicians assigned to the system shall be fully trained, qualified, and carry valid and current industry certifications regarding the Engineering, installation, operation, and testing of audio visual technologies. At least one (1) each InfoComm International CTS-D and InfoComm International CTS-I or equal certifications by NSCA shall be assigned to oversee the complete design and installation of the system. The Contractor shall provide formal written evidence of current industry certification for the designer(s) and installer(s) dedicated to this project as a part of their submittal before being allowed to commence work on the system.

    b. Provide reference list of at least five similar installations successfully completed within the last three years within a 100 mile radius. Include scope of work, contact name, title and telephone number.
    c. Project Manager Resume.

5. Manufacturer's Instructions:

    a. Manufacturer's recommendations for installing.
    b. Provide documentation of certification of manufacturer, supplier, installers, and instructors to be utilized on this project.

6. Testing Agent Qualifications.

B. Coordination Data:

1. Coordination Drawings:

    a. Provide trade coordination drawings of corridor ceilings with limited space where congestion with other systems may be a problem.

1.7 CLOSEOUT SUBMITTALS

A. Operations and Maintenance Data:

1. Final Submittal Copy:

    a. Approved copy of system submittal.
    b. Provide a listing of individual product/device/equipment warranties provided from the manufacturer with expiration dates identified.
    c. Provide a complete listing of devices, installed locations with product serial numbers for product tracking.

d. Provide all equipment and device licensing information equal to the lifetime of the product with the current system integration.
e. Provide a complete set of equipment cut sheets, parts list, including maintenance criteria, "troubleshooting" guide, distributor information and service information for all equipment provided.
f. Provide a complete set of instruction manuals; including complete written programming instructions, programming documentation and system set-up documentation.

1) Provide an additional quick-start guide with all commonly used procedures for operating the system. Laminate and provide copies during training session.

g. Provide all test results performed. Include manufacturer's certifications that installed system complies with specification requirements.

2. Special Warranty Information:

a. Provide copy of all documentation including test results sent to manufacturer for system warranty.
b. Provide all required documentation to the system manufacturer to initiate and ascertain the warranty specified.
c. Provide warranty of the system by the system manufacturer and guaranteed for the term of the warranty.

3. Service Contract:

a. Provide copy of first service contract terms for Owner evaluation prior to accepting or rejecting service contract.

B. Record Documents:

1. Operation and Maintenance Data:

a. Include the following in emergency, operation and maintenance manuals.

1) Three (3) final corrected copies of catalog data and shop drawings, critical spare parts lists, and manufacturer's operation and maintenance data applicable for the equipment furnished.
2) Instructions for periodic testing.
3) Warranty information.

b. Provide documentation identifying EDID information for all devices and components.

2. Record Drawings:

a. Record drawing indicating locations of all system components.
b. Provide a revised set of system wiring diagrams upon the completion of the installation for subsequent testing of the system to show actual cable routing, connections with other systems, cable lengths values of all equipment as installed and actual signal values as tested.
c. Utilize architectural floor plans for system layout.

3. Training / Demonstration Video.
4. Keying Schedule.
5. Software CD.
6. Final Field Quality Control Test Reports:

a. Test report indicating compliance with performance requirements for signal level, system response and signal-to-noise ratio.

1.8 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturers:

a. Firms regularly engaged in manufacture of professional quality audio/visual systems, components and accessories, of types, capacities and characteristics required, whose products have been in satisfactory use in similar service for not less than two (2) years.
b. Provided equipment shall have a guaranteed availability for a minimum of five (5) years from the delivery date through current distribution channels.

2. Suppliers:

a. Engage an experienced product supplier who is a factory-authorized sales and service representative regularly engaged in the design and installation of such systems to oversee the installation, trouble-shoot and make final connections at headend equipment.
b. Supplier shall have represented the product and components being installed for a minimum of two (2) years.

3. Installers:

a. Shall be fully capable and experienced in the installation of the systems specified, and have a minimum of five (5) years' experience on similar systems.
b. Qualified and certified installers and technicians on staff and assign them to this project. The project shall be staffed at all times by Installers and Technicians who, in the role of lead crafts persons, will be able to provide leadership and technical resources for the remaining crafts persons on the project.
c. Shall be certified by the manufacturing company(-ies) in all aspects of installation and testing of the products described within the systems specifications.
d. Refer to Division 01 Section "Definitions and Standards" for definition of experienced Installer. Upon request submit evidence of such qualifications to the Architect/Engineer.
e. Installer Supervision:

1) Provide a Project Manager as a single point of contact for all activities performed under this section and related equipment sections. The Project Manager shall have a minimum of three (3) years' experience in design and installation. The designer must have sufficient experience in this type project(s) as to be able to lend adequate technical support to the field forces during installation, during the warranty period and during any extended warranty periods or maintenance contracts. The Project Manager, or designee thereof, shall be required to attend project meetings as required until project closeout/signoff.
2) The Project Manager shall not change without the Owner consent. The Contractor shall not employ a proposed Project Manager to whom the Owner or Engineer has made reasonable objection.
3) If, in the opinion of the Owner, the Project Manager does not possess adequate qualifications to support the project, the Owner reserves the right to require to assignment of a Project Manager whom possesses the necessary skills and experience required of this project.

4. Instructors:

   a. Submit data of the instructor's experience and certified qualifications. Provide documentation that the instructor, who will train operating and maintenance personnel, has received a minimum of 24 hours of training from a recognized technical organization related to this work and two (2) years' experience in the installation of the type of equipment specified.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Acceptance Requirements:

1. Deliver components properly packaged in factory fabricated containers.
2. Deliver reels, racks, etc. on truck with hydraulic gate or lower carefully using hoist or fork lift. Never drop equipment.
3. Upended heavy equipment, racks, reels, etc. will often arrive damaged. Refuse or receive subject to inspection for hidden damages. Records of delivery date, manufacturer, installation date, any extenuating circumstances along with manufacturer test reports shall be kept on file.

B. Storage and Handling Requirements:

1. Store components in original cartons.
2. Material shall be stored in a secure area with a clean dry space protected from the effects of the weather and away from open fires or sources of heat.
3. Material shall be stored in an area away from construction traffic where construction equipment, falling or flying objects or other materials will not contact the components.
4. Material shall be stored in an area where chemicals, paint, or petroleum products will not be spilled or sprayed on them.
5. Cable reels must remain in the upright position. Cable reels must not be stored on their sides. Reels must not be stacked.
6. Cable reels and lagging must not be stored sitting in direct contact with water or dampness. Reels should be stored on flat, hard surface so that flanges do not sink into the earth. Timbers or metal supports must be placed under the red flanges to provide elevated storage away from water or damp soil.
7. Reels can be hoisted with a shaft extending through both flanges or cradle both reel flanges between fork lift forks. Never allow forks to touch cable surface or reel wrap. Do not lift by top flange.
8. Handle equipment and components carefully to avoid breakages, impacts, denting and scoring finishes. Do not install damaged equipment; replace and return damaged units to equipment manufacturer. Store components in original cartons.
9. If materials are relocated, an inspection shall be made.
10. Handle equipment and components carefully to avoid breakages, impacts, denting and scoring finishes. Do not install damaged equipment; replace and return damaged units to equipment manufacturer.

C. Packaging Waste Management:

1. Dispose of all packing materials and include cost of packing materials disposal and handling as part of the base bid.

1.10 WARRANTY

A. Contractor Construction Warranty:

1. Refer to Division 01 requirements.

B. System Warranty:

1. Provide a warranty for the entire system.
2. The warranty shall be backed by the manufacturer's certified vendor.
3. In the event that the system is being interfaced to existing equipment, that equipment warranty shall be covered by the new warranty implemented with this project.
4. Warranty shall commence when the following construction milestones are met:

   a. Substantial Completion.
   b. Final Engineer acceptance of complete system installation.

C. Special Warranties: Manufacturer specific product/equipment warranties beyond that listed as system operation.

D. EIA Compliance: Comply with the following Electronics Industries Association Standards:

1. Sound Systems, EIA-160.
2. Loudspeaker, Dynamic Magnetic Structures, and Impedance, EIA-299-A.
3. Racks, Panels, and Associated Equipment, EIA-310-A.
4. Amplifiers for Sound Equipment, SE-101-A.
5. Speakers for Sound Equipment, SE-103.
6. UL Compliance: Comply with requirements of UL 50.

1.11 LICENSES

A. Provide all licenses for all equipment to operate for the lifetime of the installed equipment and system.

1. Licenses shall not expire for the equipment or devices purchased and installed and shall not be required for extending maintenance or operation of the system.
2. Licenses shall cover software and hardware.

PART 2 - PRODUCTS

2.1 PERFORMANCE

A. General: The following minimum performance standards shall be met by the audio visual system.

B. Audio:

1. Signal/Noise ratio (including crosstalk and hum): 75dB minimum.
2. Total Harmonic Distortion: 0.5 percent maximum from 30 Hz to 15,000 Hz.
3. Frequency Response: Flat within +1.0 dB, 30 Hz to 15,000 Hz.

C. Video:

1. Provide digital signal integrity of 1080P/60 Hz and 8 bit color throughout system.
2. Digital Bit Error Rate: Zero.
3. Digital Signal Data Rate: 4.64 Gbps.
4. Signal/Noise Ratio (peak to RMS), Unweighted DC to 4.2 MHz: 45 dB minimum.
5. Crosstalk, Unweighted DC to 4.2 MHz: 45 dB minimum.
6. Frequency Response (RGBHV): Within +0.5 dB to 300 MHz.
7. Frequency Response (Composite): Within +0.5 dB to 10 MHz.
8. Frequency Response (Component): Within +0.5 dB to 100 MHz.
9. Line and Field Tilt: 2 percent maximum.
10. Differential Gain: 3 percent maximum.
11. Differential Phase: 2 degrees maximum.

D. Test Signal Paths:

1. Audio: From any and all source inputs (microphones, audiotape units, videotape units, etc.) through all audio mixers, switchers, distribution amplifiers, codecs, etc., to all signal designations.
2. Video: From any and all source inputs (microphones, audiotape units, videotape units, etc.) through all video mixers, switchers, distribution amplifiers, codecs, etc., to all signal destinations.
3. Prior to ordering equipment, coordinate the frequencies of all wireless devices to prevent unwanted interaction between devices and rooms. This includes, but is not limited to, wireless microphones, assisted listening system devices, wireless control panels, etc.
4. Video: Recover digital video signals including re-clocker for display port, SDI and HD-SDI and regeneration for DVI and HDMI.

    a. Utilize digital tester. Manufacturer: Quantum Data 780.

2.2 MANUFACTURERS

A. Careful attention has been made to specify current production models for all equipment listed; however, due to frequent updates of equipment in this field some model numbers may become discontinued. Equipment with the same features and functionality shall be provided as a replacement as recommended by the manufacturer at the time this project is built. In such cases, the nearest equivalent product by the same manufacturer of the discontinued product shall be provided.

B. AV systems and associated related equipment shall be furnished by a single supplier. Coordinate the features of materials and equipment so they form an integrated system with components and interconnections matched for optimum performance of specified functions in the specific rooms.

C. Manufacturers: Subject to compliance with requirements, provide products and components as follows:

1. Extron: The Owner's preferred manufacturer for AV switching and distribution components.

    a. The integrator may provide an Alternate Bid for touch panel equipment manufactured by FSR for consideration. Identify as Alternate Bid AV-1.

D. Classroom Spaces:

1. System performance level shall be the following:

    a. Frequency Range: 250 Hz – 10 KHz.

        1) Avg. SPL: 75 – 80 dB.

E. Video Distribution Components:

1. Scalable Matrix Switcher:

    a. Chassis:

        1) (4) Input card slots.
        2) (4) Output card slots.
        3) 15.2 Gbps backplane.
        4) EDID minder.
        5) Key minder.
        6) Manufacturer: Extron XTP Crosspoint 1600 Series.

b. Input/Output Boards:

1) (4) Input/Output DVI:

a) Support 1080p/60Hz deep color.
b) HDCP compliant.
c) Manufacturer: Extron XTP CP DVI PRO I/O.

2) (4) Input/Output HDMI Boards:

a) Support 1080p/60Hz deep color.
b) HDCP compliant.
c) Manufacturer: Extron XTP CP HDMI I/O.

3) (4) Twisted Pair Transmitter/Receiver Boards:

a) Support 1080p/60Hz deep color.
b) HDCP compliant.
c) RJ-45 connectors.
d) Manufacturer: Extron XTP CP I/O.

c. Control Port RS-232 – 9-Pin female D connector, Ethernet.
d. Rack Mount: 5 RMU.
e. Internal power supply.

2. 8 Input - 4 Output Scaling Matrix Switcher with Control Processor:

a. 2 DTP and 6 HDMI inputs.
b. 2 HDMI and 2 independently scaled DTP outputs.
c. 4K capable native resolution.
d. Integrated audio DSP.
e. Integrated 70 VDC power amplifier.
f. Integrated IP Link Pro control processor.

1) Provide additional control processor for equipment control as required.

g. Manufacturer: Extron DTP Crosspoint 84 IPCP.

3. 10 Input - 8 Output Scaling Matrix Switcher with Control Processor:

a. 4 DTP and 6 HDMI inputs.
b. 4 HDMI and 4 independently scaled DTP outputs.
c. 4K capable native resolution.
d. Integrated audio DSP.
e. Integrated 70 VDC power amplifier.
f. Integrated IP Link Pro control processor.

1) Provide additional control processor for equipment control as required.

g. Manufacturer: Extron DTP Crosspoint 108 IPCP.

4. Twisted Pair Receivers:

a. Support 1080p/60 Hz deep color and 1920 x 1200 signals.
b. Bidirectional RS-232 and IR for AV device control.
c. HDCP compliant.
d. EDID minder.
e. Key minder.
f. RJ-45 jack.
g. 12V power supply.
h. Manufacturer: Extron XTP R HDMI.

5. Twisted Pair Scaling Receiver:

    a. Support 1080p/60Hz deep color and 1920 x 1200 signals.
    b. Bidirectional RS-232 and IR for AV device control.
    c. HDCP compliant.
    d. EDID minder.
    e. Key minder.
    f. RJ-45 jack.
    g. 12V power supply.
    h. Scales HDMI, DVI, RGB, HD component video, standard definition.
    i. Manufacturer: Extron XTP SR HDMI.

6. HDMI Twisted Pair Transmitter:

    a. Support 1080p/60 Hz deep color and 1920 x 1200 signal.
    b. Bi-directional RS-232 control or IR for AV device control.
    c. HDCP compliant.
    d. EDID minder.
    e. Key minder.
    f. RJ-45 jack.
    g. 12 volt power supply or remotely powered.
    h. HDMI loop through.
    i. Manufacturer: Extron XTP T HDMI.

7. VGA Twisted Pair Transmitter:

    a. Supports RGB HD component video, SVideo and composite signals.
    b. Bi-directional RS-232 control or IP for AV device control.
    c. EDID minder.
    d. RJ-45 jack.
    e. 12 volt power supply or remotely powered.
    f. Manufacturer: Extron XTP T VGA.

8. Twisted Pair Transmitter Wall Plate:

    a. (1) HDMI and (1) VGA, 3.5 mm audio input.
    b. Support 1080p/60Hz deep color and 1920 x 1200 signal.
    c. HDCP compliant.
    d. EDID minder.
    e. Key minder.
    f. RJ-45 jack.
    g. LED indicators.
    h. Manufacturer: Extron XTP T UWP 202.

9. RBG to HDMI Scaler:

    a. RGB and HDTV component to HDMI:

        1) Input: (1) 15 pin HD female with 3.5 mm audio input.
        2) Output: (1) HDMI.

    b. Audio Embedded to HDMI with gain attenuation and delay control.
    c. Manufacturer: Extron DVC RGB-HD A.

10. HDMI Distribution Amplifier:

    a. Support single link HDMI signals 1920 x 1200.
    b. EDID minder.
    c. Input: (1) HDMI / Output: (2) HDMI.
    d. Manufacturer: Extron HDMI DA2 4K.

11. Rack Mount Power Supply:

    a. Provides 8, 12 Volt DC outputs; 4.0 amps total.
    b. Rack mountable, IU.
    c. Manufacturer: Extron # PS 124.

F. Media Controllers:

1. Media Controller:

    a. Shall be used to control additional A/V equipment located in each room. Equipment to be controlled includes but is not limited to:

        1) Projectors.
        2) LCD TVs and monitors.
        3) BluRay/DVD.
        4) Cameras.
        5) Volume control.
        6) Audio and video switchers.
        7) Projection screens.
        8) Mixers.
        9) Audio mixer/DSP.
        10) Video conferencing.
        11) Web cameras.

    b. The media controller shall have the following features as a minimum:

        1) 10/100 Ethernet port for diagnostic, administration and control.
        2) 32 MB of memory.
        3) 512 KB of non-volatile battery backed memory.
        4) Communication port support baud rates ranging from 300 to 115,200.
        5) Extron control software.
        6) (8) IR ports.
        7) (4) I/O.
        8) (8) Relays.
        9) (8) RS-232/RS-422/RS-485 serial ports.
        10) (8) Ethernet controlled devices.
        11) Support (6) touch panels.
        12) Rack mountable.
        13) Integrated with touch panel.

    c. Manufacturer: Extron IPCP 500.

2. LCD Touch Panel Controller:

    a. 1024 x 600 resolution color touch panel LCD.
    b. 32 MB compact flash.
    c. ABS polycarbonate enclosure.

        1) Black matte finish.

    d. Contrast: 500:1.
    e. 128 MB SDRAM.
    f. Integrated Speaker.
    g. Desk mount or wall mount per Drawings.
    h. Remote power supply located in rack or lectern.
    i. Manufacturer: Extron TLP Pro 720 series with XTP PI 100 power supply.

3. LCD Cable Cubby Touch Panel Controller:

a. 3.5" Flip up LCD touchscreen.
b. 320 x 290 resolution.
c. Fully customizable for control of all equipment.
d. Power over Ethernet functionality.
e. Brushed aluminum or black finish.
f. AC power module.
g. Ports and cable connectors as required for system operation:

1) HDMI.
2) VGA.
3) 3.5 audio.
4) USB power.
5) Ethernet (RJ45).

h. Manufacturer: Extron TLP Pro 320C.

4. Miscellaneous:
a. Eight relays for controlling room functions.
b. 512 MB SDRAM.
c. Combines with IP link control processors, Manufacturer: Extron IPL Pro CR88.

G. Video Display Components and Brackets:

1. Lecture Hall Projection Unit:

a. Ceiling mounted with the following features:

1) Brightness: 5500 ANSI Lumens minimum.
2) Resolution: Native WUXGA 1920 x 1200; 4K.
3) Computer Formats Supported: 1900 x 1200 through 640 x 480.
4) Computer Compatibility: SxGA+, SXGA, WXGA, XGA, SVGA, VGA.
5) 3 LCD.
6) Screen Size: As shown on Drawings.
7) Focal Length: Provide lens to meet screen size.
8) Digital zoom and focus.
9) Color Palette: 16.7 million colors.
10) Lamp – 330 W; estimated life of 3000 hours.
11) Horizontal Keystone Correction – To meet installation.
12) Vertical Keystone Correction – To meet installation.
13) Scanning Frequency: Auto; H-Sync 15-108 kHz, V-Sync 93-120 Hz.
14) Video Color Systems: NTSC/PAL/SECAM/NTSC 4.43/PAL-M + N.
15) SDTV Compatibility: 480i/p, 575i/p.
16) HDTV Compatibility: 720p, 1035i, 1080i, 1080P.
17) Aspect Ratio: 16:10.
18) Contrast Ratio: 50,000:1.
19) Audio/Video Inputs:

a) HDMI.

20) RS-232C control and service port.
21) Power Management: Auto shut-off.
22) Economy Mode.
23) UL listed.
24) Security – Cable Locking System.

b. Manufacturers: Epson Pro G 7400 U.

2. Classroom Projection Unit:

a. Brightness: 4200 Lumens.

b. Contrast Ratio: 3000:1.
c. Native Resolution: 1280 x 800.
d. Aspect Ratio: 16:10 WXGA.
e. Digital Inputs: HDMI.
f. Max. Power: 311 watts.
g. Audible Noise: 37 dB; Econs Mode: 29 dB.
h. Display Type: LCD.
i. Control: RS-232 C.
j. LAN – Ethernet.
k. Epson Powerlite 1945W.

3. Projection Unit Mounting Bracket:

   a. Provide universal, yokeless, ceiling mounted bracket as recommended by the manufacturer.

      1) Provide tamperproof hardware.
      2) Security locking device with aircraft cable.
      3) Extension Pipe: Diameter 1-1/2", Length as required for mounting height.
      4) Stabilization Bars (above accessible ceiling) to prevent projector sway.
      5) Lateral shift assembly.
      6) Finishing ring for extension pipe through ceiling and low-voltage cabling through ceiling.
      7) Manufacturer: Chief or VMP.

   b. Provide ceiling mount tile for 2' x 2' or 2' x 4' ceiling.

      1) Tile bridge to eliminate tile sag.
      2) Knockout for cable pass-thru and receptacle backbox.
      3) Manufacturer: Extron PCM 240 or approved equal.

   c. Large Projector Lock:

      1) Keyed lock assignment.

         a) Coordinate with University (A).

      2) Unique locking configuration.

         a) Coordinate with University (PL1A).

      3) Convenient lamp and filter access.
      4) Compact, discreet appearance; paint white to match projector.
      5) Manufacturer: Chief Manufacturing Large RPA Series.

4. 55-Inch Flat Panel Monitor:

   a. Aspect Ratio: 16 x 9.
   b. Resolution: 1920 x 1080.
   c. Contrast Ratio: 5000:1.
   d. Inputs: 15-Pin RGB, HDMI, RS-232C.
   e. Built in speakers: 10 watts x 2.
   f. Commercial grade.
   g. Warranty: Three (3) year parts/labor.
   h. Manufacturer: Samsung #ED65C.

5. 65-Inch Direct-Lit LED Flat Panel Monitor:

   a. Aspect Ratio: 16 x 9.
   b. Resolution: 1920 x 1080.
   c. Contrast Ratio: 4000:1.

d. Inputs: VGA, HDMI, RS-232C.
e. Warranty: Three (3) year parts/labor.
f. Manufacturer: Samsung #ED75C.

6. LCD TV Wall Mount Articulating Arm:

a. Capacity to support 37" to 60" LCD flat screen monitors.
b. +10 deg./-5 deg. tilt.
c. 180 deg. pivot.
d. +/- 7 deg. roll.
e. 31.2" extension arm, retracts to 4.5".
f. Cord management.
g. 175 lbs. load capacity.
h. Provide all accessories and miscellaneous hardware for a complete installation including unistrut support (for above accessible ceilings), mounting plates (specific to mounting surface), bolts, pipe extension, ceiling trim plates, etc. to locate monitor as directed in Contract Documents or as determined in the field.
i. Theft resistant security fasteners.
j. Manufacturer: Peerless PLAU60-UNL or approved equal.

7. LCD Monitor Wall Mount:

a. Capacity to support 37" to 60" LCD flat screen monitors.
b. +12 deg. tilt.
c. Cord management.
d. 175 lbs. load capacity.
e. Provide all accessories and miscellaneous hardware for a complete installation including mounting plates (specific to mounting surface), bolts, etc. to locate monitor as directed in Contract Documents or as determined in the field.
f. Theft resistant security fasteners.
g. Manufacturer: Premier PCM-MS2 or equal by Chief.

8. LCD Dual Monitor Ceiling Mount:

a. Capacity to support 37" – 63" diagonal flat screen monitors.
b. 350 lbs. load capacity.
c. 15 deg. tilt.
d. 360° swivel.
e. 2" extension pipe supported from structure.
f. Cable management.
g. Manufacturer: Premier ECM-3763D.

9. LCD Monitor Ceiling Mount:

a. Capacity to support 37" – 63" diagonal flat screen monitor.
b. 160 lbs. load capacity.
c. Tile +25/-20 deg.
d. 360° rotation.
e. 1.5 extension pipe supported from structure.
f. Cable management.
g. Manufacturer: Premier RTM-CL.

H. Audio Equipment:

1. Speakers:

a. Classroom Speakers:

1) Flush Recessed Ceiling Mounted Classroom Speaker:

a) 6.5" woofer.
b) .75" tweeter.
c) Frequency Range: 75 Hz – 20 kHz.
d) Power Capacity: 150W continuous, 75W pink noise.
e) Sensitivity: 89 dB, 1W @1m.
f) Multi Tap Transformer: 70V / 100V.

(i) Taps: 60W, 30W, 15W, 7.5W.

g) Coverage Angle: 110 degrees conical.
h) Suspended ceiling bracket.
i) Finish: White.
j) Manufacturer: Community D6 Series, Extron 26 CT, or approved equal by JBL, ElectroVoice.

b. Ceiling Mounted Speakers – MBA Room:

1) Two-way 6" coaxial speakers.
2) Operating Range: 65 Hz – 22 KHz.
3) Sensitivity 1W/1M: 95 dB.
4) Continuous Max. Output: 117 dB.
5) Nominal Beamwidth: 115 degrees conical.
6) 70V / 100V Auto Former: 120W, 60W, 30W, 15W.
7) Power Handling: 150W continuous @ 8 ohms.
8) Dimensions: Height: 6.788".
Diameter: 10.000".
9) Finish: Black; paintable ABS matte plastic with steel grille.
10) Manufacturer: Community D6 or approved equal by JBL, ElectroVoice.

2. Microphones:

a. Wired Lectern Microphone:

1) 19" gooseneck microphone with shock mount.
2) XLR mic jack with 4' mic cable.
3) 50 - 17 KHz frequency response.
4) Manufacturer: Shure MX418SE/S or Sennheiser MEG 14-40.

b. Wireless Microphone System:

1) Frequency Range: 518 to 558 MHz, 566 to 600 MHz.
2) Effective Range: 300 feet.
3) Transmitter Gain: 25 dB.
4) RF Output: Selectable 10 - 30 mW.
5) 1680 operating frequencies.
6) Receiver:

a) Multi-function display.
b) Tone key squelch.
c) Noise squelch.
d) RF meter.
e) Volume Control.
f) Provide antennas to accommodate quantity of receiver/transmitters.
g) Manufacturer: Sennheiser G3 500 Series or equal by Shure.

7) Transmitter (Hand Held):

a) Programmable mute button.
b) On/Off switch.

c) RF Output Level: Selectable 10 - 30 mW.
d) 20 dB pad switch.
e) Battery fuel gauge.
f) 24 compatible frequencies.
g) Manufacturer: Sennheiser G3 Series; SKM 500 Series, or equal by Shure.

8) Transmitter (Belt Pack with Lavalier Microphone):

a) Impedance Output: 50 ohms.
b) RF Output Level: Selectable 10 - 30 mW.
c) Condenser microphone.
d) Battery fuel gauge.
e) Manufacturer: Sennheiser G3 Series; SK 500, and MKE2 or equal by Shure.

9) Provide both handheld and lavalier transmitter with each receiver. Only one device will be functional at a time.

c. 3-Element Ceiling Microphone Array:

1) (3) Cardioid microphones.
2) Dynamic Range: 80 dB, 1 kHz @ max SPL.
3) SNR: 60 dBA.
4) Frequency Response: 10 Hz – 12 kHz.
5) Sensitivity: 114 mV/Pa.
6) RJ-45 to mixer adapter cable.
7) Ceiling mount kit.
8) Color shall be white.
9) Manufacturer: Audix M3 Series or equal by Clearone or Shure.

d. Hanging Microphone - Student Stations:

1) Frequency Response: 40 - 20,000 Hz.
2) Super Cardioid Shot Gun.
3) Ceiling Hanger.
4) Color shall be White in Classrooms.
5) Manufacturer: Sennheiser ME36 or approved equal by Shure.

e. Corded Handheld Microphone:

1) Frequency Response: 55 to 18,000 Hz.
2) Output Impedance: 150 ohms.
3) Polar Pattern: Cardioid 33.5 dB.
4) SNR: 71 dB.
5) XLR Connection.
6) On/off switch.
7) 50' mic cable.
8) Manufacturer: Sennheiser, Shure, AKG.

f. Wireless Conferencing System:

1) Browser based software tool for set-up and real-time control.
2) Dante digital audio network based.
3) 50m working range.
4) 1920-1930 mHz range.
5) Access Points:

a) 4 and 8 channel units.

b) PoE, gigabit Ethernet, RJ45.
c) Dante digital audio.
d) 6.7" x 6.7" x 1.35"; molded plastic paintable housing. Paint black.
e) Manufacturer: Shure MXWAPT4; MXWAPT8.

6) Audio Network Interface:

a) 4-Port Gb Ethernet switch, PoE.
b) Rack mountable.
c) 4 and 8 channel units.
d) 4 and 8 per-analog channel output.
e) Manufacturer: Shure MXWANI4; MXWANI8.

7) Transmitters:

a) -25 to +15 dB gain adjustment (1dB).
b) Lithium ion rechargeable battery.
c) Battery life; up to 9 hours.
d) Modular base transmitter with programmable on/off, push-to-talk or audio gait.
e) 10" gooseneck.
f) Manufacturer: Shure MXW8.

8) Charging Station:

a) Front panel LEDs indicate charging.
b) Ethernet port; enables software to report charging.
c) 4 and 8 bat charging stations.
d) Manufacturer: Shure MXWNCS4; MXWNCS8

9) Or approved equal by Sennheiser.

3. Digital Signal Processor/Mixer Equipment:

a. Audio DSP:

1) 12 wideband mic/line level inputs with Acoustic Echo Cancellation (configurable on each port).
2) 8 balanced mic/line level inputs.
3) USB video input.
4) RS-232 serial port.
5) Audio Video Bridging (AVB) digital audio networking.
6) 1 RMU.
7) Signal processing via software for signal routing, mixing, equalization, filtering and delay.
8) Gigabit Ethernet port.
9) Five (5) year warranty.
10) Manufacturer: BiAmp Tesira FORTE AVB CI or approved equal by Rane.

b. Audio DSP with VoIP Interface:

1) 12 wideband mic/line level inputs with Acoustic Echo Cancellation (configurable on each port).
2) 8 balanced mic/line level inputs.
3) USB video input.
4) RS-232 serial port.
5) Audio Video Bridging (AVB) digital audio networking.
6) 1 RMU.

7) Signal processing via software for signal routing, mixing, equalization, filtering and delay.
8) SpeechSense processing algorithm.
9) 2-channel VoIP interface (SIP Compliant) via RJ-45 connector.
10) Gigabit Ethernet port.
11) Five (5) year warranty.
12) Manufacturer: BiAmp Tesira FORTE AVB VI or approved equal by Rane.

c. Modular Audio DSP Server:

1) 12 I/O slots with up to 48 channels of audio control and processing.
2) 4-port mic/line level input card (Quantity as required).
3) 4-port mic/line level output card (Quantity as required).
4) Acoustic Echo Cancellation.
5) RS-232 serial port.
6) Audio Video Bridging (AVB) digital audio networking.
7) 3 RMU.
8) Signal processing via software for signal routing, mixing, equalization, filtering, dynamics and delay.
9) SpeechSense and Ambient Noise Sense processing algorithm.
10) Gigabit Ethernet port.
11) Manufacturer: BiAmp Tesira Server-IO AVB or approved equal by Rane.

d. AVB Switch:

1) 5 port AVB switch.
2) Industry standard IEEE 802.1 AVB compliant.
3) Auto device discovery and network bandwidth management for AVB devices.
4) 1 GB operation - low latency.
5) 1 Ethernet port connection.
6) MOTU AVB switch or approved equal.

4. Amplifiers:

a. Multi-Channel Amplifier:

1) 8 channels of 50 watts each; bridgeable to 100 watts.
2) LED indication of signal presence, over-temperature condition, output fault condition on each channel.
3) Self-resetting protection against short-circuit, over-temperature, improper load.
4) Input level controls and high pass filter switches.
5) Frequency Response: +0/-1 dB.
6) THD+N shall be less than 0.2%.
7) S/N ratio greater than 85 dB.
8) Five (5) year warranty.
9) Manufacturer: BiAmp MCA8050 or approved equal.

b. Classroom Amplifier:

1) 2-channel audio amplifier.
2) (2) channels 300W per channel at 8 ohms.
3) S/N Ratio: <105 dB.
4) Total Harmonic Distortion: <0.1%.
5) Frequency Response: (al watt, 20 Hz – 20 kHz).
6) Manufacturer: Crown DCI 2/300 or approved equal by ElectroVoice or QSC.

I. Racks and Cabinets:

1. Floor Mounted AV Cabinet ("AVI"):

a. Dimensions:

1) 70" H x 23" W x 28" D.
2) 40 RMU spaces.

b. 19" rack rail with 10 – 32 mounting holes front and rear.
c. Vented locking rear and front doors.
d. Vented side panels.
e. Constructed with 11 gauge steel.
f. Painted with iron phosphate coating for rust prevention and paint adhesion. Cabinet finish: black.
g. Provide vented panels for unused openings.
h. Vertical and horizontal wire management.
i. AC Receptacles:

1) Rack mounted power distribution unit.
2) Illuminated master on/off switch.
3) 8-rear outlets, 1 front outlet.
4) Surge, spike protection and EMI filtering.
5) Manufacturer: MidAtlantic Products 3PD-915R.

j. Label cabinet AV system.
k. Provide caster base.
l. Manufacturer: MidAtlantic ERK Series.

2. Sliding and Rotating Equipment Rack:

a. Dimensions:

1) 27-1/2" Height, 20" Width, 19-1/4" Deep.
2) 14 RMU (minimum).

b. 11 gauge steel construction.
c. Standard 19 inch rack mounted, combination/adjustable side rails with standard EIA mounting holes and spacing for adjustment of rack mounting.
d. Sliding Rail System:

1) 4 integrated ball bearing slides.
2) 90 degree rotating rack.

e. Detachable rack frame.
f. 250 lbs. capacity.
g. Front mounted tab to lock rotating frame at 0, 60, and 90 degrees.
h. One (1) eight outlet surge protected isolated ground outlet strips.
i. Rack shall be fully equipped with patch panels, grounding lugs, integral wire management, and housing kits.
j. Provide rack mountable sliding equipment drawers for storage of microphones, wireless equipment, and cords when not in use.
k. Manufacturer: Middle Atlantic Products, Inc. SRSR-4-14.

3. Laptop Locker Unit:

a. Stores and charges up to 10 tablets, laptops.
b. Heavy gauge steel with single bolt lock.
c. 12.63" x 13.75" D x 3.44" H power tray.
d. (2) 7-outlet power strips.

e. Surge protection; lighted on/off switch.
f. Warm grey color.
g. Manufacturer: Spectrum Industries; Connect 10 Locker.

J. Power Distribution:

1. Power Strips:

a. Sequencing Power Distribution:

1) 120V, 20 amp rack mounted horizontal power distribution strip.
2) 6-step sequencing to 6 outlets.
3) Master On/Off switch.
4) Single unswitched outlet.
5) Surge and spike protection, EMI filtering.
6) Manufacturer: Middle Atlantic or approved equal.

b. Power Distribution:

1) 120V, 20 Amp rack mounted horizontal power distribution strip.
2) 8 rear outlets and one front outlet.
3) Surge and spike protection EMI filtering.
4) Master On/Off switch (as required).
5) Manufacturer: Middle Atlantic or approved equal.

K. Lecterns:

1. Standard Media Lectern:

a. Surround control console.
b. Dimensions: 38" W x 28.5" D x 41" H.
c. Removable 12 RMU front and 12 RMU back rack cube.
d. Lockable front and rear access doors. Acrylic front.
e. Large document camera drawer with lock.
f. Keyboard/mouse tray.
g. Right and left flip up shelves.
h. Toe kick cover.
i. Cove power module.
j. 3" twin wheel castors.
k. Custom cutouts.
l. Pre-drilled monitor arm mounts.
m. 10 year warranty.
n. Color: Wilsonart Misted Zephyr 4843-60 and Wilsonart Black 1595-60.
o. Manufacturer: Spectrum Industries; Media Manager Elite Lectern.

2. Seminar Room Solution:

a. 24" W x 28" D work surface with surround.
b. 36" lectern height.
c. 12 RMU available removable rack cube.
d. Powder coated steel chassis.
e. 3" twin wheel locking castors.
f. Locking audience side door.
g. Locking instructor side door (acrylic).
h. Cable grommets.
i. Custom cut out.
j. Removable toe kick.
k. Keyboard/mouse tray.
l. Flip up document camera/task shelf (both sides).

m. 10 year warranty.
n. Color: Wilsonart Misted Zephyr 4843-60 and Wilsonart Black 1595-60.
o. Manufacturer: Spectrum Industries, Media Manager, Link Lectern.

3. Trading Room – Adjustable Height Lectern:

a. 2-piece instruction station with connector kit.
b. Workstation:

1) Manual adjustable work surface height from 30-42" with pneumatic gas assist spring. Life Capacity: 38 lbs.
2) Work Surface: 34" W x 30" D.
3) Freedom One keyboard tray.

c. Equipment Rack:

1) 21" W x 30" D x 39" H.
2) 18 RMU with integrated rails (front and rear).
3) Rack mount pull out shelf.
4) 36" clear locking door.
5) 36" locking rear door.
6) Rack mount drawer.
7) Flip up shelf.

d. Cove power module.
e. 3" twin wheel castors.
f. Color: Wilsonart Misted Zephyr 4843-60 and Wilsonart Black 1595-60.
g. 10 year warranty.
h. Manufacturer: Spectrum Industries; Freedom One Sit-to-Stand Lectern and Equipment Rack.

4. Student Single Post Lectern:

a. 47" H stand-up lectern.
b. Frame: RA-natural anodized finish.
c. Reading Shelf/Base: Black Melamine.
d. Manufacturer: Peter Pepper Products Model 7831.

L. Video Source Equipment:

1. Media Lecture Capture Camera:

a. Image Sensor: 1/3 type CMOS.
b. Lens: 10x optical zoom, 40x digital zoom
F = 3.4 to 33.9 mm
c. Horizontal Viewing Angle: 8 degrees (tele) to 70 degrees (wide).
d. Minimum Illumination: 15 lux.
e. Shutter Speed: 1/60 to 1/10,000 sec.
f. Signal System: 1080p/59.94, 1080p/50, 1080i/59.94, 1080i/50, 1080p/29.97, 1080p/50, 720p/59.97, 720p/50.
g. Pan-Tilt-Zoom: Pan +/-100 degrees; tile +/-25 degrees.
h. Video Output: DVI-I, digital and analog.
i. Control: RS-232C.
j. Presets: 6.
k. Power Supply: 12V DC.
l. AC Adaptor, IR Remote.
m. Wall mount bracket.
n. Manufacturer: Sony EVI-HD7V.

2. Web Cameras:

    a. USB 2.0 (MJPEG).
    b. low-noise 2.38 Megapixel CMOS Image Sensor.
    c. Controllable via RS-232 or remote control.
    d. Includes mount, extender and camera.
    e. Manufacturer: Vaddio ZoomSHOT 20 QUSB System.

3. Apple TV:

    a. HDMI output.
    b. Wireless 802.11, RJ-45 connectivity.
    c. Apple TV; 4th generation. 64 GB.

4. Annotation Processor:

    a. Live annotation capabilities plus scaling and switching.
    b. HDCP compliant.
    c. Inputs: Displayport, HDMI, VGA.
    d. Outputs: (2) HDMI, (1) DTP; 3 Simultaneous Video Outputs.
    e. Manufacturer: Extron Annotator 300 or approved equal.

5. Document Camera (Desk Mounted):

    a. Document cameras shall have the following features:

        1) 1/4" CMOS sensor.
        2) Control panel for operation.
        3) Capture live images with 30 fps frame rate.
        4) Zoom (32x digital).
        5) Pixel Count: 5 megapixels.
        6) Digital Signal Output: HDMI.
        7) HDMI input.
        8) Power supply and remote control.
        9) Five (5) year warranty.

    b. Manufacturer:

        1) Aver #F17HD.

6. Barco Clickshare Systems:

    a. 4-Dongle System:

        1) Operating Systems: Windows 7/8/8.1/10 32 & 64 bit, Mac OS 10.10/10.11/10.12.
        2) Video Output: DVI-I, Displayport.
        3) Frame Rate: Up to 30 FPS.
        4) Output Resolution: UHD (3840 x 2160).
        5) Authentication Protocol: WPA2-PSK.
        6) Wireless Transmission Protocol: IEEE 802.11 a/g/n
        7) Frequency: 2.4 GHz and 5 GHz.
        8) Barco CSC-1.

    b. 2-Dongle System:

        1) Operating Systems: Windows 7/8/8.1/10 32 & 64 bit, Mac OS 10.10/10.11/10.12.
        2) Video Output: HDMI.
        3) Frame Rate: Up to 30 FPS.
        4) Output Resolution: 1920 x 1200.

5) Authentication Protocol: WPA2-PSK.
6) Wireless Transmission Protocol: IEEE 802.11 a/g/n
7) Frequency: 2.4 GHz and 5 GHz.
8) Barco CSE-200.

7. Blu-Ray Player: Sony.
8. Touch Panel:

a. 16:9 aspect ratio; 21" diagonal.
b. Full HD resolution; 1920 x 1080.
c. Multi-touch point capable.
d. HDMI input.
e. USB 3.0 control.
f. Compatible with Extron Annotator 300.
g. VESA 100 x 100 or 75 x 75 hole pattern.
h. Manufacturer: Planar, HP, NEC, Samsung.

M. Miscellaneous Equipment:

1. Wireless Keyboard/Mouse: OFCI.
2. Multi-Purpose Cooling Fan:

a. AC powered, heavy duty aluminum fan with fan guard.
b. Size: 4.7" x 4.7" x 1" D.
c. Airflow: 51 CFM.
d. Noise: 30 dBA.
e. Speed: 1800 RPM.
f. Voltage: 120 VAC.
g. Coordinate installation in lectern, cabinet, etc.
h. Manufacturer: AC Infinity LS-1225A-X.

3. Dual Stacking Monitor Arm:

a. Dual monitor bracket.
b. Enables monitor stacking.
c. Extends monitors up to 25 inches; adjusting up to 18 inches.
d. Constant force lift and pivot technology holds monitor in place.
e. Cable management below and within monitor arm.
f. 10 year warranty.
g. Manufacturer: Ergotron LX #45-248-026.

4. Multi-Service Ceiling Boxes:

a. A multi-service outlet box assembly designed and fabricated to provide a flush-to-ceiling, concealed, multi-outlet/multi-port facility, for the purposes of extending AC power and audio/video/data cabling and wiring connections to adjacent equipment installed at the ceiling.
b. Construction: Shall be fabricated from not less than 18 ga. sheet metal, formed, machined, and assembled into a rectangular enclosure, designed for concealed, flush, install into ceiling construction material. Shall be designed and fabricated to:

1) House outlet provisions for not less than two (2), AC duplex receptacles, and shall be provided with coverplate for receptacle access.
2) House outlets, connectors, ports, etc., for the purpose of extending cables and wiring from their faces to adjacent equipment.
3) House active AV active distribution devices, components, and equipment, within the enclosure.

4) Be field installed flush to non-accessible drywall, or accessible grid ceiling construction. Provide brackets, clamps, etc., to facilitate field install into ceiling construction.
5) Provide knockouts and cable management tie-off points for the concealed dressing and routing of excess wiring and cable lengths, such that connections to adjacent equipment remain concealed.

c. Size: Inside enclosure dimensions shall be nom. 11" W x 22" L x 6" D.
d. Provided with a hinged, sheet metal door assembly, fitting flush to enclosure, with semi-flush keyed latch.
e. Finish: Polyester power paint finish - white.
f. Devices, Ports, and Connectors:

1) Refer to Drawings for device requirements, ganging, multi-service technology requirements, ratings, quantities, etc.

g. Basis of Design:

1) Hubbell Premise Wiring - AVCE Series.

h. Acceptable Equivalent Manufacturers:

1) FSR.
2) Premier Mounts.

2.3 CABLES

A. Utilize factory manufactured patch cords in lieu of field terminated cables and components at rack connections and wherever possible.

1. Utilize industry standard color coded connectors.
2. Verify patch cord length and routing through sleeves/conduits prior to submittal stage.
3. Utilize compression type connectors for all field terminated components where required. Provide industry standards identifiable color rings indicating connection type.

B. All cabling shall be plenum rated.

C. Provide all video cabling/connectors to produce the optimal video signal available from the source to the display as available from the equipment and video switcher.

D. Speaker Cable:

1. 1-pair 18 AWG copper stranded conductors.
2. Plenum rated exterior jacket.
3. Utilize 10 AWG and 12 AWG cables as required for extended runs.
4. Manufacturer: West Penn or approved equal.

E. Audio/Video Cabling:

1. Provide audio/video cabling to provide a means of distributing computer video and audio signals from source to display.
2. Audio Cabling:

a. Left-Right Stereo Audio Cabling:

1) Pre-manufactured, dual male to dual male audio patch cords terminated on female RCA audio bulkhead connectors and installed from specified data location (18 inches A.F.F.) to display location.

b. 3.5 mm Stereo Audio Cabling:

1) Pre-manufactured 3.5 mm jack and audio cabling as required installed from specified data location to display.

3. Shielded Twisted Pair Cabling:

a. 4-pair, individually foil wrapped.
b. Overall braided shield.
c. 26 AWG, solid copper conductors.
d. Plenum rated.
e. Manufacturer: Extron #DTP-24P.

4. Skew Free Unshielded Twisted Pair Cabling:

a. 4-pair, UTP cable.
b. 23 AWG, solid copper conductors.
c. Eliminates skew or time delays of signals (pair lengths are equalized).
d. Manufacturer: Extron #Skew-Free UTP-P.

5. Digital DVI-D Cables:

a. Pre-terminated male to male ends.
b. Dual link.
c. Support resolutions of 2560 x 1600 @ 60 Hz.
d. 22 AWG copper length up to 100'.
e. Manufacturer: Extron DVID DL Pro Series.

6. Digital HDMI 2.0b Cables:

a. Pre-terminated male to male connectors.
b. Supports resolutions 1920 x 1200 @ 60Hz, and 1080p/60 without cable equalization products.

1) Cables 13-75 feet in length:

a) Data Rate Speeds: 4.95 Gbps.
b) Color depth to 24 bits, 8 bits per color.
c) Shielded 22 AWG copper conductors.

2) Cables up to 12 feet in length:

a) Data Rate Speeds: 10.2 Gbps.
b) Color depth to 48 bits, 16 bits per color.
c) Shielded 24 AWG copper conductors.

c. Manufacturer: Extron HDMI Pro Series or approved equal by Cables 2 Go or Belden.

2.4 FURNITURE MOUNTABLE ENCLOSURE

A. Table accessible enclosure for low voltage cabling and connectors.

B. Accommodates up to eight (8) low voltage cables and two (2) simplex power outlets.

C. Flush mountable into table with hinged cover with access slot.

D. Brushed aluminum or black anodized finish.

E. Manufacturer: Extron Cubby 600 or approved equal.

2.5 AUDIO/VISUAL OUTLETS

A. Coordinate A/V jacks/couplers with structured cabling system manufacturer's components to provide a complete, uniform, aligned, modular jack assembly.

PART 3 - EXECUTION

3.1 INSTALLERS

A. Provide experienced and qualified technicians to carry out installation of system equipment and programming.

3.2 EXAMINATION

A. Verification of Conditions:

1. Examine areas and conditions under which work is to be performed. Confirm suitability of conditions for installation of products to avoid latent defects in quality of work and function.
2. Verify that site conditions are satisfactory for installation of audio visual systems and components.
3. Ensure components and conditions are in compliance with manufacturer's requirements, installation tolerances and other conditions affecting performance.

B. Pre-Installation Testing:

1. Identify and document conditions detrimental to proper or timely completion.

C. Evaluation and Assessment:

1. Identify and document conditions detrimental to proper or timely completion.
2. Correct unsatisfactory conditions.
3. Do not proceed until unsatisfactory conditions have been corrected.

3.3 PREPARATION

A. Coordinate system requirements with appropriate Divisions.

1. Review device locations, telecommunication room locations, routings, trunk risers, cable trays, details, and special features.
2. Coordinate installation requirements with installation of all pathways, sleeves, raceways, outlet boxes, firestopping, bonding, etc.

B. Review Drawings for equipment locations, telecommunication room locations, routing, trunk risers, and special features. Coordinate requirements with appropriate Divisions.

C. Meet with Owner for detailed system design and configuration review. Meeting to explain features, functionality and operability of system. Provide four (4) 4-hour sessions. Include the following in review meeting:

1. Mounting cabinets, and equipment grounds.
2. Telecommunications room raceway installations.
3. Pulling cable.
4. Terminating cable.
5. Labeling of cable and equipment.
6. Meet with Owner and develop a complete labeling convention for system, telecommunications rooms, racks, pathways, etc.
7. Testing cable.
8. As-built documentation completion.

3.4 PROTECTION OF IN-PLACE CONDITIONS

A. Handle components carefully to avoid breakage, dents, scoring finishes and impacts.

B. Take precautions to protect any surfaces already in-place before continuing with work.

C. Protect everything in existing space from dust and debris in an acceptable manner.

D. Notify Architect/Engineer in writing, of any damage to surrounding areas or surfaces already in place.

3.5 INSTALLATION

A. General:

1. Install equipment in accordance with manufacturer's written instructions.
2. Install all equipment to industry safety and ergonomic standards and provide full Engineering and technical support throughout the installation process.
3. Provide cabinets, and associated raceway/pathway installations including special wire management auxiliaries.
4. Provide all labor, tools, materials, services and technical knowledge to provide a complete, reliable, system.
5. Install all in a safe, neat, professional, workmanlike manner
6. Repairs: Wherever walls, ceilings, floors, or other building finishes are cut for installation, repair, restore, and refinish to original appearance.

B. General Cabling Requirements:

1. Pull all telecommunications cabling to rack or equipment backboard in telecommunications room from outlet boxes as shown on the Drawings.
2. Conceal all cabling except where specifically indicated otherwise. Surface raceway allowed only where specifically shown on drawings or approved by Engineer.
3. Do not employ pulling lubricants as they can degrade cable performance insertion loss.
4. Install horizontal cabling open in accessible ceiling spaces.
5. Support cabling 4-feet on center using J-hooks, or a unistrut trapeze configuration approved by the Engineer.
    a. Utilize multiple J-hooks, etc. as required to route all cabling. Provide 30 percent additional usable pathway space at minimum.
    b. Loosely cinch cable bundles with cable ties at each mounting location. Avoid over-tightening cable ties.
    c. Cable SAG should be no more than 12 inches between fasteners, minimum 4 inches.
6. Coordinate cabling installation such that it is not supported from conduits, piping, ductwork, etc. Cabling shall not lie directly on ceiling or be supported by ceiling tie-wires.
7. Utilize metal or plenum rated mounting hardware in ceiling spaces.
8. Install all cabling parallel and perpendicular to building lines.
9. Install cabling tight to building steel. Avoid locating cabling within 12 inches of lay-in ceilings or access panels.
10. Support vertically routed cabling at each floor. Attach supports such as wire mesh grips as recommended by manufacturer and required by local codes.
11. Traverse common system cables along the same pathway. Multiple runs of cabling terminated at roughly the same geographic area shall traverse the same path whenever possible.
12. Install cable bundles level, taught and tight to building steel. Provide caution during installation so as to not stress or provide excessive tension on the cable.
    a. Pulling tension shall not exceed 25 pounds on a single cable or bundle.
    b. Avoid unnecessary bends and do not exceed a 90 degree bend for any cable.

c. Do not exceed manufactures bend radius requirements.

13. Cabling shall be routed in metallic conduit to box (located at required height) concealed in new wall construction.
14. Group and tie-wrap all cabling in a neat and orderly manner with Velcro cable ties for observation during above ceiling punch list or other walk-through. Remove ties after approval by Engineer.
15. Install cabling in pathways/raceways without exceeding EIA/TIA maximum fill for that raceway type.

    a. Install cabling in conduits/sleeves to the maximum fill capacity allowed before using an adjacent conduit/sleeve when multiple conduits/sleeves are required.
    b. Install all exposed cabling penetrating walls or through floors through rigid metallic conduit/sleeves or Fire Rated Assembly.
    c. Refer to Division 26 Section "Conduit Rough-In Systems" for conduit/sleeve requirements.

16. Route cabling to avoid elevator shafts, elevator equipment rooms or any areas that contain or store hazardous materials.
17. Avoid sources of electromagnetic interface (EMI) for all voice/data equipment and cables.

    a. Maintain 5 inch minimum from lighting ballast.
    b. Maintain 4 foot minimum from all transformers.
    c. Maintain 1 foot minimum from electric power conductors.
    d. Distances may be reduced if sufficient EMI isolation is provided and prior approval is given by the Engineer.

18. Avoid routing cabling in areas subject to excessive environmental conditions.

    a. Refer to Division 26 Section "Conduit Rough-In Systems" for environmental requirements.

19. Replace entirely any cable jacket that is cut or scored during installation.
20. Terminate all cabling at each cable end as indicated in these Specifications.
21. Test cabling as indicated in these Specifications.
22. Label cabling as indicated in these Specifications.

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

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

    1. Mount microphones as required to table tops or lecterns as specified by manufacturer. Provide pass-thru grommets into tables as required.

E. The Contractor shall provide suitable filters, traps, and pads for minimizing interference and for balancing the amplifiers and distribution system(s). Items used for balancing and minimizing interference shall be able to pass video, audio, data, and control signals in the speeds and frequency bands selected, in the directions specified, with low loss and high isolation. The Contractor shall install all equipment necessary to meet the requirements each system’s performance standards.

F. All passive equipment shall be connected according to the original equipment manufacturer’s specifications to insure correct termination, isolation, impedance match, and signal level balance.

G. Provide system so that the installation, integration, and combination of equipment actually employed does not produce any undesirable visual effects such as key stoning, banding and shimmering as well as any undesirable aural effects such as signal distortion, noise pulses, glitches, audio hum, poling noise, voltage or spike transients, etc.

H. Provide noise filters and surge protectors for the audio visual system including cabling, equipment racks and display devices to ensure protection from input primary AC power surges and noise glitches are not induced into low voltage data circuits.

I. Provide all necessary scaling equipment to ensure that all images are provided at their maximum resolution to fill the available screen size and aspect ratio the image is presented on.

J. Provide additional branch circuits and power connections to equipment as required. Include and indicate additional power requirements on wiring diagrams at submittal stage for coordination with other Divisions and approval by Engineer.

3.6 EQUIPMENT INSTALLATION

A. Mount all equipment in equipment racks designed to support the equipment.

B. Install systems and components, in accordance with equipment manufacturer's written instructions, in compliance with recognized industry practices, to ensure that the AV system complies with requirements and serves intended purposes.

C. Install equipment properly to avoid causing mechanical stresses, twisting or misalignment of equipment being exerted by clamps, supports, and cabling.

D. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torque requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Standards 486A and B, and the National Electrical Code.

E. Remove all dirt, dust and construction debris from all system equipment. Touch-up scratched and marred surfaces to match original finishes to the satisfaction of the Owner/Engineer.

F. Identify, initiate, coordinate and complete all required programming of all equipment for proper and safe operation of equipment and users.

G. Utilize optimal video inputs for connection of video source equipment to switcher and projection units.

H. Properly test all equipment for proper operation and provide final adjustments as required for optimal audio and visual performance.

I. Provide all equipment test reports, signed and certified to Owner and Engineer prior to substantial completion.

J. Trim and Escutcheon Components:

1. To insure a proper finished appearance, the AV Contractor shall furnish and install trim/escutcheon components at all conditions where AV components pass through the finished ceilings. This would include but not be limited to video projector supports, television monitor/receiver supports and any other component which is not specifically supplied with integral flanges/trim components; i.e. speaker mount, assistance listening devices, etc.
2. The visible component of any trim should be minimal in size, preferably no wider than 1/2 inch. All trim components at the ceiling plane shall be finished to match the approved ACT ceiling grid system components. The audio visual Contractor should obtain a sample from the Generator Contractor, including any custom color information, or

standard color numbers. All trim components shall be submitted to the Architect for review and approval prior to fabrication.

3.7 EQUIPMENT RACK INSTALLATION

A. Provide and install required equipment rack size to accommodate equipment in A/V closet and lectern as shown on Drawings.

B. Review available closet configuration for equipment rack and provide racks allowing access to equipment controls and connections at front and back of equipment.

C. Mount equipment racks 60 inches AFF to top of rack.

D. Mount equipment rack to equipment back boxes providing rigidity to support all equipment and allow accessibility to rack.

E. Provide wire management at equipment rack to support all cabling, patch cords, etc. to allow equipment rack accessibility, telescoping, etc. Provide vertical and horizontal lacing bars.

1. Separate cables with different voltages including but not limited to:

a. Microphone level.
b. Line level.
c. Digital control.
d. Video.
e. Speaker level audio.
f. RF.
g. Power.

2. Provide 4 inch separation between groups of cables at different voltages.
3. Provide 90 degrees when crossing cables or different voltages.

F. Provide power strips to support all equipment mounted in racks.

G. Locate power supplies for remote transmitters and other equipment in rack/lectern and extend low voltage cable to device. Local power supplies are not allowed at remote devices.

H. Mount racks to allow access to chases, sleeves or slots for cable routing to equipment and devices.

I. Install ground lug and attach ground conductor as recommended by manufacturer.

3.8 WALL MOUNTED EQUIPMENT

A. Coordinate all blocking for support of wall mounted equipment such that equipment does not interfere with rough-in device boxes.

B. Coordinate all wall-mounted brackets supporting wall mounted equipment such that equipment does not interfere with rough-in device boxes.

3.9 PROJECTION UNIT INSTALLATION

A. Install ceiling mounting tile and projection unit bracket level and plumb.

1. Provide supplemental framing (unistrut) spanning ductwork or other obstructions above ceiling to properly support equipment. Support unistrut independently from structure. Do not let unistrut make contact with ductwork or other obstacles.

B. Secure projection unit to bracket. Install security cable and projector lock unit.

C. Provide isolation mounts to prevent vibrations from affecting the video projector. The projected image shall not shake or move due to building vibrations.

D. Install all A/V patch cords, test and adjust unit per manufacturer's recommendation.

1. Bundle all patch cords below the ceiling and install in plenum innerduct or cable sock into ceiling space.

E. Provide laminated plastic plate and mount to projector at base of mount with the following "Device Protected by Integrated Security System Contact A/V Department Before Removal."

F. Mounting shall allow replacement / removal of lamp and filter of projection unit while projection unit is suspended from ceiling.

G. Locate unit at the required distance to allow the maximum use of the projection screen or interactive whiteboard.

H. Route power cord through projector bracket tubing into ceiling space.

I. Ceiling support with wires/chains to support device independently from ceiling grid.

3.10 LOUDSPEAKER INSTALLATION

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

1. Provide all rigging/mounting brackets and tile bridges for speakers. Provide positioning for loudspeaker assemblies wherever required.
2. Coordinate installation of all loudspeaker assemblies and baffles to ensure proper projection of the respective loudspeaker elements, and access to them for maintenance and/or removal.
3. Verify that no loudspeaker assembly is subjected to stress, abrasion or loading effects which could contribute to extraordinary failure.
4. Eliminate all conditions causing noise, rattle, or other extraneous sounds resulting from the operation of a loudspeaker assembly under any operating condition.
5. Verify that baffle openings and loudspeaker components are clear of paint, and/or any other obstructions.
6. Connect all loudspeaker assemblies to the appropriate 70-volt line transformer tap to realize specified sound pressure levels and ensure uniform polarities of loudspeaker elements.
7. Install ceiling mounted speakers in tile bridge and center in appropriate tile.
8. Install in pre-fabricated decorative ceilings as required. Coordinate with ceiling provider.

3.11 DIGITAL SIGNAL PROCESSOR / MIXER INSTALLATION

A. Configuration:

1. Provide inputs and outputs as shown on the Drawings and identified in the Specifications to meet the requirements intended.
2. Cascade and link units as required to accommodate inputs and outputs for integration and control.
3. Program unit in conjunction with speaker and microphone layouts for mix-minus operation during conference and presentation modes.
4. Coordinate programming with media controller and A/V switcher inputs.
5. Customize equalizer configuration to the rooms environment including but not limited to tone controls, compressors, limiters, levelers, gates, delays and other devices as recommended by manufacturer.

3.12 MICROPHONE INSTALLATION

A. Wireless Systems:

1. Coordinate microphone frequency availability through manufacturer utilizing verifiable up-to-date FCC website data prior to ordering equipment.
2. Identify quantity of microphones and frequency availability for proper functionality of proposed wireless devices with other building equipment.
    a. Use Spectrum below 600 MHz where possible.
3. Locate antennas in line-of-sight with transmitters. Utilize remote antennas and RF cabling to achieve positioning.
4. Upon installation, coordinate wireless microphone systems by conducting an RF scan via the wireless receivers.
5. Coordinate final location of all microphones to ensure coverage of spaces intended. Test microphone coverage with Owner prior to final approval.
6. Microphone systems shall include a lapel and handheld device to operate with each receiver allowing the user to choose which device to use.

B. Wired Microphones:

1. Install all hanging microphones for best layout for proposed space.
2. Coordinate locations away from noise such as projection unit fans, HVAC diffusers, and lighting ballasts.
3. Provide all hanging and mounting devices as recommended by manufacturer.
4. Utilize directional microphones and aim at intended area.
5. Coordinate microphones to operate in mix-minus layouts with surrounding speakers and microphones.

3.13 MEDIA CONTROLLER PROGRAMMING

A. Coordinate all inputs/outputs from each audio/visual system and incorporate into implementation scenarios for review by the Owner and Engineer. Each scenario shall include the following:

1. Input Source – Audio/Video.
2. Outputs – Audio/Video.
3. Screen Option - Icons, colors, etc.
4. Controlled Devices – Projection screen, projector, amplifier, etc.
5. Coordinate projection surface type with projection unit image size for output scenario – projection screen or interactive whiteboard or both as required.

B. Provide programming details, flow charts and code to Owner upon completion and acceptance.

C. Provide a consistent appearance and layout for all user interface throughout Facility and make similar to existing Campus standards. User interface shall be easy to operate and intuitive.

1. Utilize Owner standard templates and configurations if available. Customize as required to accommodate system design.
2. Break up large amounts of information into small, manageable chunks. No more than nine parts to a chunk.
3. Create standard locations for components of layout.
4. Maximum of three (3) button presses to perform desired operation.
5. Utilize icons in addition to text when creating operational buttons:
    a. Provide visual properties queuing user that buttons can be pressed.
    b. Provide visual change identifying that button has been pressed using color and shadowing.
    c. Create buttons with three dimensional properties to show depth.
    d. Maintain uniform spacing between buttons.
    e. Utilize verbs as text to describe intended function of buttons.
    f. Group common controls with a single label.

6. Utilize sans-serif fonts when creating text.
7. Select font and size that will fit within the button or screen.
8. Do not utilize italics or bold italics when creating text.
9. Maintain consistent shapes throughout touch panel design.
10. Color selection shall incorporate a color scheme that is usable when changed to monochrome to be understandable by visual impaired or color blind.

D. Title Screen:

1. Each touch panel screen shall incorporate a standard "Title Screen" that uses the Owner's logo as the background behind all button/preset display overlays. Actual logo and color scheme to be used as TBD by the Owner. Contractor is to obtain appropriate file from Owner. Size logo on screen as directed by Owner.
2. Include Owner logo as background.
3. Provide preset buttons for the following:
    a. Presentation.
    b. Video/Audio conferencing.
4. Lights ON lights OFF.
5. Include password (as required by Owner).

E. Home Screen/Main Screen (displayed when presentation type is selected from title screen):

1. Provide the following groups:
    a. Inputs/Sources to include floor boxes, wall boxes podium auxiliary inputs (laptop) dedicated PCs, BluRay, document camera, tuner, cameras, etc.
    b. Outputs/Displays to include projectors, monitors, recording/capture devices, video conferencing.
    c. Task Group:
        1) Lighting pop-up menu depending on lighting configuration.
        2) Shades: Open/Close.
        3) Projection Screen: Up/Down.
        4) Motorized lifts.
        5) Volume control.
    d. Control Group (when selected device control layout will pop-up in center of screen):
        1) BluRay/DVD control.
        2) Document camera control.
        3) Tuner control.
        4) Audio conference control.
        5) Video conference control.
        6) Video preview window.
        7) Camera control.
    e. Audio Group:
        1) Each touch panel screen shall incorporate a "Sound System Processor Presets Screen" which will allow the user to choose one of the various preprogrammed system presets from the sound system processor (i.e. Automated Lecture, Manual Theater, Surround Sound, etc.). Selection of any particular system preset will tell the sound system processor which system present to make active and that particular preset will become highlighted and active.
        2) Source Selection: Podium microphone, wireless microphone, miscellaneous MIC jacks, note selection of AV.

3) Source will automate audio (i.e. BluRay).
4) Audio Destination: Program speakers, monitor speaker, ceiling speaker.
5) Program preset audio configurations based on presentation types (i.e. video conference, classroom capture, etc.) Audio configuration will be automated depending on selection.

f. Audio Conference: Press the Audio Conference button on the top menu bar to make a phone call. This will not affect the current audio and video source routing.

1) Call / End Call: Touch CALL to dial the number showing in the keypad display. Touch END CALL to hang up.
2) Keypad: Use these buttons to enter a number to dial. Press CLEAR to erase the number or BACKSPACE to delete the last entered digit.
3) Flash / Redial: Touch FLASH to perform a hood flash. Touch REDIAL to dial the last number called.
4) Mic Mute: Touch this button to mute and un-mute outgoing audio from the mics.
5) Incoming Volume: Use the plus and minus buttons to raise and lower the volume of incoming call audio.
6) Speaker Mute: Mute the incoming call audio that is heard on the room speakers. This does not affect the microphones or outgoing audio.

g. Video Conference - Main: Video Conference controls are accessed via either the "Video Conference" preset mode button on the Home page, or by pressing the "Video Conference" button on the top menu bar. The "Main" tab is the default view.

1) Remote Functions: Use these buttons to navigate on-screen menus.
2) Call / End Call: Touch the CALL to dial the numbered entered in the keypad display. Touch END CALL to hang up.
3) Keypad: Use these buttons to enter a number to dial. Press CLEAR to erase the number or BACKSPACE to delete the last entered digit.
4) Incoming Volume: Touch the plus and minus buttons to raise and lower the incoming video call audio.
5) Speaker Mute: Touch this button to mute and un-mute incoming video call audio. This does not affect microphones or outgoing audio.
6) Mic Mute: Touch this button to mute and un-mute outgoing audio from the microphones.
7) Main / Directory / Monitor / Cameras: Touch these buttons to switch between different sets of video conference controls.

h. Video Conference - Directory: Use the Video Conference Directory controls to call contacts in the directory.

i. Video Conference - Monitor: Use the Video Conference Monitor controls to send video to the LCD monitor.

1) Life-Size Main Output: Show the codec's main output on the LCD monitor.
2) PIP On / Off: Turn the PIP window on and off. What shows in the PIP window is determined by the current layout.
3) Presentation Sources: Select a presentation source to show on the LCD monitor. Once selected, press the START and STOP buttons to display on the monitor.

j. Video Conference - Cameras: Use controls to adjust cameras.

1) Cameras: Select near or far end camera to control. (Far end camera control is not always enabled by the far end).
2) Pan / Tilt / Zoom: Adjust the position of the selected camera.

3) Camera Presets: Save and recall particular camera positions with the preset buttons. To recall a preset, press a preset button.
4) Mic Mute: Touch this button to mute and un-mute outgoing audio from the microphones.

k. General - Lighting Scenes: The Lighting Scenes "preset" on the Home page allows control of room lights and shades.

1) Lights: Select lighting presets or raise and lower lighting levels.
2) Window Shades: Open or close the window shades.

l. Lights and Shades Popup: Press the Lights and Shades button on the menu bar to display this popup and quickly adjust lighting while using another device.

1) Lights: Select lighting presets or raise and lower lighting levels.
2) Window Shades: Open or close the window shades.
3) Close: Close the popup and return to the previous page.

m. Volume: Press the Volume button on the menu bar to show this popup and quickly adjust volume levels.

1) Presentation Volume: Raise and lower the volume of the presentation sources.
2) Audio Conference: Raise and lower the volume of the far end participants in an audio conference call.
3) Video Conference: Raise and lower the volume of the far end participants in a video conference call.
4) Mic Mute: Touch this button to mute and un-mute outgoing audio from the microphones.
5) Close: Use this button to close the Volume popup and return to the previous control screen.

n. Video Conference - Cameras: Use the Video Conference Camera controls to adjust cameras.

1) Cameras: Select near or far end camera to control. (Far end camera control is not always enabled by the far end).
2) Pan / Tilt / Zoom: Adjust the position of the selected camera.
3) Camera Presets: Save and recall particular camera positions with the preset buttons.

a) To save a preset, position camera as desired, press SAVE PRSET, then select a preset slot.
b) To recall a preset, press a preset button.

o. Shutdown: The Shutdown confirmation is displayed when Shutdown is selected on the top menu bar.

1) Yes: This button will turn the system off hang up any active calls, and return the touch panel to the "Start" screen.
2) No: This button closes the shutdown window and returns to the previous control screen.

a) Note: If no choice is made after 3 minutes, the system will automatically shut down.

2. Each touch panel screen shall incorporate a "Home" button or object ton every screen (or physical button on unit – if screen is so equipped) that will take the user to the home screen whenever this button is activated.

3. Each touch panel screen shall incorporate a "Back" button or object on every screen, except the Home screen, (or physical button on unit – if screen is so equipped) that will take the user back to the previous page/screen whenever this button is activated.
4. Contractor and Owner are to submit all screen layouts (jpeg screen shots are acceptable) to the consultant for final approval prior to loading all software.
5. Contractor is responsible for all touch panel and control system programming and final touch panel screen looks, layouts, and icons and for interfacing each piece of controlled equipment with the media control system. Contractor is to verify that all controlled equipment can "talk to" and be controlled by the media control unit(s).

3.14 LABELING

A. Provide at equipment (rack) and outlet as required.

B. All cables, regardless of length, shall be marked with a permanent, self-laminating wrap-around number or letter cable marker at both ends, similar to the Panduit "Pan-Code" system. Labels must be computer-generated for legibility. Wire labels done by hand in the field must be replaced with computer generated labels. There shall be no unmarked cables at any place in the system. Marking codes used on cables shall correspond to codes shown on drawings and or run sheets.

C. Engraved Faceplates:

1. Engrave faceplates with input type in classrooms and finished areas.

D. Machine Printed Labels:

1. Self-adhesive, smudge resistant vinyl labels for cables and faceplates.
2. Size labels appropriately for cable diameters; utilize "wrap" installation.
3. Size labels appropriately to fit in recessed area of faceplate, under available plastic cover or at proper location to identify control buttons or inputs.
4. Submit samples of labels to verify color of label and size of font for each application.
5. Center justify all text.
6. Utilize Hellermon-Tyton Spirit 2100 or approved equal by Rhino Pro, Brother, or Panduit.
7. Engrave faceplates for A/V outlets with input type or provide factory provided (non-removable) markings acceptable to Owner and Engineer.

E. Provide labels at all equipment controls requiring user interface for Owner troubleshooting and easy identification for future re-programming or configuration.

F. Labels shall be affixed free of smudges and fingerprints within 3 inches of termination.

G. Labels shall be viewable without rotating or removing patch cords or cables.

3.15 GROUNDING

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

B. Electrically ground audio visual systems and components.

1. Ground system rack to local telecom ground busbar in telecommunications room. Use #6 AWG minimum.

C. Provide equipment grounding connections for system. Tighten connections to comply with tightening torques specified in UL Standard 486A to assure permanent and effective grounds.

D. Refer to Section Division 26 Section "Grounding and Bonding" for acceptable connections and ground conductor sizes for field measured lengths.

E. Grounding Procedures:

1. In order to minimize problems resulting from improper grounding, and to achieve maximum signal-to-noise ratios, the following grounding procedure shall be adhered to:

a. System Grounds:

1) A single primary "system ground" shall be established for the systems in each particular area. All grounding conductors in that area shall connect to this primary system ground. See the perimeter grounding conductor installed under the base construction contract.

a) The system ground shall be provided in the audio equipment rack for the area, and shall consist of a copper bar of sufficient size to accommodate all secondary ground conductors. A copper conductor having a maximum of 0.1 ohms total resistance shall connect the primary system ground bar to the nearest approved electrical ground. The Contractor shall be responsible for determining if the metallic conduit is properly electrically bonded to the building ground system.

2) Secondary system grounding conductors shall be provided from all racks, audio consoles, and grounding point for the area. Each of these grounding conductors shall have a maximum of 0.1 ohms total resistance.

3) Under no conditions shall the AC neutral conductor, either in the power panel or in a receptacle outlet, be used for a system ground.

b. Audio Cable Shields:

1) All audio cable shields shall be grounded at one point only. There are no exceptions. For inter and intra-rack wiring, this requires that the shield be connected at one end only. For ungrounded portable equipment, such as microphones, the shield shall be connected at both ends but grounded at only one end.

c. Video Receptacles:

1) All video receptacles that are provided and installed by the Contractor shall be insulated from the mounting panel, outlet box, or wireway. Unless otherwise detailed herein, this shall be accomplished by using insulated-from-panel type receptacles.

d. Audio Receptacles:

1) All audio receptacles that are provided and installed by the Contractor shall be insulated from the mounting panel, outlet box, or wireway. Unless otherwise detailed herein, this shall be accomplished by using insulated-from-panel type receptacles.

e. General:

1) Because of the great number of possible variations in grounding systems, it shall be the responsibility of the Contractor to follow ground engineering practice, as outlined above, and to deviate from these practices only when necessary to minimize crosstalk and to maximize signal-to-noise ratios in the audio, video, and control systems.

3.16 CABLE INSTALLATION

A. All wire bundles are to be neat and combed free of cable crossovers.

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

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

C. As a general practice, all power cables, control cables, and high level cables shall be run on the left side of an equipment rack as viewed from the rear. All other cables shall be run on the right side of an equipment rack, as viewed from the rear.

D. Cable ties shall be placed at appropriate intervals of no greater than six inches for vertical bundles, two inches for horizontal bundles.

E. All vertical cable bundles shall be attached to the rack frame.

F. All cables shall be continuous lengths without splices. All system wire, after being cut and stripped, shall have the wire strands twisted back to their original lay and be terminated by approved soldered or mechanical means. Except where noted otherwise in the specifications, NO BARE WIRE TERMINATIONS WILL BE ACCEPTED. Heat-shrink tubing shall be used to insulate the ground or drain wire. Unused wires at the end of a cable shall remain unstrapped and shall be laid back and held in place with wire ties.

G. All solder connections shall be made with rosin-core solder using temperature-controlled solder stations. Care shall be taken to avoid cold or cracked solder joints. Any connections that do not appear to be clean and shiny, or which show signs of cracking, shall be resoldered by the Contractor before final acceptance of the system.

H. Mechanical connections using insulated, crimp-type connectors shall be bonded to the connector by soldering the wire to the metal part of the connector.

I. Connections made with screw actuated pressure type terminal strips shall be made by stripping approximately 1/4 inch of insulation from the stranded conductor. Then the untinned wire shall be inserted into the terminal and the screw tightened using a secure fitting precision screwdriver.

J. Terminal blocks, boards, strips, or connectors shall be furnished for all cables which interface with racks, cabinets, consoles, or equipment modules. No audio cables shall run directly to the audio patch panel jacks. Each audio patch panel shall be furnished with an audio terminal block, and all audio cables to and from the audio patch panel shall terminate on this block.

K. All wire markers shall face a common direction.

L. All cables shall have proper connector housing.

M. Cables shall not protrude from the back of racks.

N. All cable entry shall be through the tops of racks or through entrance holes in the base of the rack. No cable shall enter racks through front, rear or side panel openings.

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

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

Q. Where cables are installed in architectural niches, ensure that the cables are black, unless otherwise directed, to reduce visibility from the audience.

R. Wires and cables shall be insulated to prevent contact with signal or current carrying conductors and 100 percent shielded. Wires or cables used in assembling consoles, panels, equipment cabinets and racks shall be formed into harnesses that are bundled and tied. Harnessed wires or cables shall be combed straight, formed, and dressed in either a vertical or horizontal relationship to equipment, controls, components or terminations.

S. Harnesses with intertwined members are not acceptable. Each wire or cable that breaks out from a harness for connection or termination. Tie off at that harness or bundle point, and be provided with an ample neatly formed service loop.

T. Provide system input and output polarity as recommended by the original equipment manufacturer. Ensure each color-coded wire or cable is connected and terminated to maintain system polarity to be at least the same quality of professional audio systems. Reflect all color codes, wire and cable terminations on the system's Drawings of Record as required herein.

3.17 FIELD QUALITY CONTROL

A. Wiring Methods:

1. Install wiring in raceways except within lecterns, desks, racks, and except in accessible ceiling spaces, where open cable wiring methods may be used. Use UL-listed plenum cable.
2. Install cabling in raceways in all areas with exposed structure.
3. Conceal all exposed furniture wiring in approved cable enclosure to make inconspicuous.
4. Cable shall be homerun per manufacturer's specifications.
5. Control Circuit Wiring: Provide number of conductors as recommended by system manufacturer to provide control functions indicated, specified or to meet design intent.
6. Install cables and raceways parallel and perpendicular to surfaces or exposed structural members, and follow surface contours. Secure and support cables/conduits by straps or similar fittings so designed and installed as not to damage the cables. Secure cable at intervals not exceeding 30 inches and not more than 6 inches from every cabinet, box, or fitting.
7. Wiring within Enclosures: Provide adequate length of conductors to allow sliding cabinet to open and rotate 90 degrees. Bundle, lace, and train the conductors to terminal points with no excess. Provide and use lacing bars.
8. Splices, Taps, and Terminations: Make splices, taps, and terminations on numbered terminal strips in junction, pull, and outlet boxes, terminal cabinets, and equipment enclosures.
9. Identification of Conductors and Cables: Use color coding of conductors and apply wire and cable marking tape to designate wires and cables so all media are identified in coordination with system wiring diagrams.
10. Provide physical isolation from each other for microphone, line level, speaker, and power wiring. Run in separate raceways or provide 12-inch minimum separation where exposed or in same enclosure. Provide additional physical separation as recommended by equipment manufacturer.

B. Impedance and Level Matching: Carefully match input and output impedances and signal levels at signal interfaces. Provide matching networks where required.

C. Manufacturer's Field Services: Provide services of a factory-authorized service representative to supervise the field assembly and connection of components and the pretesting, testing, and adjustment of the system.

D. Before final acceptance of the system, manufacturer-supplier of system shall, in presence of Owner's representative, test each and every component and device in the system. Test shall be documented with signed copy submitted to the Owner and Architect/Engineer.

E. The system shall be physically inspected by the Owner's representative and the Architect/ Engineer to assure that all equipment is installed in a neat and workmanlike manner as called for in the plans and specifications.

F. Upon completion of the system installation, and after circuitry has been energized with the normal power source, test the system to verify the following:

1. All components are operational and functioning properly to the system designs intent.
2. Perform all necessary adjustments and balancing of all signal and amplifier level controls to insure proper operation. Ensure output levels of sources are equal.
3. The complete system is free from grounds, open and shorts except for made grounds required by the system installation.
4. The system is free of hum or noise including but not limited to ground loops, improper impedance matching or improper shielding.
5. Configure signal processor to perform all gating, precedence, equalization and compression to provide optimal performance.
6. Correct all of the above and retest to demonstrate compliance where required by Engineer.
7. All testing shall be documented. Provide a signed copy to the Owner/Engineer verifying the system is complete, and fully functional.
8. Make observations to verify that units and controls are properly labeled and interconnecting wires and terminals are identified.

G. Contractor System Checkout:

1. Before acceptance tests are schedule, perform system checkout based upon an approved testing procedure for the systems. Contractor to furnish all required test equipment and perform all work necessary to determine and/or modify performance of the system to meet the requirements of this specification. Submit testing system for approval from the Owner’s Representative.

H. Provide written records of all test results in spreadsheet form.

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

J. Maintain documentation of all performance tests for reference by the Owner’s Representative during the System Acceptance Tests.

K. System Acceptance Tests:

1. System Acceptance Tests will not be performed until the Contractor’s System Checkout has been completed and the test results have been reviewed. The System Acceptance Tests will be supervised by the Owner’s Representative and will consist of the following:

    a. A physical inventory will be taken of all equipment on site and will be compared to equipment lists in the contract documents.
    b. The operation of all system equipment shall be demonstrated by the Contractor.
    c. Both subjective and objective tests will be required by the Owner’s Representative to determine compliance with the specifications. The Contractor shall be responsible for providing test equipment for these tests.
    d. All final "as-built" drawings, run sheets, manuals, and other required documents, as detailed in the previous section, shall be on hand.

e. In the event further adjustment is required, or defective equipment must be repaired or replaced, tests may be suspended or continued at the option of the Owner's Representative.

L. Occupancy Adjustments:

1. When requested by the Architect, within one (1) year of date of Substantial Completion, provide on-site assistance in re-programming systems to suit user operation and actual, occupied conditions.
2. Provide up to three (3) visits for this work.

M. Test Equipment:

1. Each Contractor is responsible for furnishing all test equipment required to test the system in accordance with the parameters specified. Unless otherwise stated, the test equipment shall not be considered part of the system. Each Contractor shall furnish test equipment of accuracy better than the parameters to be tested.
2. The test equipment furnished by each Contractor shall have a calibration tag of an acceptable calibration service dated not more than 12 months prior to the test. As part of the submittal, a test equipment list shall be furnished that includes the make and model number of the following type of equipment as a minimum:

a. Oscilloscope.
b. Spectrum Analyzer.
c. Signal Level Meter.
d. Volt-Ohm Meter.
e. SPL Meter.
f. SPL Calibrator.
g. Sine wave and random Noise Generator.
h. Audio Amplifier with external speaker.

3. Sound System Speaker Testing:

a. Utilize impedance meter to measure true impedance of circuit prior to connection of amplifiers. Identify and correct short circuits, open loudspeaker lines, transformers installed backwards, and total load of the speaker system. Document measurements and provide documentation with closeout.

4. Provide system equalization adjusting loudspeaker output to compensate for room frequency response. Utilize pink noise generator and real time analyzer to adjust equalizer as required. Include documentation of settings with closeout documentation.

3.18 CLEANING

A. Clean all equipment on a day-to-day basis and final cleaning of all equipment prior to turning over to the Owner. Clean to the satisfaction of the Owner's representative.

B. Equipment:

1. Clean all equipment completely inside and out prior to testing.
2. Furnish cleaning consisting of vacuuming all panels, terminations, enclosures (inside and out), etc. Thoroughly dry wet equipment or if contains moisture before testing.

C. Raceways and Junction Boxes:

1. Blow out and dry all raceways and conduits prior to installation of cabling.

D. Audio/Visual Closets and Lecterns:

1. Sweep rooms clean and all garbage remove from the site upon completion of cleaning equipment as described in above paragraph, but before testing equipment.

2. Ensure that once equipment and room are cleaned and tested, the area remains clean and the doors remain closed until completion of job. If rooms and equipment are subject to dust and moisture after testing equipment, reclean equipment to the same specifications.

3.19 CLOSE OUT ACTIVITIES

A. Record cable runway locations and sizes onto project blueprints.

1. Record sizes of pathways, location of cable routings and system rack elevations as installed on the project blueprints.
2. Submit as-built documents for Engineer's review and approval.

B. Owner's Instructions:

1. Operation and Maintenance Data: Provide approved shop drawings with modifications as required by Engineer's instructions or project progression. Include operating and maintenance instructions, parts inventory listing, purchase source listing, emergency instructions, assembly/disassembly and termination diagrams, and wire administration data as specified herein.
2. Provide any additional information as required per the manufacturer's requirements for required warranties.

C. Software Documentation:

1. Actual source code must be provided. The software developer shall retain intellectual property rights to the operation software. The Owner shall be granted a license in perpetuity for use. Include the following:

a. All source code becomes the exclusive property of Owner.
b. All source code changes must be fully documented.
c. All custom programs for remote control system touch panels, and other programmed devices, are the property of the Owner, and be submitted with the final systems documentation in the CD-ROM. Include a copy of the current program with the "as-built" drawings, in a magnetically protective envelope.
d. Subsequent to system certification, implement source code changes and/or additional programming, warranty changes by the vendor for a period of one (1) year, with the vendor responsible for the diagnosis and repair. Ensure that the current program is saved to a CD, and stored as outlined above.

D. Training:

1. Furnish the services of a factory-trained engineer or technician for two (2) 4-hour periods to instruct the Owner’s personnel. Include corrective and preventive maintenance of each system’s equipment. Schedule training at the convenience of the Owner.
2. Furnish the services of a representative of the systems; familiar with the functions and operation of the equipment, for two (2) 4-hour periods to train selected Owner personnel. Instructions provided for staff personnel in each area where new equipment is provided under this contract. When multiple locations are involved, classes will be grouped. Coordinate period of training with Owner to ensure all shifts receive the required training. Utilize digital camera to record training secession and provide two copies of training to Owner.

3.20 TURNOVER MEETING

A. Meeting:

1. Upon completion of all work, coordinate a meeting with the Owner and Owner's Representative at the site to provide all as-built documentation, certifications, test reports, spare parts, and additional manuals, etc. Turn over prior to completion of final punch list.
2. Provide in-depth review of all documentation and equipment to Owner for acceptance.

END OF SECTION 274111

SECTION 274127 – VIDEO CONFERENCING SYSTEM

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide and install new audio visual systems equipment for use an integrated Video Conferencing System. The integrated Video Conferencing System shall incorporate multiple inputs including video cameras, document cameras, PC and Audio input with the intent of sharing and distributing to other video conference systems.

B. Video conferencing uses a suit of standards that assure interoperability between systems including ITU H.323 for intercommunication over Ethernet network. These overarching standards drive the fundamental standards for video, audio and control coding, compression and transmission.

C. All AV equipment shall be controlled by media controllers with integrated touch panel. This is to include all monitors, audio visual switchers, audio mixers, amplifiers, cameras, and source equipment/inputs.

D. The installation shall include comprehensive audio/video systems consisting of modern solid state type equipment providing the following:

1. System shall be flexible to accommodate various uses of the room and various video conferencing presentation types. Customize system as directed by the Owner.
2. Video system shall communicate with other video conference systems via H.323 over Ethernet and H.320 over ISDN telephone lines.
3. Provide integration with audio/visual equipment, including but not limited to: media control, projection screens, LCD TV, audio/visual inputs, volume (amplifiers), AV switchers and mixers.

E. Requirements of the following Division 27 Sections apply to this section:

1. Section "Basic Division 27 Requirements."
2. Section "Assistive Listening System."
3. Section "Integrated Audio Visual Systems."

1.2 PRODUCTS FURNISHED

A. This Section includes requirements for video and sound system components for video conferencing including, but not limited to, the following:

1. Equipment Cabinets and Racks.
2. Speakers.
3. Video Conferencing Control Unit.
4. Cameras.
5. Microphones.
6. Mounting Brackets.
7. Equipment Cabling.
8. Connectors and Cables.

1.3 REFERENCES

A. Electrical Component Standard: Provide work complying with applicable requirements of NFPA 70 "National Electrical Code."

B. EIA Compliance: Comply with the following Electronics Industries Association Standards:

1. Sound Systems, EIA-160.
2. Loudspeaker, Dynamic Magnetic Structures, and Impedance, EIA-299-A.
3. Racks, Panels, and Associated Equipment, EIA-310-A.
4. Amplifiers for Sound Equipment, SE-101-A.
5. Speakers for Sound Equipment, SE-103.
6. UL Compliance: Comply with requirements of UL 50.

1.4 SEQUENCING AND SCHEDULING

A. Coordinate with other work, including but not limited to electrical wiring work, cabinet and rack placement, casework, fire rated assembly locations, and structured telecommunications cabling, as necessary to interface installation of this system with other work.

B. Sequence system installation work with other work to minimize possibility of damage and soiling system during remainder of construction period.

1.5 ACTION SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract, Division 01 Specification Sections, and Division 27 Section "Basic Division 27 Requirements."

B. Shop Drawings:

1. Product Data for systems equipment:

a. Provide manufacturer’s literature to include all information necessary to confirm that the proposed system is in complete compliance with the Specifications.

1) All items of equipment must be new, in current production, currently eligible for warranty and maintenance coverage and have guaranteed availability for a minimum of five (5) years from the delivery date.

2. Submit the following:

a. Equipment Information:

1) Complete materials list indicating manufacturer, part numbers, and quantities with table of contents indicating page number for quick reference. All equipment shall be specific to this section only unless required for integration.
2) Manufacturer’s specifications and descriptive literature.
3) Manufacturer’s recommended installation procedures.

b. Provide certification with data substantiating that products comply with requirements of the Contract Documents. Furnish UL File # with product data as submitted.
c. Coordination Drawings: Submit scaled diagrams using architectural floor plans showing A/V system layout and dimensions. Include layout of equipment in relation to room size and other existing and new system equipment in that room. Include rack equipment layout.
d. Wiring Diagrams detailing wiring for power, signal, and control differentiating clearly between manufacturer-installed wiring and field-installed wiring. Identify terminal numbers and wiring color codes to facilitate installation, operation, and maintenance. Identify wiring interface to other systems.
e. Single-line diagram of the system including major components, their relationship to provisions and the number and type of cables between components.
f. Detailed drawings for custom casework, standard furnishings, fixtures, and fabricated assemblies required by the system. In particular, define requirements for passage of interconnecting cables, equipment cooling requirements and equipment mounting requirements. Include means to access external connections in the floor or wall
g. Field Testing Data.
h. Warranty information.
i. Grounding: Identify grounding requirements and connections to Tele-communications Grounding Busbar.

1.6 CLOSEOUT SUBMITTALS

A. Equipment Drawings:

1. Contractor shall provide a revised set of system wiring diagrams upon the completion of the installation for subsequent testing of the system to show actual cable routing, connections with other systems cable lengths values of all equipment as installed and actual signal values as tested.
2. Utilize architectural floor plans for system layout.

B. Equipment Manuals:

1. Approved copy of system submittal:

a. Provide a complete set of equipment cut sheets, parts list, including maintenance criteria, distributor information and service information for all equipment provided.

C. Operation and Maintenance Data: Include the following in emergency, operation and maintenance manuals.

1. Provide a complete set of instruction manuals; including complete written programming instructions, programming documentation and system set-up documentation.

a. Provide an additional quick-start guide with all commonly used procedures for operating the system. Laminate and provide copies during training session.

2. Emergency Service Contact information.
3. Warranty information.

4. Provide all test results performed. Include manufacturer's certifications that installed system complies with specification requirements.

D. Software:

1. Provide copies of all system programming for backup of systems and future reworking/reconfiguration.
2. Provide all documentation to Owner on CD in PDF and Word format.
3. Turn over all manufacturer software or code to Owner for ongoing maintenance.

1.7 QUALITY ASSURANCE

A. Manufacturer's Qualifications:

1. Firms regularly engaged in manufacture of professional quality video conferencing systems, components and accessories, of types, capacities and characteristics required, whose products have been in satisfactory use in similar service for not less than 2 years.
2. Provided equipment shall have a guaranteed availability for a minimum of five (5) years from the delivery date through current distribution channels.

B. Supplier's Qualifications:

1. Engage an experienced product supplier who is a factory-authorized sales and service representative regularly engaged in the design and installation of such systems to oversee the installation, trouble-shoot and make final connections at headend equipment.
2. Supplier shall have represented the product and components being installed for a minimum of two (2) years.

C. Installer Qualifications:

1. Firms with at least five (5) years of successful installation experience with projects installing video conferencing similar to that required for this project.

   a. Provide the names and certifications of two qualified Manufacturer certified programmers currently on staff that are capable and experienced in this type of installation.

2. Provide reference list of at least five similar installations successfully completed within the last three years within a 100 mile radius. Include scope of work, contact name, title, and telephone number.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Acceptance Requirements:

1. Deliver components properly packaged in factory fabricated containers.
2. Records of delivery date, manufacturer, installation date, any extenuating circumstances along with manufacturer test reports shall be kept on file.

B. Storage and Handling Requirements:

1. Store components in original cartons.
2. Material shall be stored in a secure area with a clean dry space protected from the effects of the weather.
3. Material shall be stored in an area away from construction traffic where construction equipment, falling or flying objects or other materials will not contact the components.
4. Material shall be stored in an area where chemicals, paint, or petroleum products will not be spilled or sprayed on them.
5. If materials are relocated, an inspection shall be made.
6. Handle equipment and components carefully to avoid breakages, impacts, denting and scoring finishes. Do not install damaged equipment; replace and return damaged units to equipment manufacturer.

C. Packaging Waste Management:

1. Dispose of all packing materials and include cost of packing materials disposal and handling as part of the base bid.

1.9 LICENSES

A. Provide all licenses for all equipment to operate for the lifetime of the installed equipment and system.

1. Licenses shall not expire for the equipment or devices purchased and installed and shall not be required for extending maintenance or operation of the system.
2. Licenses shall cover software and hardware.

1.10 WARRANTY

A. Manufacturer Warranty:

1. All components shall be covered by a one (1) year warranty from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. All items of equipment including wire and cable shall be designed by the manufacturer supplier to operate as a complete system and shall be accompanied by complete service notes and drawings detailing all inter-connections.

B. Equipment shall be listed by Underwriters Laboratories, Inc. Each major component shall bear the manufacturer's name and catalog number.

C. Careful attention has been made to specify current production models for all equipment listed, however due to frequent updates of equipment in this field some model numbers may become discontinued. Equipment with the same features and functionality shall be provided as a replacement as recommended by the manufacturer at the time this project is built. In such cases the nearest equivalent product discontinued by the same manufacturer shall be provided.

2.2 SYSTEM REQUIREMENTS

A. General: Provide complete and fully functional video conferencing system integrating with audio visual equipment to distribute, signal and share resources. Utilize materials and equipment of types, sizes, ratings, and performances as indicated. Use materials and equipment that comply with referenced standards and manufacturers' standard design and construction in accordance with published product information. Coordinate the features of materials and equipment so they form an integrated system with components and interconnections matched for optimum performance of specified functions.

B. Provide video conferencing systems in the following rooms:

1. Dean's Conference Room 202F.

2.3 EQUIPMENT AND MATERIALS

A. General: Provide equipment using all solid state components fully rated for continuous duty at the ratings indicated or specified. Select equipment for normal operation on input power supplied at 120V, 60Hz.

B. Video Conferencing Components: Video Conferencing Unit: Conference Rooms

1. Video conference unit shall be used to collaborate via video, audio, and content and integrate to the audio/visual systems throughout the space.
2. The video conferencing system shall have the following features and functionality:

a. H.323, SIP compliant.
b. Bandwith:

1) IP Data Rate: 6 Mbps.

c. Video Standards H.261, H.263++, H.264, H.239/people and contents H.263 and H.264 video error concealment.
d. Frame Rates: 720P, 30 fps from 512 Kbps, 1080P, 30 fps from 1024 Kbps.
e. Video Inputs: 1 x HDMI 1.3, 1 x VGA.
f. Video Outputs: 2 x HDMI 1.3.
g. Integration with media controller/touch panel.
h. 4:3, 16:9 aspect ratios.
i. Output Resolution 720P, 1080P.
j. Supports content + people.
k. Multipoint license for up to 6 sites at 720p30, or 4 sites at 1080p30.
l. PSTN Analog voice input.
m. 10/100/1000 auto NIC.
n. Rack Mounted: 1U.

3. Video Camera and Shelf:

a. PTZ 1080P video camera.
b. 10x/12x optical/digital zoom, 65 deg. FOV min.
c. Camera adjustable shelf.

4. Microphones:

a. Ceiling mounted 3-element mic array.
b. Refer to section “Integrated Audio Visual Systems.”

5. Collaboration software shall be provided to support sharing of content:

a. Inputs: PC/Laptop.
b. Support Windows, XP, 7, 8.
c. Minimum 4 participants.
d. Adjustable bandwidth split between people and content.

6. Manufacturer: Polycom Group 500 – 1080P, Eagle Eye IV Camera.

2.4 CABLES / WIRES

A. Utilize factory-manufactured patch cords in lieu of field terminated cables and components at rack connections and wherever possible.

1. Utilize industry standard color coded connectors.
2. Verify patch cord length and routing through sleeves/conduits prior to submittal stage.
3. Utilize compression type connectors for all field terminated components where required. Provide industry standards identifiable color rings indicating connection type.

B. All cabling shall be plenum rated.

C. Provide all video cabling/connectors to produce the optimal video signal available from the source to the display as available from the equipment and video switcher.

D. Amplify video signals as required for intended video resolution.

E. Specialized Audio/Video Cabling:

1. At specified data locations, audio/video cabling shall be installed to provide a means of signal from the cameras/microphones to the AV switcher/video conferencing unit to displays/speakers.
2. Video Cabling:

a. Camera HDCI Breakout Cable:

1) HDCI video out to five BNC connectors and the serial com and IR to a DB-9 connector.

3. Audio Cabling:

a. Left-Right Stereo Audio Cabling:

1) Pre-manufactured, dual male to dual male audio patch cords terminated on female RCA audio bulkhead connectors and installed from specified data location (18" A.F.F.) to projection unit or monitor location.

b. 3.5 mm Stereo Audio Cabling:

1) Pre-manufactured 3.5 mm jack and audio cabling as required installed from specified data location to projection unit or monitor.

4. Coordinate audio/video jacks/couplers with structured cabling system manufacturer's components to provide a complete, uniform, aligned, modular jack assembly.
5. Manufacturer: Rapid Run or approved equal.

2.5 LABELING

A. Engraved Faceplates:

1. Engrave faceplates with input type in Classrooms and finished areas.

B. Machine Printed Labels:

1. Self adhesive, smudge resistant vinyl labels for cables and faceplates.
2. Size labels appropriately for cable diameters; utilize "wrap" installation.
3. Size labels appropriately to fit in recessed area of faceplate, under available plastic cover or at proper location to identify control buttons or inputs.
4. Submit samples of labels to verify color of label and size of font for each application.
5. Center justify all text.
6. Utilize Hellermon-Tyton Spirit 2100 or approved equal by Rhino Pro, Brother, or Panduit.

PART 3 - EXECUTION

3.1 INSTALLERS

A. Provide experienced, qualified and certified technicians to carry out installation of audio visual devices and components for Video Conferencing Systems equipment.

3.2 EXAMINATION

A. Verification of Conditions:

1. Examine areas and conditions under which work is to be performed. Verify that site conditions are satisfactory for installation of Audio Visual Systems and components.
2. Ensure components and conditions are in compliance with manufacturer's requirements, installation tolerances and other conditions affecting performance.

B. Evaluation and Assessment:

1. Identify conditions detrimental to proper or timely completion.
2. Correct unsatisfactory conditions.
3. Do not proceed until unsatisfactory conditions have been corrected.

3.3 PREPARATION

A. Review Drawings for equipment locations, telecommunication room locations, routing, trunk risers, and special features. Coordinate requirements with appropriate Divisions.

3.4 PROTECTION OF IN-PLACE CONDITIONS

A. Handle components carefully to avoid breakage, dents, scoring finishes and impacts.

B. Take precautions to protect any surfaces already in-place before continuing with work.

C. Protect everything in existing space from dust and debris in an acceptable manner.

D. Notify Architect/Engineer in writing, of any damage to surrounding areas or surfaces already in place.

3.5 INSTALLATION OF AUDIO VISUAL SYSTEMS

A. General: Install system in accordance with NFPA 70 and other applicable codes. Install equipment in accordance with manufacturer's written instructions.

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

C. If, in the opinion of the installer, an installation practice is desired or required, which is contrary to these Specifications or Drawings, a written request for modification shall be made to the Consultant. Modifications shall not commence without written approval from the Consultant.

D. Maintain a competent supervisor and supporting technical personnel, acceptable to the University and Engineer during the entire installation. The Contractor shall submit the name and contact information of the supervisor. Change of supervision during the project is not acceptable without prior written approval from the Owner.

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

F. Wiring Methods: Install wiring in raceway except within lecterns, desks, racks, and except in accessible ceiling spaces, where open cable wiring methods may be used. Use UL listed plenum cable. Conceal wiring.

1. Install cabling in conduit/raceway in all areas with exposed structure.
2. Install all cabling as required for proper system operation.
3. Cable shall be homerun per manufacturer’s specifications.

G. Impedance and Level Matching: Carefully match input and output impedances and signal levels at signal interfaces. Provide matching networks where required.

H. Control Circuit Wiring: Install control circuits in accordance with NFPA 70 and as indicated. Provide number of conductors as recommended by system manufacturer to provide control functions indicated, specified or to meet design intent.

I. Install cables/conduits parallel and perpendicular to surfaces or exposed structural members, and follow surface contours. Secure and support cables/conduits by straps or similar fittings so designed and installed as not to damage the cables. Secure cable at intervals not exceeding 30 inches and not more than 6 inches from every cabinet, box, or fitting.

J. Wiring within Enclosures: Provide adequate length of conductors to allow sliding cabinet to open and rotate 90 degrees. Bundle, lace, and train the conductors to terminal points with no excess. Provide and use lacing bars.

K. Splices, Taps, and Terminations: Make splices, taps, and terminations on numbered terminal strips in junction, pull, and outlet boxes, terminal cabinets, and equipment enclosures.

L. Identification of Conductors and Cables: Use color coding of conductors and apply wire and cable marking tape to designate wires and cables so all media are identified in coordination with system wiring diagrams.

M. Repairs: Wherever walls, ceilings, floors, or other building finishes are cut for installation, repair, restore, and refinish to original appearance.

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

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

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

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

R. Provide physical isolation from each other for microphone, line level, speaker, and power wiring. Run in separate raceways or provide 12-inch minimum separation where exposed or in same enclosure. Provide additional physical separation as recommended by equipment manufacturer.

1. Mount microphones as required to table tops or lecterns as specified by manufacturer. Provide pass-thru grommets into tables as required.

3.6 EQUIPMENT INSTALLATION

A. Mount all equipment in equipment racks designed to support the equipment.

B. Install all equipment per manufacturer’s recommendations.

C. Meet with Owner for detailed system design and configuration review. Meeting to explain features, functionality and operability of system. Provide four (4) 4 hour sessions.

D. Identify, initiate, coordinate and complete all required programming of all equipment for proper and safe operation of equipment and users.

E. Utilize optimal video inputs for connection of video source equipment to switcher and projection units.

F. Properly test all equipment for proper operation and provide final adjustments as required for optimal audio and visual performance.

G. Provide all equipment test reports, signed and certified to Owner and Engineer prior to Substantial Completion.

H. Video Conferencing Equipment: Integrate equipment with AV switcher to allow sharing of resources between sources/displays.

3.7 EQUIPMENT RACK INSTALLATION

A. Provide and install required equipment rack size to accommodate equipment in A/V closet and lectern as shown on drawings.

B. Review available closet configuration for equipment rack and provide racks allowing access to equipment controls and connections at front and back of equipment.

C. Mount equipment racks 60 inches AFF to top of rack.

D. Mount equipment rack to equipment backboxes providing rigidity to support all equipment and allow accessibility to rack.

E. Provide wire management at equipment rack to support all cabling, patch cords, etc. to allow equipment rack accessibility, telescoping, etc. Provide vertical and horizontal lacing bars.

1. Separate cables with different voltages including but not limited to:

    a. Microphone level.
    b. Line level.
    c. Digital control.
    d. Video.
    e. Speaker level audio.
    f. RF.
    g. Power.

2. Provide 4 inch separation between groups of cables at different voltages.
3. Provide 90 degrees when crossing cables or different voltages.

F. Mount racks to allow access to chases, sleeves or slots for cable routing to equipment and devices.

G. Install ground lug and attach ground conductor as recommended by manufacturer.

3.8 MEDIA CONTROLLER PROGRAMMING

A. Integrate with media control unit and touch screen display. Provide code and necessary programming to allow control of video conferencing system from the touch panel.

3.9 LABELING

A. Provide labels on all cabling and patch cords identifying source, output, type to easily and correctly indicate operation and use.

B. Provide at equipment (rack) and outlet as required.

1. Engrave faceplates for A/V outlets with input type or provide factory provided (non-removable) markings acceptable to Owner and Engineer.

C. Provide labels at all equipment controls requiring user interface or not for Owner troubleshooting and easy identification for future re-programming or configuration.

D. Labels shall be affixed free of smudges and fingerprints within 3 inches of termination.

E. Labels shall be viewable without rotating or removing patch cords or cables.

3.10 GROUNDING

A. Electrically ground audio visual systems and components.

B. Provide equipment grounding connections for system. Tighten connections to comply with tightening torques specified in UL Standard 486A to assure permanent and effective grounds.

C. Ground equipment, conductor, and cable shields to eliminate shock hazard and to minimize to the greatest extent possible, ground loops, common mode returns, noise pickup, cross talk, and other impairments. Provide 5-ohm ground at main equipment location. Measure, record and report ground resistance.

D. Refer to Section or Division 27 Section "Grounding and Bonding" for acceptable connections and ground conductor sizes for field measured lengths.

E. Remove painted finish at point of ground connection to ensure proper connection.

F. Certify resistance has been tested and is less than 5 ohms.

3.11 FIELD QUALITY CONTROL

A. Manufacturer's Field Services: Provide services of a factory-authorized service representative to supervise the field assembly and connection of components and the pretesting, testing, and adjustment of the system.

B. Before final acceptance of the system, manufacturer-supplier of system shall, in presence of Owner's representative, test each and every component and device in the system. Test shall be documented with signed copy submitted to the Owner and Architect/Engineer.

C. The system shall be physically inspected by the Owner's representative and the Architect/Engineer to assure that all equipment is installed in a neat and workmanlike manner as called for in the plans and specifications.

D. Upon completion of the system installation, and after circuitry has been energized with the normal power source, the manufacturer/supplier shall test the system to verify the following:

1. All components are operational and functioning properly to the system designs intent.
2. Perform all necessary adjustments and balancing of all signal and amplifier level controls to insure proper operation. Ensure output levels of sources are equal.
3. The complete system is free from grounds, open and shorts except for made grounds required by the system installation.
4. The system is free of hum or noise, including but not limited to ground loops, improper impedance matching, or improper shielding.
5. Configure signal processor to perform all gating, precedence, equalization, and compression to provide optimal performance.
6. Correct all of the above and retest to demonstrate compliance where required by Engineer.
7. All testing shall be documented. Provide a signed copy to the Owner/Engineer verifying the system is complete and fully functional.
8. Make observations to verify that units and controls are properly labeled and interconnecting wires and terminals are identified.

E. The manufacturer/supplier shall set all field adjustable components to optimize the system. Balance all signals, adjust and verify input voltages, current settings and frequency settings.

F. Occupancy Adjustments:

1. When requested by the Architect, within one (1) year of date of Substantial Completion, provide on-site assistance in re-programming systems to suit user operation and actual, occupied conditions.
2. Provide one (1) visit for this work.

3.12 CLEANING

A. Provide cutting and patching necessary to perform work per appropriate Sections. Clean all equipment on a day-to-day basis and final cleaning of all equipment prior to turning over to the Owner. All necessary cleaning referred to herein shall be cleaned to the satisfaction of the Owner's representative.

B. Equipment:

1. Clean all equipment completely inside and out prior to testing.
2. Furnish cleaning consisting of vacuuming all panels, terminations, enclosures (inside and out), etc. If equipment is wet or contains moisture, it shall be thoroughly dried before testing.

C. Raceways and Junction Boxes:

1. Blow out and dry all raceways and conduits prior to installation of cabling.

D. Audio/Visual Closets and Lecterns:

1. Rooms shall be swept clean and all garbage removed from the site upon completion of cleaning equipment as described in above paragraph, but before testing equipment.
2. Ensure that once equipment and room are cleaned and tested, the area remains clean and the doors remain closed until completion of job. If rooms and equipment are subject to dust and moisture after testing equipment, the equipment shall be recleaned to the same specifications.

E. Final Cleaning:

1. Clean all devices, device plates, etc. left in "like new" condition to the satisfaction of the Owner's representative prior to Owner occupancy.
2. Dispose of all rubbish and discarded materials and remove from the site, as required.
3. Clean all equipment to the satisfaction of the Owner's representative.
4. Include all costs for service such as travel, mileage, expenses, labor, etc.

3.13 CLOSE-OUT ACTIVITIES

A. Record cable runway locations and sizes onto project blueprints.

1. Record sizes of pathways, location of cable routings, and system rack elevations as installed on the project blueprints.
2. Submit as-built documents for Engineer's review and approval.

B. Owner's Instructions:

1. Operation and Maintenance Data: Provide approved shop drawings with modifications as required by engineer's instructions or project progression. Include operating and maintenance instructions, parts inventory listing, purchase source listing, emergency instructions, assembly/disassembly and termination diagrams, and wire administration data as specified herein.
2. Provide any additional information as required per the manufacturer's requirements for required warranties.

3.14 TURNOVER MEETING

A. Meeting:

1. Upon completion of all work, coordinate a meeting with the Owner and Owner's Representative at the site to provide all as-built documentation, certifications, test reports, spare parts, and additional manuals, etc. This shall be done upon completion of final punch list and without requirement of final payment being processed.
2. Provide in-depth review of all documentation and equipment to Owner for acceptance.

END OF SECTION 274127

SECTION 274219 – VIDEO WALL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Requirements specified in the following Division 27 sections apply to this Section:

1. Section "Basic Division 27 Requirements."
2. Section "Integrated Audio Visual Systems."

1.2 SUMMARY

A. Provide video wall systems ad indicated in these Specifications, including all software, hardware, licensing, and programming.

B. Includes requirements for video system components including, but not limited to, the following:

1. Video Wall Software.
2. Input/Output Components.
3. Power Supplies/Cables.
4. Quad Controller Modules.
5. LCD Monitors.
6. Mounting Brackets.
7. Equipment Cabling.

1.3 DESIGN INTENT

A. To display scaled source video and content from computer, cable TV feed, and other sources as required onto flat panel LCD monitors with pre-determined, controllable/alterable configurations onto the video wall.

1.4 SYSTEM DESCRIPTION

A. The installation shall include comprehensive video systems consisting of modern solid state type equipment providing the following:

1. MBA Classroom:

a. Distribution of digital video content to 9-panel video wall location from local AV cabinet.
b. System shall be flexible to accommodate various inputs and content. Customize system as required by Owner.
c. Provide software to allow Owner to create and customize various forms of content, including but not limited to images, live CATV, Power Point, text, video, RSS feeds, etc.

d. Provide output of video wall display as scaled input to OFCI Lecture Capture System to be recorded (with available audio) for future playback using Panopto Lecture Capture System.
e. Provide hardware and software to allow Owner to create and customize various forms of content to display on the monitors in various configurations and sizes encompassing single screens, multiple screens (2 x 1, 1 x 2, 2 x 2, 2 x 3, 3 x 2, 3 x 3, 1 x 3, 3 x 1) and up to nine separate outputs.
f. As Alternate Bid, provide additional hardware and software to allow content to display on monitors at virtually any size (portions of multiple screens) not limited to screen size.

2. Trading Room:

a. Distribution of digital video content to 4-panel video wall location from local AV cabinet.
b. System shall be flexible to accommodate various inputs and content. Customize system as required by Owner.
c. Provide software to allow Owner to create and customize various forms of content, including but not limited to images, live CATV, Power Point, text, video, RSS feeds, etc.
d. Provide output of video wall 2 x 2 display (single image content) or a single screen with available audio for scaled input to OFCI Lecture Capture System to be recorded for future playback using PanoPTO Lecture Capture System.
e. Provide hardware and software to allow Owner to create and customize various forms of content to display on the monitors in a 2 x 2 display or on any single screen.

3. Provide training to Owner's staff to operate, customize, and maintain video wall hardware and software.

1.5 SUBMITTALS

A. Shop drawings and manufacturer’s literature shall include all information necessary to confirm that the proposed system is in complete compliance with the Specifications.

1. All items of equipment must be new, in current production and currently eligible for maintenance coverage.

B. General: Submit the following:

1. Detailed bill of materials/equipment list.
2. Manufacturer's product data for each type of product specified.
3. Details of audio/visual system including, but not limited to the following:

a. Rack arrangements.

4. Wiring Diagrams detailing wiring for power, signal, and control differentiating clearly between manufacturer-installed wiring and field-installed wiring. Identify terminal numbers and wiring color codes to facilitate installation, operation, and maintenance. Identify wiring interface to other systems.
5. Field Testing Data.

6. Record Documents:

    a. Provide record documents in accordance with Division 01 and Division 26 Specification Sections.

7. Warranty Information: All items of equipment must be new, in current production, currently eligible for warranty and maintenance coverage and have guaranteed availability for a minimum of five (5) years from the Substantial Completion date.
8. Qualifications as specified in Section 1.6.

1.6 QUALITY ASSURANCE

A. Manufacturer's Qualifications:

1. Firms regularly engaged in manufacture and installation of professional audio/visual systems, components and accessories, of types, capacities and characteristics required, whose products have been in satisfactory use in similar service for not less than five (5) years and who shall be able to refer to similar installations rendering satisfactory service.

B. Supplier's Qualifications:

1. Engage an experienced product supplier who is a factory-authorized sales and service representative regularly engaged in the design and installation of such systems to oversee the installation, trouble-shoot and make final connections at headend equipment.
2. Supplier shall have represented the product and components being installed for a minimum of two (2) years.

C. Installer Qualifications:

1. Firms with at least five (5) years of successful installation experience with projects installing professional audio and video systems similar to that required for this project.

    a. Provide the names and certifications of two qualified Manufacturer certified installers currently on staff that are capable and experienced in this type of installation.

2. Provide reference list of at least three (3) similar installations successfully completed within the last three (3) years within a 100 mile radius. Include scope of work, contact name, title and telephone number.

D. Electrical Component Standard: Provide work complying with applicable requirements of NFPA 70 "National Electrical Code."

E. EIA Compliance: Comply with the following Electronics Industries Association Standards:

1. Sound Systems, EIA-160.
2. Loudspeaker, Dynamic Magnetic Structures, and Impedance, EIA-299-A.
3. Racks, Panels, and Associated Equipment, EIA-310-A.
4. Amplifiers for Sound Equipment, SE-101-A.
5. Speakers for Sound Equipment, SE-103.

6. UL Compliance: Comply with requirements of UL 50.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in factory containers. Store in clean, dry space in original containers. Protect products from fumes, dust and construction traffic. Handle carefully to avoid damage.

1.8 COORDINATION

A. Coordinate all work to be performed with actual field and project conditions. At a minimum, perform the following tasks prior to submitting bids or shop drawings for the project:

1. Perform field investigations to determine all necessary incidental items which will be required for complete and proper installation of all work. Verify all items affecting the bid price prior to bidding.
2. Perform all necessary field measurements to provide complete, accurate, and coordinated shop drawing submittals.
3. Organize and attend all necessary coordination meetings required to assure proper coordination and installation of all related work included in the project.

1.9 PROJECT MANAGEMENT

A. At the time of Contract execution, the A/V Contractor shall assign a Project Manager to this Project that will be responsible for administering all correspondence between the A/V Contractor, administering all other trades, Construction Manager, Owner and Architect/ Engineer. The Project Manager shall also be responsible for the following:

1. Attending all meetings and reporting on project status, schedule, deliverables, manpower, shutdowns, etc.
2. Approving all submittal information.
3. Supervising and providing implementation, installation, testing, certification, acceptance, and documentation for all installed work.

B. The project team will consist of a Project Engineer that will be responsible for all on-site day-to-day tasks, installation, and data collection and programming at the site.

C. Kickoff Meeting: Purpose of the meeting is to introduce the project team to the Owner, Construction Manager, and Engineer and to identify any schedule conflicts, equipment lead times, review any previously approved substitutions, environmental and space requirements, additional data/electrical requirements, and customer responsibilities.

1. Provide a list of milestone dates to meet the installation schedule including shop drawing review, equipment delivery, programming review, customer review, etc.

D. Programming Design Meetings:

1. The A/V Contractor shall provide a comprehensive block diagram or flow chart for each video wall system to present to the Owner the intuitive operation of all components.

2. Provide a configuration review session for the operation of the system component sources and outputs for the Owner's review and input prior to beginning programming. Be prepared with sample control scenarios and each system input/output criteria for the design session. Provide follow-up information in submittal format for written approval.

E. Installation Review:

1. Complete a review meeting with the Owner and review all the required inputs/outputs and scenarios discussed in the design meetings and implement to verify with all the equipment in operating condition.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. All items of equipment including wire and cable shall be designed by the manufacturer supplier to operate as a complete system and shall be accompanied by complete service notes and drawings detailing all inter-connections.

B. Equipment shall be listed by Underwriter's Laboratories, Inc. Each major component shall bear the manufacturer's name and catalog number.

C. Careful attention has been made to specify current production models for all equipment listed, however due to frequent updates of equipment in this field some model numbers may become with the same features by the time this project is built. In such cases the nearest equivalent product discontinued by the same manufacturer shall be provided.

D. Basis of Design Manufacturers:

1. Planar.
2. RGB Spectrum.

2.2 SYSTEM REQUIREMENTS

A. General: Provide complete and fully functional Video Wall System using materials and equipment of types, sizes, ratings, and performances as indicated. Use materials and equipment that comply with referenced standards and manufacturers' standard design and construction in accordance with published product information. Coordinate the features of materials and equipment so they form an integrated system with components and interconnections matched for optimum performance of specified functions.

B. Provide head end service capable of streaming unique video content sources to multiple monitors comprising video wall. Sources shall include those indicated on individual riser diagram.

2.3 EQUIPMENT AND MATERIALS

A. Quad Controller:

1. (1) DVI input.
2. Rack mount.
3. Custom length video distribution cabling.
4. Planar or approved equal.

B. Power Supply Modules:

1. 20A, 120V.
2. Rack mount.
3. Custom length power supply cabling.
4. Planar or approved equal.

C. 55" LCD Flat Panel Monitor:

1. Aspect Ratio: 16 x 9.
2. Resolution: 1920 x 1080.
3. HD Display Standards: 480i, 480p, 720p, 1080P, 4K.
4. Contrast Ratio: 3000:1.
5. Inputs: DVI-D.
6. Wall mount included (Easy Axis Mounting System).
7. Ultra Narrow Bezel (3.7 mm).
8. Three (3) year warranty.
9. Manufacturer: Planar Clarity LX55HDU or approved equal.

D. Digital Content, Control, Management Software:

1. Provide all software and licenses to allow multiple users to control, manage, and create content.
2. Software shall have the following features and functionality as a minimum:

    a. Pre-formatted configuration templates. Intuitive set up wizard and software development kit.
    b. Web-based browser interface.
    c. Owner-created preset templates for emergency announcements.
    d. Real-time video integration.
    e. Account management and scheduling tool.

3. Include one day manufacturer on site commissioning and training.
4. Manufacturer: RGB Spectrum.

E. Real Time Display Wall Processor:

1. Display real time video and graphics on 30 screens on 3 x 3 array. Images can be displayed any size, anywhere, within or across screens in correct aspect ratio.
2. Allow display of HDCP protected content.
3. Input shall be (2) DVI/RGB, (1) HDSDI for a total of six (6) inputs.
4. Rack mountable enclosure with replaceable air filters.
5. Manufacturer:

    a. RGB Spectrum Media Wall 4500-3 with HDCP.
    b. Approved equal by Planar.

2.4 CABLES/WIRES

A. Utilize factory-manufactured cords in lieu of field terminated cables and components at rack connections and wherever possible.

1. Utilize industry standard color coded connectors.
2. Verify cord length and routing through sleeves/conduits prior to submittal stage.
3. Utilize compression type connectors for all field terminated components where required. Provide industry standards identifiable color rings indicating connection type.

B. Amplify video signals as required for intended video resolution.

C. Provide all video cabling/connectors to produce the optimal video signal available from the source to the display as available from the equipment.

D. Manufacturers:

1. Planar 175-0757 IR Cables.
2. Planar 903-0836 DVI-D Cables.
3. Planar 955-0157 Cable Set.
4. Extron STP.

2.5 LABELING

A. Engraved Faceplates:

1. Engrave faceplates with input type in video equipment closet and finished areas.

B. Machine Printed Labels:

1. Self-adhesive, smudge resistant vinyl labels for cables and faceplates.
2. Size labels appropriately for cable diameters; utilize "wrap" installation.
3. Size labels appropriately to fit in recessed area of faceplate, under available plastic cover or at proper location to identify control buttons or inputs.
4. Submit samples of labels to verify color of label and size of font for each application.
5. Center justify all text.
6. Utilize Hellermon-Tyton Spirit 2100 or approved equal by Rhino Pro, Brother, or Panduit.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions for compliance with requirements and other conditions affecting the performance of the video wall system work.

B. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install system in accordance with NFPA 70 and other applicable codes. Install equipment in accordance with manufacturer's written instructions.

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

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

D. Maintain a competent supervisor and supporting technical personnel acceptable to the University and Engineer during the entire installation. The Contractor shall submit the name and contact information of the supervisor. Change of supervision during the project is not acceptable without prior written approval from the Owner.

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

F. Wiring Methods: Install wiring in raceway except within accessible ceiling spaces, where open cable wiring methods may be used. Use UL-listed plenum cable. Conceal wiring.

1. Install cabling in conduit/raceway in all areas with exposed structure.
2. Install all cabling as required for proper system operation.
3. Cable shall be homerun per manufacturer’s specifications.

G. Impedance and Level Matching: Carefully match input and output impedances and signal levels at signal interfaces. Provide matching networks where required.

H. Install cables/conduits parallel and perpendicular to surfaces or exposed structural members, and follow surface contours. Secure and support cables/conduits by straps or similar fittings so designed and installed as not to damage the cables. Secure cable at intervals not exceeding 30 inches and not more than 6 inches from every cabinet, box, or fitting.

I. Wiring Within Enclosures: Provide adequate length of conductors to allow sliding cabinet to open and rotate 90 degrees. Bundle, lace, and train the conductors to terminal points with no excess. Provide and use lacing bars.

J. Splices, Taps, and Terminations: Make splices, taps, and terminations on numbered terminal strips in junction, pull, and outlet boxes, terminal cabinets, and equipment enclosures.

K. Identification of Conductors and Cables: Use color coding of conductors and apply wire and cable marking tape to designate wires and cables so all media are identified in coordination with system wiring diagrams.

L. Repairs: Wherever walls, ceilings, floors, or other building finishes are cut for installation, repair, restore, and refinish to original appearance.

M. Adjust and balance all circuits as specified herein. Set all controls and software parameters to render a fully and optimally operating systems and subsystems. All computer-controlled

functions shall require complete audio/computer/software setup, balancing, label-entry and documentation.

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

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

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

3.3 EQUIPMENT INSTALLATION

A. Mount all equipment in equipment racks designed to support the equipment.

B. Install all equipment per manufacturer's recommendations.

C. Meet with Owner for detailed system design and configuration review. Meeting to explain features, functionality and operability of system. Provide two (2) sessions.

D. Identify, initiate, coordinate and complete all required programming of all equipment for proper and safe operation of equipment and users.

E. Utilize optimal video inputs for connection of equipment to encoder and decoder.

F. Properly test all equipment for proper operation and provide final adjustments as required for optimal audio and visual performance.

G. Provide all equipment test reports, signed and certified to Owner and Engineer prior to substantial completion.

3.4 LCD INSTALLATION

A. Coordinate exact unit location with Drawings and exact field dimensions.

B. Install wall mount as required including bracing in wall as required.

C. Install all A/V cords, test and adjust unit per manufacturer's recommendation.

D. Connect monitor to security cable.

E. Install cosmetic wall trim assembly to cover all four (4) edges of video wall.

3.5 LABELING

A. Provide labels on all cabling and patch cords identifying source, output, type to easily and correctly indicate operation and use.

B. Provide at equipment (rack) and outlet as required.

1. Engrave faceplates for A/V outlets with input type or provide factory provided (non-removable) markings acceptable to Owner and Engineer.

C. Provide labels at all equipment controls requiring user interface or not for Owner troubleshooting and easy identification for future re-programming or configuration.

D. Labels shall be affixed free of smudges and fingerprints within three (3) inches of termination.

E. Labels shall be viewable without rotating or removing patch cords or cables.

F. Provide label with FM transmitter frequency engraved at video wall visible in Atrium.

G. Color shall be black on stainless steel.

3.6 GROUNDING

A. Provide equipment grounding connections for systems. Provide ground conductor to signal grounding busbar per J-Std. 607A.

B. Tighten connections to comply with tightening torques specified in UL Standard 486A to assure permanent and effective grounds.

C. Ground equipment, conductor, and cable shields to eliminate shock hazard and to minimize to the greatest extent possible, ground loops, common mode returns, noise pickup, cross talk, and other impairments. Measure, record, and report ground resistance.

3.7 FIELD QUALITY CONTROL

A. Manufacturer's Field Services: Provide services of a factory-authorized service representative to supervise the field assembly and connection of components and the pretesting, testing, and adjustment of the system.

B. Before final acceptance of the system, manufacturer-supplier of system shall, in presence of Owner's representative, test each and every component and device in the system. Test shall be documented with signed copy submitted to the Owner and Architect/Engineer.

C. The system shall be physically inspected by the Owner's representative and the Architect/ Engineer to assure that all equipment is installed in a neat and workmanlike manner as called for in the plans and specifications.

3.8 SYSTEM TESTING AND ADJUSTMENTS

A. Upon completion of the system installation, and after circuitry has been energized with the normal power source, the manufacturer/supplier shall test the system to verify the following:

1. All components are operational and functioning properly to the system designs intent.
2. Perform all necessary adjustments and balancing of all signal and amplifier level controls to insure proper operation. Ensure output levels of sources are equal.

3. The complete system is free from grounds, open and shorts except for made grounds required by the system installation.
4. The system is free of hum or noise including but not limited to ground loops, improper impedance matching or improper shielding.
5. Configure signal processor to perform all gating, precedence, equalization and compression to provide optimal performance.
6. Correct all of the above and retest to demonstrate compliance where required by Engineer.
7. All testing shall be documented. Provide a signed copy to the Owner/Engineer verifying the system is complete, and fully functional.
8. Make observations to verify that units and controls are properly labeled and interconnecting wires and terminals are identified.

B. The manufacturer/supplier shall set all field adjustable components to optimize the system. Balance all signals, adjust and verify input voltages, current settings and frequency settings.

C. Occupancy Adjustments:

1. When requested by the Owner, within one (1) year of date of Substantial Completion, provide on-site assistance in re-programming systems to suit user operation and actual, occupied conditions.
2. Provide up to three (3) visits for this work.

3.9 CLEANING

A. Provide cutting and patching necessary to perform work per appropriate Sections. Clean all equipment on a day-to-day basis and final cleaning of all equipment prior to turning over to the Owner. All necessary cleaning referred to herein shall be cleaned to the satisfaction of the Owner's representative.

B. Equipment:

1. Clean all equipment completely inside and out prior to testing.
2. Furnish cleaning consisting of vacuuming all panels, terminations, enclosures (inside and out), etc. If equipment is wet or contains moisture, it shall be thoroughly dried before testing.

C. Raceways and Junction Boxes:

1. Blow out and dry all raceways and conduits prior to installation of cabling.

D. Final Cleaning:

1. Clean all devices, device plates, etc. left in "like new" condition to the satisfaction of the Owner's representative prior to Owner occupancy.
2. Dispose of all rubbish and discarded materials and remove from the site, as required.
3. Clean all equipment to the satisfaction of the Owner's representative.
4. Include all costs for service such as travel, mileage, expenses, labor, etc.

3.10 MANUFACTURER’S FIELD SERVICES

A. Prepare, set up, and supervise installation of system equipment to the satisfaction of the Owner's Representative and requirements of manufacturer warranty.

B. Include services of technician to review installation techniques and service final connections, and system testing.

C. Final Adjustment Upon Achieving Substantial Completion of the Work: Adjust all operable components to ensure that they are properly installed and functioning smoothly. Replace any component which cannot be adjusted for proper operation.

3.11 OPERATION INSTRUCTION

A. The installer shall provide on-the-job training by a suitably qualified instructor, to personnel designated by the Owner, to instruct them in the operation and maintenance of the systems. At no additional cost to the Owner, the Installer shall provide a manufacturer's representative for such instruction in the event the Installer does not have qualified instructors on staff for the specified equipment. All training shall take place after the systems are operational, but before the acceptance tests. There shall be a total of 24 hours of training on the systems included in this specification in four (4) hour periods, at the discretion of the Owner. There shall be two (2) follow-up training visits after six (6) months, each a 4-hour training session for a refresher on equipment as determined by the Owner.

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

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

D. A schedule shall be submitted clearly defining the training period 20 days prior to commencement of such training. Schedule shall be approved by Owner.

3.12 OPERATION AND MAINTENANCE MANUALS

A. Equipment Manuals:

1. Approved copy of system submittal.
2. Provide a complete set of equipment cut sheets, parts list, including maintenance criteria, "trouble-shooting" guide, distributor information and service information for all equipment provided.
3. Provide a complete set of instruction manuals; including complete written programming instructions, programming documentation and system set-up documentation.

    a. Provide an additional quick-start guide with all commonly used procedures for operating the system. Laminate and provide copies during training session.

4. Provide all test results performed. Include manufacturer's certifications that installed system complies with specification requirements.

B. Equipment Drawings:

1. Contractor shall provide a revised set of system wiring diagrams upon the completion of the installation for subsequent testing of the system to show actual cable routing, connections with other systems cable lengths values of all equipment as installed and actual signal values as tested.
2. Utilize architectural floor plans for system layout.

C. Software:

1. Provide copies of all system programming for backup of systems and future reworking/reconfiguration.
2. Provide all documentation to Owner on CD in PDF and Word format.

END OF SECTION 274219

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SECTION 274220 – FINANCIAL SERVICES STOCK TICKER

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes installation, programming and setup of computer information systems and digital display equipment.

B. This Section includes the following equipment and services:

1. LED Stock Ticker Display.

C. Requirements of the following Division 27 Sections apply to this Section:

1. Section "Basic Division 27 Requirements."

D. Base Bid: Provide LED Stock Ticker as identified on the Drawing of the length shown (approximately 30') with the capability to extend the device in the future.

E. Alternate Bid: Provide the additional length of the Ticker as shown on the Drawings (approximately 22') to extend it to the edge of trading room.

1.2 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract, Division 01 Specification Sections and Division 27 Section "Basic Division 27 Requirements."

B. Shop Drawings:

1. Manufacturer's product data for each type of product specified.
2. Details of system including, but not limited to the following:

a. Equipment layout.
b. Include dimensional information and mounting points.
c. Interface method and equipment for Network and Display Connectivity.
d. Software information.

3. Wiring diagrams detailing wiring for power, signal, and control differentiating clearly between manufacturer-installed wiring and field-installed wiring. Identify terminal numbers and wiring color codes to facilitate installation, operation, and maintenance. Identify wiring interface to other systems.

C. Field Testing Data.

D. Record Documents:

1. Provide record documents in accordance with Division 01 Specification Sections.

1.3 QUALITY ASSURANCE

A. Manufacturer's Qualifications:

1. Firms regularly engaged in manufacture of professional quality digital display systems, components and accessories, of types, capacities and characteristics required, who products have been in satisfactory use in similar service for not less than two (2) years.

a. Contact: Perry Kirk
RiseVisions, Inc.
512-595-4683

B. Supplier's Qualifications:

1. Engage an experienced product supplier who is a factory-authorized sales and service representative regularly engaged in the design and installation of such systems to oversee the installation, trouble-shoot and make final connections at headend equipment.
2. Supplier shall have represented the product and components being installed for a minimum of two (2) years.

C. Installer Qualifications:

1. Firms with at least three (3) years of successful installation experience with projects installing professional equipment similar to that required for this project.
2. Refer to Division 01 Section "Definitions and Standards" for definition of experienced Installer. Upon request submit evidence of such qualifications to the Architect/Engineer.

D. Electrical Component Standard: Provide work complying with applicable requirements of NFPA 70 "National Electrical Code."

E. EIA Compliance: Comply with the following Electronics Industries Association Standards:

1. Racks, Panels, and Associated Equipment, EIA-310-A.
2. UL Compliance: Comply with requirements of UL 50, UL-1950, and UL-60950-1.
3. ETL and CE compliant.
4. ANSI/UL 60950-1, 2nd Edition (2007), "Safety of Information Technology Equipment."

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in factory containers, store in clean, dry space in original containers. Protect products from fumes and construction traffic. Handle carefully to avoid damage.

PART 2 - PRODUCTS

2.1 SYSTEM REQUIREMENTS

A. General: Provide a complete and functional digital display system using materials and equipment that comply with referenced standards and manufacturer's standard design and construction per published product data.

2.2 EQUIPMENT AND MATERIALS

A. Indoor Electronic LED Message Center (Stock Ticker):

1. 24 pixel premium LED stock tickler.
2. Cabinet: 35' L x 8.2" H x 3" D.
3. Character Height: 7.2".
4. Mounting: Wall or ceiling.
5. Custom rigid cabinet shall be pendant supported and custom measured to match wall curvature. Coordinate support locations with mullions identified on Drawings.
6. Unit shall be expandable for future extension of cabinet.
7. Brightness: 3200 NITS.
8. Full Color: 16.7 million shades; LED pixels: 40/foot.
9. Ethernet connectivity.
10. 30A, 120V AC power connection; 3600 watts max.
11. Heat Dissipation: 3600 BTU/hour.
12. Web-based Client for control of configuration, scheduling, scrolling, brightness, power on/off, user management.
13. Content Display:

    a. Financial news.
    b. Sports news.
    c. Entertainment news.
    d. Twitter feeds.
    e. Image distribution.
    f. RSS feed.
    g. Text messages.
    h. Custom database or Excel file.

14. Financial Market Data:

    a. Equity and mutual fund prices from NYSE, NASDAQ, or AMEX.
    b. Futures and Commodity prices.
    c. Market statistics such as net gainers, net losers, most actives.
    d. Domestic indices such as DOW, NASDAG Composite, S & P 500, and others.
    e. Foreign Indices.
    f. US Treasury Rates.
    g. Precious Metals Rates.

15. Manufacturer: Rise Display or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with the installer present, for compliance with requirements and other factors affecting the performance of the Digital Display Systems.

B. Do not proceed until unsatisfactory conditions have been corrected.

3.2 GENERAL INSTALLATION

A. Provide power to all equipment as required.

B. Mount all equipment as recommended by manufacturer. Provide display mounts to angle display as necessary to increase viewable area from audio locations.

3.3 INSTALLATION

A. General: Install system in accordance with NFPA 70 and other applicable codes. Install equipment in accordance with manufacturer's written instructions.

B. Wiring Methods:

1. Install wiring in raceways and conceal all system wiring.
2. Homerun and terminate all cabling at A/V rack system.
3. Cabling shall not have splices.
4. Label all cabling with type-printed labels, Brady type or equal.

C. Provide physical separation and isolation from other system wiring, with 12 inch minimum separation as a criteria. Provide additional separation as recommended by equipment manufacturer.

D. Identify conductors and cables with color coding, and apply wire and cable mounting tape to designate all media per system wiring diagrams.

E. Assure full compatibility with the content engines and display equipment for reliable performance.

3.4 GROUNDING

A. Provide equipment grounding connections for system components, as recommended by the manufacturer.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Services: Provide services of a factory-authorized service representative to supervise the field assembly and connection of components and the pretesting, testing, and adjustment of the system.

B. Test each and every component and device in the system before final acceptance of the system, in presence of the Owner's representative. Test shall be documented with signed copy submitted to the Owner and Architect/Engineer.

3.6 SYSTEM TESTING, ADJUSTMENTS, AND CLEANING

A. Test the system upon completion of the system installation and after circuitry has been energized with the normal power source. The manufacturer/supplier shall verify the following:

1. All components are operational and functioning properly to the system designs intent.
2. Perform all necessary adjustments balancing of all signal, amplifier level controls, and viewable formats fill screens. Insure proper operation.
3. The complete system is free from grounds, open and shorts except for made grounds required by the system installation.
4. Correct all of the above and retest to demonstrate compliance where required by Engineer.
5. All testing shall be documented. Provide a signed copy to the Owner/Engineer verifying the system is complete and fully functional.

B. The manufacturer/supplier shall set all field adjustable components to optimize the system. Balance all signals, adjust and verify input voltages, current settings and frequency settings.

3.7 TRAINING

A. Provide on-site training on the use of the Digital Display Systems to the Owner's selected personnel.

1. Provide a minimum of three (3) hours of training to selected personnel for the creation of unique, personalized presentation curriculum and preventative maintenance of the system.
2. Schedule training with Owner through Architect with at least seven (7) days advance notice.

B. Occupancy Adjustments: When requested by the Architect within one (1) year of date of Substantial Completion, provide on-site assistance in adjusting devices, resetting equipment and reprogramming software to suit actual occupied conditions. Provide up to three (3) visits to the site for this purpose.

3.8 SUBSCRIPTION SERVICES

A. Coordinate with the Owner regarding the University’s plan to receive Market Data and news subscriptions from multiple provisions and consult on the advantages and disadvantages of each.

B. Provide at the time of submittal, an estimate of monthly costs for receiving and displaying specific market data requested by the University.

3.9 OPERATION AND MAINTENANCE MANUALS

A. Equipment Manuals:

1. Approved copy of system submittal.
2. Provide a complete set of equipment cut sheets, parts list, including maintenance criteria, "troubleshooting" guide, distributor information and service information for all equipment provided.
3. Provide a complete set of instruction manuals; including complete written programming instructions, programming documentation and system set-up documentation.
4. Provide all test results performed. Include manufacturer's certifications that installed system complies with specification requirements.

B. Equipment Drawings:

1. Provide a revised set of system wiring diagrams upon the completion of the installation for subsequent testing of the system to show actual cable routing, connections with other

systems cable lengths values of all equipment as installed and actual signal values as tested.

3.10 CLEANING AND PROTECTION

A. Prior to final acceptance, clean system components and protect from damage and deterioration.

END OF SECTION 274220

SECTION 275127 - RADIO ASSISTIVE LISTENING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes radio assistive listening systems and connection to the local AV system for amplification of the sound system for the hearing impaired.

B. This Section includes radio assistive listening systems for installation in the following areas:

1. MBA Room.
2. Classroom Type A.
3. Classroom Type C (2).
4. Classroom Type D.
5. Trading Room.
6. Seminar Room (2).

C. This Section includes two (2) portable assistive listening systems for connection and operation with local AV systems not equipped with a fixed assistive listening system transmitter.

D. Requirements of the following Division 26 Sections apply to this Section:

1. Section "Basic Division 26 Requirements."
2. Section "Conduit Rough-In Systems."

E. Requirements of the following Division 27 Sections apply to this Section:

1. Section "Basic Division 27 Requirements."
2. Section "Integrated Audio Visual Systems."

1.2 SUBMITTALS

A. General: Submit in accordance with Division 27 Section "Basic Division 27 Requirements" for ACTION SUBMITTALS, INFORMATIONAL SUBMITTALS, and CLOSEOUT SUBMITTALS specific information.

1.3 ACTION SUBMITTALS

A. Shop Drawings: Submit six (6) complete sets of shop drawings including:

1. Manufacturer's product data for each type of product specified.
2. Details of system including, but not limited to the following:
    a. Equipment Locations - Include Dimensional Information:
        1) Transmitters.
        2) Antennas.
        3) Receivers.
        4) Repeaters.
        5) Equipment Cabinets.
    b. Rack arrangements.
    c. Riser diagram including interface method and equipment for connection to associated distribution systems.
    d. Density maps identifying coverage of specified space using Contract Documents.
3. Wiring Diagrams detailing wiring for power, signal, and control differentiating clearly between manufacturer-installed wiring and field-installed wiring. Identify terminal numbers and wiring color codes to facilitate installation, operation, and maintenance. Identify wiring interface to other systems.

1.4 INFORMATIONAL SUBMITTALS

A. Field Testing Data.

B. Manufacturer certification that system complies with specifications requirements.

C. Coordination information.

1.5 CLOSEOUT SUBMITTALS

A. Record Documentation including service, warranty, maintenance, operator instructions, and serial numbers.

1.6 QUALITY ASSURANCE

A. Manufacturer's Qualifications:

1. Firms regularly engaged in manufacture of professional quality audio systems, components and accessories, of types, capacities and characteristics required, whose products have been in satisfactory use in similar service for not less than two (2) years.

B. Supplier's Qualifications:

1. Engage an experienced product supplier who is a factory-authorized sales and service representative regularly engaged in the design and installation of such systems to oversee the installation, trouble-shoot and make final connections at headend equipment.
2. Supplier shall have represented the product and components being installed for a minimum of two (2) years.
3. Maintain a service organization to provide both normal and emergency service. Emergency service must be available 24 hours per day; 365 days per year and staff must be adequate to respond within two (2) hours of an emergency call.
4. Maintain adequate spare parts inventory to provide both normal and emergency service.
5. Employ service technicians who are trained in accordance with the systems manufacturer's recommendations.
6. Own and demonstrate proficiency in the use of the required test equipment, tools, etc. for the proper installation, set-up, testing, and maintenance of the system. If requested, must provide a listing of tools and/or equipment and where appropriate certifications in the proper training and use of the tools and/or equipment.
7. Provide all systems programming to deliver a customized system to the Owner ready for use.

    a. All system programming is to be completed to the satisfaction of the Owner. If after preliminary use of the system, and/or training, the increased understanding of the system's features and capabilities necessitates reprogramming to any extent, it is to be performed at no additional cost.

C. Installer Qualifications:

1. Firms with at least five (5) years of successful installation experience with projects installing professional equipment similar to that required for this project.
2. Refer to Division 01 Section "Definitions and Standards" for definition of experienced Installer. Upon request submit evidence of such qualifications to the Architect/Engineer.

D. Regulatory Requirements: All work is to be completed in accordance with all the latest requirements of the following authorities and/or documents the most stringent requirements of which will apply:

1. Underwriters Laboratories, Inc. (U.L.) - "Fire Resistance Directory."

E. Installation shall be in accordance with NFPA 70 (National Electrical Code), National Electric Safety Code (NESC), state codes, local codes, and requirements of authority having jurisdiction.

F. Equipment shall be designed, manufactured, assembled, and tested in accordance with the latest revisions of applicable published ANSI, NEMA, and IEEE Standards.

G. Each item shall bear the U.L. label.

H. EIA Compliance: Comply with the following Electronics Industries Association Standards:

1. Sound Systems, EIA-160.
2. Loudspeaker, Dynamic Magnetic Structures, and Impedance, EIA-299-A.
3. Racks, Panels, and Associated Equipment, EIA-310-A.
4. Assistive Listening Performance Standard, RS81-3.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in factory containers, store in clean, dry space in original containers. Protect products from fumes and construction traffic. Handle carefully to avoid damage.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, provide products by one of the following:

1. Williams Sound.
2. Listen Technologies.
3. Phonic Ear OnWave.
4. Sennheisser.
5. Telex Sound Mate.

2.2 SYSTEM REQUIREMENTS

A. General: Provide a complete and functional assistive listening system using materials and equipment that comply with referenced standards and manufacturer's standard design and construction per published product data.

2.3 EQUIPMENT AND MATERIALS

A. Base Station Narrow Band Transmitter: Basis of Design is Williams Sound Model PPA T45 17-Channel Transmitter with the following features:

1. Rack mounting.
2. 1/4" wave telescoping omni directional antenna.
3. Signal to Noise Ratio: 74 dB transmitted.
4. RF Range: 72 to 76 MHz.
5. Modulation: ± 75 KHz deviation.
6. Power: 115 VAC, 60 Hz @ 300 mA.
7. LCD Display: Channel, frequency, audio meter, RF level.

B. Receivers: Basis of Design is Williams Sound Model PPA R37 17-channel receiver with the following features:

1. Frequency Response <3dB variation.
2. Modulation: ± 75 KHz.
3. Power Requirements: (2) AA batteries, included with unit (not installed).
4. Volume/on/off switch.
5. Distortion < 2% T.H.D.
6. Signal to Noise Ratio: > 77dB.
7. Image Rejection: >65dB.
8. Selectable Channels: 17.
9. Audio Output: 3.5 mm stereo connector.

C. Neckloops: Basis of Design is Williams Sound Model NKL 001.

1. 3.5 mm male connector.
2. Frequency Response: 20 Hz - 20 KHz.
3. Impedance: 12 ohm +/- 15 percent @ 1 KHz.
4. 18" breakaway neckloop.
5. For use with telecoil device.

D. Ear Speakers: Basis of Design is Williams Sound Model EAR 002 over the ear surround speaker, sanitizeable, no foam covers.

1. 3.5 mm mono plug.
2. 39" cord.
3. Frequency Response: 20 Hz - 20 KHz.
4. 23 mm driver.
5. Impedance: 32 ohm.
6. Sensitivity: 118 dB @ 1 KHz.

E. Headset: Basis of Design is Williams Sound Model HED 021 Mono Folding Headphones.

1. 3.5 mm mono plug.
2. 39" cord.
3. Frequency Response: 20 Hz - 20 KHz.
4. 30 mm driver.
5. Impedance: 32 ohm.
6. Sensitivity: 110 dB @ 1 KHz.

F. Portable Assistive Listening System:

1. Belt pack transmitter with input from local AV system. Williams Sound #T46 or approved equal.
2. Receivers, neckloops, headphones and ear speakers as indicated in "Quantities" table.
3. Hard carry case.
4. ADA wall plaque for each AV system intended for use located in the Building: Total of 2.

G. Equipment Cabinet:

1. Provide a wall-mounted equipment cabinet for storage of receivers.
    a. Wall mounted unit manufactured of steel with a black anodized finish.
    b. Hinged front door with lock and latch. Match lock to sound equipment cabinets.
        1) Provide six (6) sets of keys. Engrave label keys: "Sound System."
    c. Provide storage of all receivers, ear pads and batteries associated with associated assistive listening system.
    d. Provide label on exterior of cabinet: "Assistive Listening System: Headsets".
    e. Provide one (1) cabinet. Locate cabinet adjacent to AV system near the MBA Room. Coordinate exact location with Engineer and Owner prior to rough-in.

H. Equipment Drawer:

1. Provide a rack mount drawer in local AV cabinet for storage of end user devices.
2. Coordinate with AV equipment installation.

I. Batteries:

1. Provide rechargeable batteries (with charger) for all equipment and turn over to Owner.

J. Cabling:

1. Provide and install all cables as recommended by the manufacturer.

K. Wall Plaques:

1. Provide wall plaques indicating the availability of assistive listening headsets in accordance with the ADA 2010.

   a. Locate one (1) plaque in the building main lobby.
   b. Locate one (1) plaque near the entrance of each equipped area.

2. Coordinate exact location with Architect/Engineer prior to installation.
3. Williams Sound Model IDP 008 or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with the installer present, for compliance with requirements and other factors affecting the performance of the Assistive Listening Systems.

B. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install system in accordance with NFPA 70 and other applicable codes. Install equipment in accordance with manufacturer's written instructions.

B. Wiring Methods: Install wiring in raceways and conceal all system wiring.

C. Provide physical separation and isolation from other system wiring, with 12 inch minimum separation as criteria. Provide additional separation as recommended by equipment manufacturer.

D. Provide a shelf and mounting for system rack.

E. Identify conductors and cables with color coding, and apply wire and cable mounting tape to designate all media per system wiring diagrams.

F. Install base transmitter and equipment antennas as recommended by the manufacturer. Coordinate antenna placement with architect prior to installation.

G. Locate headsets, receivers, ear speakers in cabinet.

3.3 GROUNDING

A. Provide equipment grounding connections for system components, as recommended by the Manufacturer.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Services: Provide services of a factory-authorized representative to supervise the field assembly and connection of components. Also, to supervise the pretesting, testing, and adjustments of the system.

B. Pretesting: Upon completing installation of the system, align, adjust, and balance the system and perform complete pretesting. Determine, through pretesting, the conformance of the system to the requirements of the Drawings and Specifications. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new, and retest until materials satisfactory performance and conditions are achieved.

C. Testing: Upon completion of pretesting, notify the Architect a minimum of 10 days in advance of acceptance test performance. Schedule and conduct tests in his presence. Provide a written record of tests results.

D. Operational Test: Perform an operational system test to verify conformance of system to these Specifications. Submit test reports for inclusion on O & M Manuals.

END OF SECTION 275127

EXHIBIT B
SUPPLIER DIVERSITY PARTICIPATION FORM

The contractor/supplier must indicate below the percentage of diverse supplier participation committed to in relation to the total dollar value of the contract. Please provide this information whether the contractor/supplier is awarded one, some, or all of the categories being proposed. Overall the diverse supplier participation must not be contingent upon award of a specific category. The contractor/supplier, if awarded a contract, must be able to achieve the stated participation for the resulting contract regardless of the categories awarded or not awarded. The contractor/supplier must be able to achieve participation stated below for the total value of the awarded contract(s). If the contractor/supplier is a certified diverse supplier, the contractor/supplier may indicate 100% participation below. We also ask that a diverse supplier we contract with directly provide us with any supplier diversity participation your firm does that helps to fulfill the contract. Listed below are definitions of direct versus indirect 2nd Tier spending:

- Direct 2nd Tier spending: This is diverse supplier spending by a first tier supplier of goods and/ or services that directly fulfills a UMSSC contract. The principle to follow— if the diverse supplier spending by the first tier supplier can be traced and tracked specifically to the contract, this is direct 2nd tier spending.
    a. Example: Company A is a prime supplier that sells UMSSC Health System medical supplies. Masks that are supplied to fulfill the contract come from a woman-owned business. This would be called direct 2nd tier as the purchase is directly fulfilling the contractual obligation.
    b. Example: Company B is a prime supplier of office products to UMSSC. Ink pens that are supplied are provided by a minority-owned business. This would also be direct 2nd Tier. Dollars can be tracked and traced to fulfilling the contract.

- Indirect 2nd Tier spending: Calculates the 2nd Tier spending by prorating the prime supplier's company-wide diverse supplier spending with the percentage of its total business represented by the customer company's business.
    a. Example: Company A spends $100,000 with a Veteran-owned landscaping company. UMSSC comprises 20% of that company's/subsidiary's business revenue. Company A can report $20,000 of the amount spent for landscaping as part of its reporting to UMSSC.
    b. Example: Company B spends $150 million dollars in diverse supplier spending for its enterprise. UMSSC comprises 1% of Company B's overall revenue. Company B can the report 1% ($1.5 million) as supplier diversity spending to UMSSC.

The contractor/ supplier is committing to the following diverse supplier participation on this proposal:

Complete the following table indicating the suppliers that will be used as direct subcontractors to meet the participation levels indicated. If you are committing to indirect 2nd tier spending, please list as "indirect" under supplier name and indicate what percentage you will target. If your company will not have a supplier diversity component, please indicate that below as well.

Supplier Name	% of Contract	Specify 1st or 2nd Tier

Supplier Diversity Certifying Agencies

The list below provides a list of agencies that do certification for MBE, WBE, DBE, Veteran and Veteran Service Disabled businesses. Bidders are responsible for obtaining information regarding the certification status of a firm for the prospective sub-contractor being used. A list of certified firms may also be obtained from many of the agencies listed below, including the State of Missouri's websites for M/WBE's and Service-Disabled Veterans.

State of Missouri Office of Equal Opportunity
P.O. Box 809, Harry S. Truman office Building
Room 630, 301 W. High Street
Jefferson City, MO. 65102
573-751-8130
www.oeo.mo.gov

Missouri M/WBE Certification and database
State of Missouri Office of Administration
Division of Purchasing & Materials Management
P.O. Box 809
Jefferson City, MO 65102
573-751-3273
www.oa.mo.gov/purchasing-materials-management
Missouri Service Disabled Veterans Website

State of Kansas Department of Commerce
M/WBE and DBE Department
1000 S.W. Jackson St. Suite 100
Topeka, KS. 60612
785-296-3425
www.kansascommerce.com
Kansas M/WBE and DBE database and certification

Missouri Department of Transportation
External Civil Rights
1017 Missouri Blvd
Jefferson City, MO. 65102
573-526-2978
www.modot.org/ecr
Missouri DBE database and certification

Lambert St. Louis International Airport
4610 N. Lindbergh, Suite 240
Bridgeton, MO 63044
314-551-5000
www.mwdbe.org
St. Louis M/WBE and DBE database and certification

City of Kansas City Missouri
MBE/WBE Division
414 E. 12th St
Kansas City, MO. 64106
816-513-1313
Kansas City M/W/DBE database and certification
www.kcmo.gov/humanrelations/resources

St. Louis Development Corporation
1520 Market St. Suite 2000
St. Louis, MO. 63103
314-657-3700
www.stlouis-0mo.gov/sldc
Certification help for M/WBE suppliers in St. Louis area.

Mid-States Minority Supplier Development Council
317 N. 11th St. Suite 502
St. Louis, MO. 63101
314-436-8877
www.midstatesmsdc.org
MBE certification for St. Louis based corporations/database available for a fee

Mountain Plains Minority Supplier Council
777 Admiral Blvd.
Kansas City, MO. 64106
816-221-4200
www.mpmsdc.org
MBE certification for Kansas City based corporations/database available for a fee

U.S. Small Business Administration-Kansas City
1000 Walnut Suite 500
Kansas City, MO. 66106
816-426-4900
http://www.sba.gov/about-offices-content/2/3123
Kansas City SBA Office. Info for Federal Gov. Certification

U.S. Small Business Administration-St. Louis
1222 Spruce St. Suite 10.103
St. Louis, MO. 63103
314-539-6600
http://www.sba.gov/about-offices-content/2/3124
St. Louis SBA Office. Info for Federal Gov. Certification.

U.S. Veterans Business Administration
Veteran and Service Disabled Veteran Database and verification
www.vetbiz.gov
U.S. database of Veteran and Service Disabled Veteran Businesses

St. Louis Minority Business Council
308 N. 21st St, 7th floor
St. Louis, MO. 63101
314-241-1143
www.slmbc.org
St. Louis MBE certifying agency/database access for a fee

Women's Business Development Center (WBENC)-Chicago
8 S. Michigan Ave Suite 400
Chicago, Illinois 60603
312-853-3477
www.wbdc.org
Certification for WBE's in the Missouri area

SUPPLIER REGISTRATION INFORMATION

Completion of this section is strongly encouraged. Please review and check ALL applicable boxes.

SMALL BUSINESS CONCERN: _____Yes _____No

The term "small business concern" shall mean a business as defined pursuant to Section 3 of the Small Business Act and relevant regulations issued pursuant thereto. Generally, this means a small business concern organized for profit, which is independently owned and operated, is not dominant in the field of operations in which it is bidding. We would consider any firm with 500 employees or less a "small business concern".

WOMAN OWNED BUSINESS (WBE): _____Yes _____No

A woman owned business is defined as an organization that is 51% owned, controlled and/or managed, by a woman. The determination of WBE status depends solely on ownership and operation and is not related to employment. The firm should be certified by a recognized agency (e.g., state, local, federal, etc.). Please see Public Law 106-554 for more detail.

MINORITY BUSINESS ENTERPRISE (MBE): _____Yes _____No

A minority business is defined as an organization that is 51% owned, controlled and/or managed by minority group members. The determination of minority status depends solely on ownership and operation and is not related to employment. The firm should be certified by a recognized agency (e.g., state, local, federal, etc.). Please see Public Law 95-507 for more detail. Place an X by the appropriate space below.

1. Asian-Indian - A U.S. citizen whose origins are from India, Pakistan and Bangladesh _____ (A)

2. Asian-Pacific - A U.S. citizen whose origins are from Japan, China, Indonesia, Malaysia, Taiwan, Korea, Vietnam, Laos, Cambodia, the Philippines, Thailand, Samoa, Guam, the U.S. Trust Territories of the Pacific or the Northern Marianas. _____ (P)

3. Black - A U.S. citizen having origins in any of the Black racial groups of Africa. _____ (B)

4. Hispanic - A U.S. citizen of true-born Hispanic heritage, from any of the Spanish-speaking areas Mexico, Central America, South America and the Caribbean Basin only. _____ (H)

5. Native American - A person who is an American Indian, Eskimo, Aleut or Native Hawaiian, and regarded as such by the community of which the person claims to be a part. _____ (N)

A Veteran or Service Disabled Veteran business is defined as an organization that is 51% owned, controlled and/or managed by Veterans. The firm should be certified by a recognized agency (e.g., state, local, federal, etc.). Please see Public Law 109-461 for more detail.

VETERAN BUSINESS ENTERPRISE _____Yes _____No

SERVICE DISABLED VETERAN BUSINESS ENTERPRISE _____Yes _____No

Please include what organization your firm has secured certification from with a certification number and date it expires. _____

MISSOURI FIRM: _____Yes _____No

A Missouri Firm is defined as an organization which has and maintains within the State of Missouri a regular place of business for the transaction of their business.

BUSINESS TYPE:

Manufacturer	_____ (M)
Distributor/Wholesaler	_____ (D)
Manufacturer's Representative	_____ (F)
Service	_____ (S)
Retail	_____ (R)
Contractor	_____ (C)
Other	_____ (O)

SOLE PROPRIETORSHIP: _____Yes _____No

SUPPLIER'S CERTIFICATION:

The undersigned hereby certifies that the foregoing information is a true and correct statement of the facts and agrees to abide by the laws of the State of Missouri and the rules and regulations of the University of Missouri System now in effect including any subsequent revisions thereof. Supplier acknowledges that it is his/her responsibility to keep the information current by notifying the University of Missouri of any changes. The supplier also acknowledges that repeated failure to respond to Invitation to Bids may result in removal from the bid lists.

_____

Signature of Person Authorized to Sign this Supplier Registration Information Form

Title: _____ Date: _____

'AV' SERIES GENERAL NOTES

1.
FOR EXACT LOCATION AND FINISHED SURFACE CONDITIONS OF MILLWORK, CEILING, WALL, OR FLOOR MOUNTED DEVICES, REFER TO ARCHITECTURAL DRAWINGS.

2.
FOR EXACT LOCATION OF FACILITY EXPANSION JOINTS, FIRE RATED WALLS AND SMOKE WALLS, REFER TO ARCHITECTURAL DRAWINGS.

3.
MOUNTING HEIGHTS ARE TO CENTER OF DEVICE OR EQUIPMENT, UNLESS NOTED OTHERWISE.

4.
CONFIRM ALL LABELS AND ROOM NUMBERS WITH OWNER PRIOR TO FINALIZING LABELING AND PROGRAMMING.

5.
COORDINATE FINAL OUTLET LOCATIONS WITH ALL TRADES AND FURNITURE/MILLWORK PLACEMENT PRIOR TO ROUGH-IN.

6.
PROVIDE GROUNDING PER NEC AND TIA 607B.

7.
INSTALL DATA OUTLETS AT SAME ELEVATION AND WITHIN 6" OF ASSOCIATED ELECTRICAL OUTLET.

8.
CONDUIT ROUTING SHOWN FOR INTENT. REFERENCE CIVIL DRAWINGS FOR UNDERGROUND COORDINATION AND DISTANCE OF RUNS. COORDINATE WITH ALL TRADES.

9.
IN EACH INSTANCE WHERE TWO OR MORE LIKE OR UNLIKE DEVICE BOXES ARE GENERALLY LOCATED IN THE SAME VICINITY AND AT DIFFERENT ELEVATIONS, MOUNT THE BOXES VERTICALLY ON A COMMON CENTERLINE. COORDINATE WITH ALL TRADES.

10.
COORDINATE HEIGHT AND LOCATION OF OUTLETS WITH EQUIPMENT MOUNTING BRACKETS AND BLOCKING IN WALL.

11.
UNLESS NOTED OTHERWISE, WHEN DATA OUTLET IS ABOVE COUNTER, MATCH ELECTRICAL DEVICE ORIENTATION AND ELEVATION.

12.
SUPPORT ALL CEILING MOUNTED DEVICES FROM STRUCTURAL STEEL. PROVIDE ALL NECESSARY SUPPORTS TO EXTEND STRUCTURE TO MOUNTING POSITION REQUIRED.

13.
ALL RISERS ARE DIAGRAMMATIC. REVIEW SPECIFICATIONS AND DETAILS FOR COMPLETE REQUIREMENTS.

ABBREVIATIONS

A	AMPERE
ACC	ARMOR CLAD CABLE
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AHJ	AUTHORITY HAVING JURISDICTION
ANN	ANNUNCIATOR
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
AV	AUDIO VISUAL
AWG	AMERICAN WIRE GAUGE
BAS	BUILDING AUTOMATION SYSTEM
BDF	BUILDING DISTRIBUTION FRAME
BFC	BELOW FINISHED CEILING
BFG	BELOW FINISHED GRADE
BKBD	BACKBOARD
C	CONDUIT
CAT	CATEGORY
CATV	CABLE ANTENNA TELEVISION
CCTV	CLOSED CIRCUIT TELEVISION
CKT	CIRCUIT
CLG	CEILING
CM	CONSTRUCTION MANAGER
CO	COMPANY
COAX	COAXIAL
CU	COPPER
D	DEPTH/DIAMETER
D26	DIVISION 26
D27	DIVISION 27
D28	DIVISION 28
DC	DIRECT CURRENT
DHCP	DYNAMIC HOST CONFIGURATION PROTOCOL
DIV	DIVISION
DN	DOWN
DSP	DIGITAL SIGNAL PROCESSOR
DVD	DIGITAL VERSATILE DISC
DVR	DIGITAL VIDEO RECORDER
DVS	DIGITAL VIDEO SURVEILLANCE
DWG	DRAWING
EA	EACH
ELEC	ELECTRIC
EMT	ELECTRICAL METALLIC TUBING
EQ	EQUIPMENT BY OWNER
EQUIP	EQUIPMENT
FBO	FURNISHED BY OWNER
FLR	FLOOR
FPS	FRAMES PER SECOND
GA	GAUGE
Gb	GIGABIT
GND	GROUND
H	HEIGHT
HZ	HERTZ (CYCLES/SECOND)
ICC	INTERMEDIATE CROSS CONNECT
IDF	INTERMEDIATE DISTRIBUTION FRAME
IMC	INTERMEDIATE METAL CONDUIT
IP	INTERNET PROTOCOL
IPS	IMAGES PER SECOND
IR	INFRARED
ISCSI	INTERNET SMALL COMPUTER SYSTEMS INTERFACE
IWB	INTERACTIVE WHITEBOARD
JB	JUNCTION BOX
KV	KILOVOLT
LAN	LOCAL AREA NETWORK
LCD	LIQUID CRYSTAL DISPLAY
LED	LIGHT EMITTING DIODE
LS	LIFE SAFETY
MAX	MAXIMUM
Mb	MEGABIT
Mbps	MEGABITS PER SECOND
MDF	MAIN DISTRIBUTION FRAME
MDP	MAIN DISTRIBUTION PANELBOARD
MFGR	MANUFACTURER
MH	MANHOLE
MIC	MICROPHONE
MIN	MINIMUM
MM	MULTIMODE
MTD	MOUNTED
NA	NOT APPLICABLE
NEC	NATIONAL ELECTRICAL CODE
NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
NIC	NOT IN CONTRACT
NOC	NETWORK OPERATIONS CENTER
NTS	NOT TO SCALE
NVR	NETWORK VIDEO RECORDER
OC	ON CENTER
OEM	ORIGINAL EQUIPMENT MANUFACTURER
OFE	OWNER FURNISHED EQUIPMENT
OSP	OUTSIDE PLANT
PA	PUBLIC ADDRESS
PB	PULLBOX/PUSHBUTTON
PC	PERSONAL COMPUTER
PoE	POWER OVER ETHERNET
PTZ	PAN TILT ZOOM
PVC	POLYVINYL CHLORIDE
PWR	POWER
RAID	REDUNDANT ARRAY OF INDEPENDENT DISKS
RCP	REFLECTED CEILING PLANS
RE	REFER TO
RF	RADIO FREQUENCY
RFID	RADIO FREQUENCY IDENTIFICATION DEVICE
RGS	RIGID GALVANIZED STEEL
RM	ROOM
SCHED	SCHEDULE
SH	SHEET
SM	SINGLE MODE
SPEC	SPECIFICATION
SPKR	SPEAKER
SPR	SPARE
STP	SHIELDED TWISTED PAIR
TB	TERABYTES
TBB	TELECOMMUNICATIONS BONDING BACKBONE
TC	TERMINAL CABINET
TERM	TERMINAL
TEL	TELEPHONE
TGB	TELECOMMUNICATIONS GROUNDING BUSBAR
TIA	TELECOMMUNICATIONS INDUSTRY ALLIANCE
TMGB	TELECOMMUNICATIONS MAIN GROUNDING BUSBAR
TR	TELECOMMUNICATIONS ROOM
TSER	TELECOMMUNICATIONS SERVICE ENTRANCE ROOM
TYP	TYPICAL
UC	UNDERCOUNTER
UG	UNDERGROUND
UON	UNLESS OTHERWISE NOTED
UPS	UNINTERRUPTIBLE POWER SUPPLY
UTP	UNSHIELDED TWISTED PAIR
V	VOLT
VoIP	VOICE OVER INTERNET PROTOCOL
W	WIDTH
WAN	WIDE AREA NETWORK
WAP	WIRELESS ACCESS POINT
WLAN	WIRELESS LOCAL AREA NETWORK
WP	WEATHERPROOF

GENERAL

- NEW EQUIPMENT
- EQUIPMENT REFERENCE, SHOWN ON MULTIPLE DRAWINGS
- DEVICE TO BE REMOVED (DEMO PLANS) UNDERFLOOR CONDUIT (NEW PLANS)
- WIRE AND/OR CONDUIT RUN CONTINUED ON REFERENCED DETAIL
- MATCH LINE REFERENCING CONTINUATION ON OTHER DRAWING
- DETAIL AND/OR SECTION REFERENCE
- CABLE ROUTING BOUNDARY
- FUTURE

DRAWING NOTES AND DESIGNATIONS

- (X) DRAWING KEYED NOTES
- <X> CABLE ROUTING NOTES
- (XXX) DOOR #/LAB EQUIPMENT TAG
- X / X DETAIL OR SECTION REFERENCE TAG
- SYMBOL LOCATED WITHIN SOLID CIRCLE INDICATES INSTALLATION FLUSH IN CEILING (TYP)
- SYMBOL LOCATED WITHIN DASHED CIRCLE INDICATES INSTALLATION ABOVE CEILING (TYP)

DIVISION 27: LEGEND

NOTE: SPEC REFERENCES ARE GENERAL AND MAY NOT BE SPECIFIC.

27 4110 AUDIO VISUAL EQUIPMENT

- CC CLASSROOM CAPTURE CAMERA
- VP VIDEO PROJECTION UNIT, CEILING MOUNTED WITH POLE MOUNT ASSEMBLY
- VC VIDEO CONFERENCING CAMERA WITH LENS, ANGLE OF VIEW
- DC DOCUMENT CAMERA, CEILING MOUNTED
- LCD FLAT PANEL MONITOR WITH WALL MOUNT BRACKET
- TV TV MONITOR AND SUPPORT BRACKET
- TV TV MONITOR, CEILING MOUNTED
- DVD DIGITAL VIDEO DISC PLAYER (COMBINATION DVD/BLURAY PLAYER)
- SW SUB WOOFER - CEILING MOUNTED, UNLESS OTHERWISE NOTED
- S CEILING MOUNTED SPEAKER
- S1 ROOM AUDIO SYSTEM LOUDSPEAKER, FLUSH CEILING MOUNTED
- S2 AUDITORIUM LOUDSPEAKER
- S3 GYMNASIUM LOUDSPEAKER
- S WALL MOUNTED AV SPEAKER (FLUSH OR SURFACE), 7'-0" AFF
- AV1 AV SYSTEM FLOOR MOUNTED CABINET. DARK LINE INDICATES FRONT OF RACK.
- AV2 AV SYSTEM WALL MOUNTED CABINET. DARK LINE INDICATES FRONT OF RACK.
- AV3 AV SYSTEM CREDENZA OR LECTERN MOUNTED RACK. DARK LINE INDICATES FRONT OF RACK.
- AV4 AV SYSTEM FLOOR MOUNTED EXTENDING RACK. DARK LINE INDICATES FRONT OF RACK.
- LEC LARGE LECTERN WITH INTEGRATED MEDIA RACK. DARK LINE INDICATES FRONT OF RACK.
- LEC1 ELECTRICALLY OPERATED LECTERN WITH INTEGRATED MEDIA RACK. DARK LINE INDICATES FRONT OF RACK.
- LEC2 SEMINAR LECTERN WITH INTEGRATED MEDIA RACK. DARK LINE INDICATES FRONT OF RACK.
- LEC3 STUDENT LECTURN
- LEC3 STAND-ALONE SINGLE POST LECTERN.
- LL 10 UNIT LAPTOP LOCKER.
- M MICROPHONE JACK, 1'-6" AFF
- M1 PODIUM MOUNTED MICROPHONE
- M2 CEILING MOUNTED MICROPHONE - DIRECTIONAL
- M3 CEILING MOUNTED MICROPHONE - 3 - ELEMENT
- A1 AUDIO INPUT
- TP TOUCH PANEL WALL MOUNT
- TP1 TOUCH PANEL DESK MOUNT
- TP2 TOUCH PANEL WITH TABLE BOX
- WB INTERACTIVE WHITEBOARD
- ALS ASSISTIVE LISTENING SYSTEM
- SR SOUND REINFORCEMENT SYSTEM
- IPOD IPOD DOCKING STATION, WALL MOUNTED 3'-8" AFF
- V1 VIDEO CAMERA, FIXED WITH DOME, CEILING MOUNTED
- V1 VIDEO CAMERA, FIXED WITH DOME, 7'-6" AFF
- V2 VIDEO CAMERA, PTZ WITH DOME, CEILING MOUNTED
- V2 VIDEO CAMERA, PTZ WITH DOME, 7'-6" AFF

27 1000 STRUCTURED CABLING

REFER TO TELECOMMUNICATIONS SCHEDULE ON T0001 FOR DEVICE REQUIREMENTS

"XF" X = DEVICE TYPE (C=COMMUNICATIONS, D=DATA, M=MULTIMEDIA, T=TELEPHONE, V=VIDEO, W=WIRELESS)
= QUANTITY

EXAMPLE: D2 = TWO DATA OUTLETS

- X# TELECOMMUNICATIONS OUTLET WITH BACKBOX, CONDUIT, AND INDICATED DEVICES AND CABLES, 1'-6" AFF
- X# TELECOMMUNICATIONS OUTLET WITH BACKBOX, CONDUIT, AND INDICATED DEVICES AND CABLES, 3'-8" AFF OR 6" ABOVE COUNTER
- X# TELECOMMUNICATIONS OUTLET WITH BACKBOX, CONDUIT, AND INDICATED DEVICES AND CABLES, 5'-0" AFF
- X# TELECOMMUNICATIONS OUTLET WITH BACKBOX, CONDUIT, AND INDICATED DEVICES AND CABLES, 8'-0" AFF OR 1'-0" BELOW CEILING (WHICHEVER IS LOWER)
- X# TELECOMMUNICATIONS OUTLET WITH INDICATED DEVICES AND CABLES, INSTALLED IN FLOORBOX / DEVICE, WITH CONDUIT ROUGH-IN IN SLAB TO ACCESSIBLE CEILING.
- X# TELECOMMUNICATIONS OUTLET WITH INDICATED DEVICES AND CABLES INSTALLED IN FURNITURE RACEWAY, WITH CABLE EXTENDED THROUGH ACTIVATION DEVICE.
- X# TELECOMMUNICATIONS OUTLET WITH BACKBOX, CONDUIT AND INDICATED DEVICES AND CABLES, INSTALLED FLUSH IN CEILING
- X# TELECOMMUNICATIONS OUTLET WITH BACKBOX, CONDUIT AND INDICATED DEVICES AND CABLES, INSTALLED ABOVE ACCESSIBLE CEILING

AUDIO VISUAL SHEET LIST

Sheet Number	Sheet Name
AV0001	AUDIO VISUAL SYMBOLS & ABBREVIATIONS
AV0100	LEVEL 00 AUDIO VISUAL PLAN
AV0101	LEVEL 01 AUDIO VISUAL PLAN
AV0102	LEVEL 02 AUDIO VISUAL PLAN
AV0521	AUDIO VISUAL SYSTEMS RISER - CLASSROOM A
AV0522	AUDIO VISUAL SYSTEMS RISER - CLASSROOM C
AV0523	AUDIO VISUAL SYSTEMS RISER - CLASSROOM D
AV0524	AUDIO VISUAL SYSTEMS RISER - TRADING ROOM
AV0525	AUDIO VISUAL SYSTEMS RISER - MBA ROOM - BASE BID
AV0526	AUDIO VISUAL SYSTEMS RISER - MBA ROOM - ALTERNATE
AV0527	AUDIO VISUAL SYSTEMS RISERS - DEANS CONFERENCE ROOM
AV0528	AUDIO VISUAL SYSTEMS RISERS - FACULTY CONFERENCE ROOM
AV0529	AUDIO VISUAL SYSTEMS RISERS - SEMINAR ROOM
AV0530	AUDIO VISUAL SYSTEMS RISER DIAGRAMS
AV0601	AUDIO VISUAL SYSTEMS SCHEDULES
AV0701	AUDIO VISUAL SYSTEMS DETAILS

4/4/2017 4:30:24 PM

UMSL

NEW COLLEGE OF BUSINESS ADMINISTRATION BUILDING PHASE 1
#S7646

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No.	Description	Date
-	ISSUED FOR BID	03 FEB 2017

Plan North

Drawing Title:

AUDIO VISUAL SYMBOLS & ABBREVIATIONS

Project No.: UM: S7646 / CD: 04348.00
Checked by: TZ

AV0001

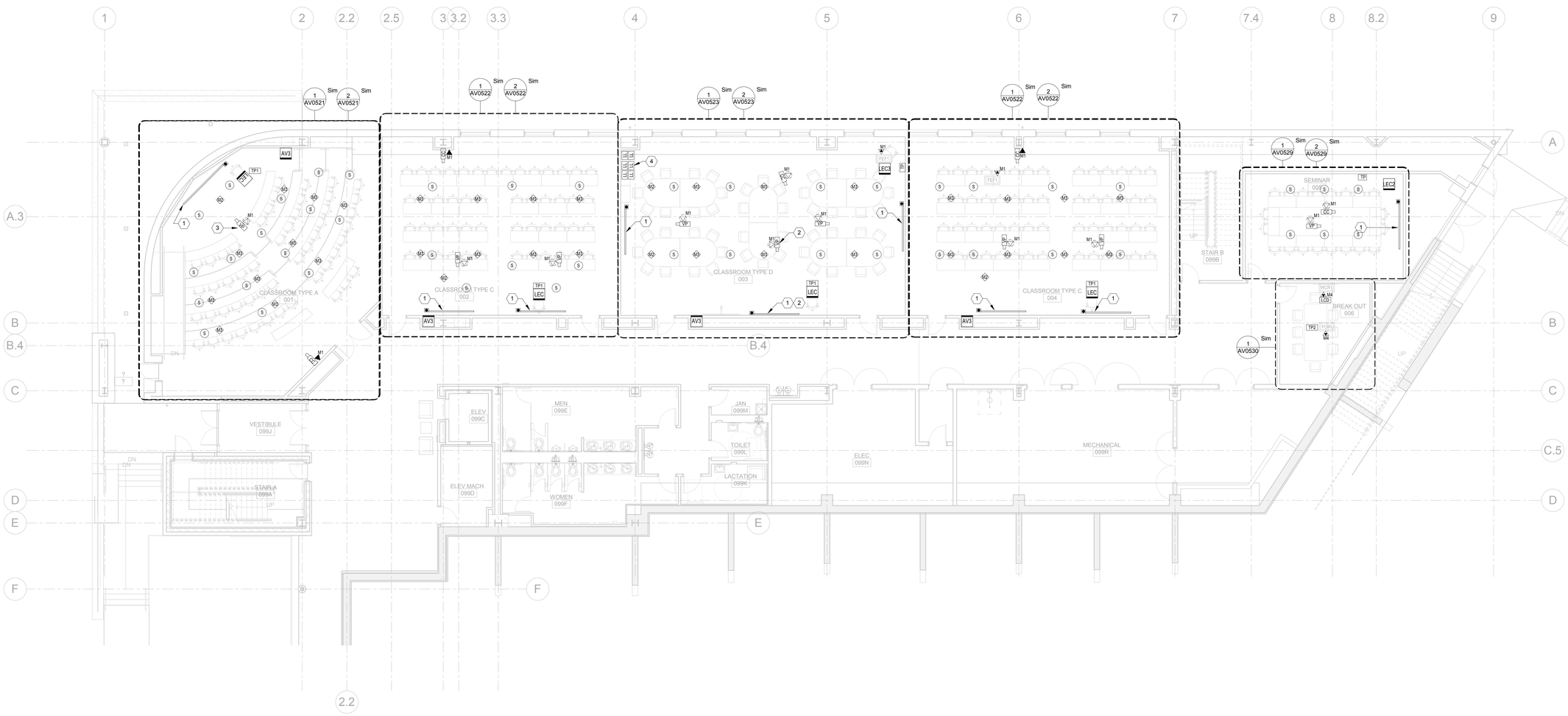
KEYED NOTES ⬡ :

1.
COORDINATE LOW VOLTAGE CONTROL OF MOTORIZED PROJECTION SCREENS AND INSTALLATION THROUGH AV MEDIA CONTROLLER WITH GC.

2.
EXISTING DEVICE. OFCI.

3.
PROVIDE POLE MOUNT THROUGH CUSTOM CEILING. PROVIDE SUPPORT STRUCTURE TO ALIGN PROJECTION UNIT WITH SCREEN. COORDINATE WITH CEILING CONTRACTOR.

4.
PROVIDE 8-OUTLET POWER STRIP WITH 12-FOOT CORD TO CONNECT LAPTOP LOCKERS TO LOCAL 120V OUTLET.



1 LEVEL 00 PLAN
1/8" = 1'-0"

4/4/2017 4:30:29 PM

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-	ISSUED FOR BID	03 FEB 2017

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KEY PLAN

Drawing Title:

LEVEL 00 AUDIO VISUAL PLAN

Project No.: UM: S7646 / CD: 04348.00
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AV0100

KEYED NOTES ⬡ :

1.
PROVIDE STORAGE FOR ASSISTIVE LISTENING HEADPHONES/ EQUIPMENT.

1 LEVEL 01 PLAN
1/8" = 1'-0"

UMSL

NEW COLLEGE OF BUSINESS ADMINISTRATION BUILDING PHASE 1
#S7646

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KEY PLAN

Drawing Title:

LEVEL 01 AUDIO VISUAL PLAN

Project No.: UM: S7646 / CD: 04348.00
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AV0101

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KEYED NOTES ⬡ :

1.
PROVIDE SPEAKER AND MICROPHONE WIRELESS ACCESS POINT TEMPLATES TO CEILING CONTRACTOR TO CUT CEILING TILE. COORDINATE SPEAKER LOCATIONS WITH FINAL CONDITIONS AND PROVIDE ALL MOUNTING EQUIPMENT TO SUPPORT DEVICE ABOVE CEILING. SPEAKERS SHALL BE BLACK.

2.
MICROPHONE WIRELESS ACCESS POINT. INSTALL FLUSH IN CEILING. LOCATE AS RECOMMENDED BY MANUFACTURER.

3.
INSTALL RACK IN CREDENZA BY OTHERS.

1 LEVEL 02 PLAN
1/8" = 1'-0"

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No.	Description	Date
-	ISSUED FOR BID	03 FEB 2017

Plan North

KEY PLAN

Drawing Title:

LEVEL 02 AUDIO VISUAL PLAN

Project No.: UM: S7646 / CD: 04348.00
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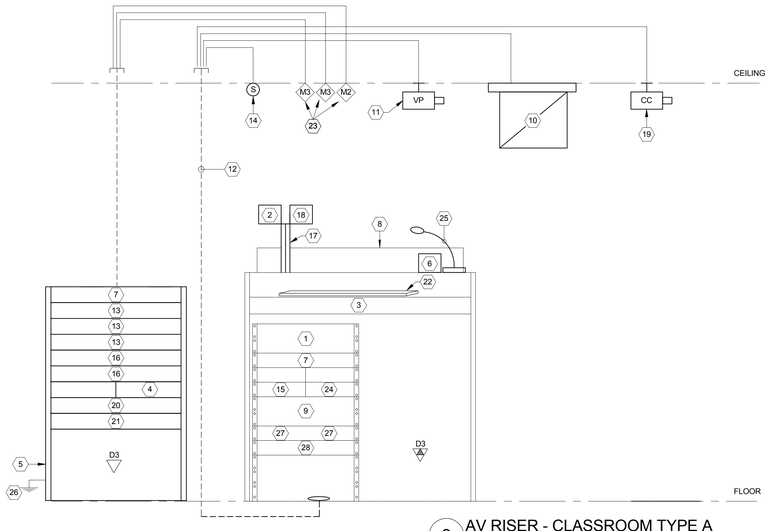
AV0102



2 AV RISER - CLASSROOM TYPE A
NTS

KEYED NOTES

1.
RACK MOUNT AV SWITCHER WITH INTEGRATED INPUTS / OUTPUTS AND MEDIA CONTROLLER. PROVIDE CONTROL OF VIDEO PROJECTORS, PROJECTION SCREENS, CAMERA, CLASSROOM CAPTURE, ETC. CONNECT AS RECOMMENDED BY MANUFACTURER.

2.
21" COMPUTER MONITOR (DELL) OFCI.

3.
DOCUMENT CAMERA IN LOCKING DRAWER.

4.
WIRELESS MICROPHONE RECEIVER. PROVIDE BELT PACK TRANSMITTER AND LAPEL MICROPHONE. PROVIDE RACK MOUNT.

5.
INTEGRATED, SLIDING, PULL-OUT AV RACK MOUNTED IN CUSTOM MILLWORK BY OTHERS.

6.
TOUCH PANEL WITH TABLE TOP MOUNT. SECURE TO LECTERN. PROVIDE CUSTOMIZED CONTROL WINDOWS FOR OWNER REVIEW PRIOR TO PROGRAMMING.

7.
RACK MOUNT POWER DISTRIBUTION UNIT / SEQUENCER.

8.
LECTERN - WITH DRAWER AND REMOVABLE 12 RMU AV RACK TO SUPPORT EQUIPMENT.

9.
PC WITH LECTURE CAPTURE SOFTWARE. (OFCI).

10.
RECESSED CEILING MOUNTED MOTORIZED PROJECTION SCREEN. PROVIDE LOW VOLTAGE CONTROL THROUGH CONTROLLER. PROVIDE 16:10 IMAGE ON 4:3 SCREEN.

11.
CEILING MOUNTED PROJECTION UNIT WITH CHIEF PL2A LOCKING SYSTEM. PROVIDE POLE MOUNT KIT WITH SHELF FOR TWISTED PAIR RECEIVER. COORDINATE LOCATION FOR OPTIMAL IMAGE PROJECTION ON SCREEN.

12.
(1) 1-1/4" CONDUIT FROM FLOOR BOX TO CEILING SPACE. COORDINATE CABLE INSTALLATION WITH DATA CABLE INSTALLATION BY OTHERS.

13.
12X8 AUDIO DSP.

14.
RECESSED CEILING MOUNTED SPEAKERS. SUPPORT FROM STRUCTURE. QUANTITY AS SHOWN ON DRAWINGS.

15.
PROVIDE APPLE TV WITH RACK MOUNT KIT.

16.
8-CHANNEL AUDIO AMPLIFIER.

17.
ERGOTRON LX DUAL MONITOR ARM.

18.
21" TOUCH PANEL.

19.
PROVIDE LECTURE CAMERA AND WALL/ CEILING MOUNT KIT. PROVIDE POWER TO CAMERA FROM AV RACK. PROVIDE CONTROL OF CAMERA FROM MEDIA CONTROLLER.

20.
AVB SWITCH.

21.
ASSISTIVE LISTENING SYSTEM.

22.
KEYBOARD & MOUSE (IN DRAWER)

23.
CEILING MOUNTED MICROPHONES. QUANTITY AS INDICATED ON DRAWING.

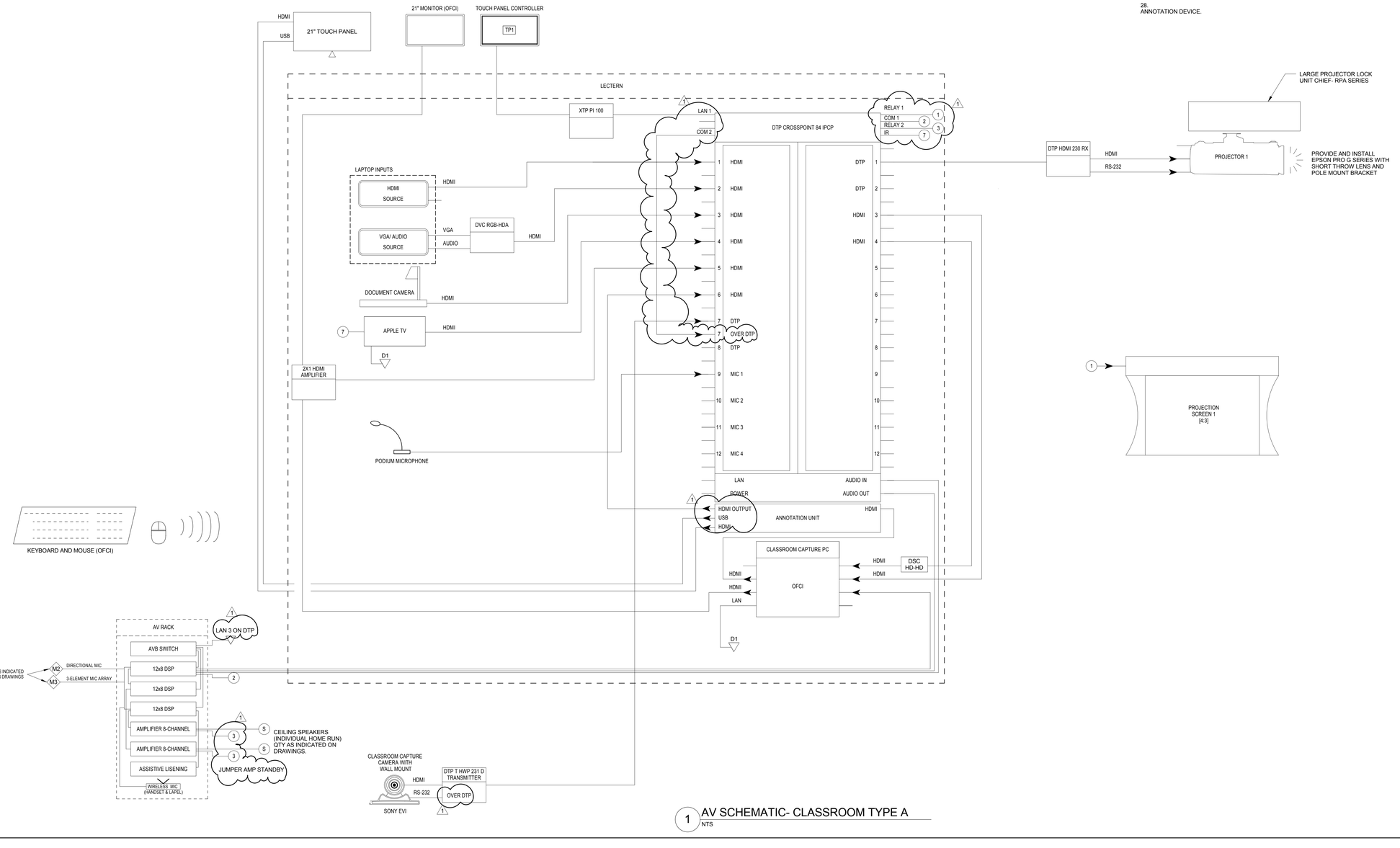
24.
2X1 HDMI AMPLIFIER.

25.
PODIUM MICROPHONE.

26.
PROVIDE #6 AWG GROUND MINIMUM TO LOCAL TGB IN TELECOM ROOM.

27.
PROVIDE REMOTE POWER SUPPLIES IN RACK FOR TWISTED PAIR RECEIVERS LOCATED AT DISPLAYS AND TWISTED PAIR TRANSMITTERS LOCATED REMOTELY. QUANTITY AS REQUIRED.

28.
ANNOTATION DEVICE.



1 AV SCHEMATIC- CLASSROOM TYPE A
NTS

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NEW COLLEGE OF BUSINESS ADMINISTRATION BUILDING PHASE 1 #S7646

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No.	Description	Date
1	ADDENDUM 01	04/03/2017
-	ISSUED FOR BID	03 FEB 2017

Plan North

Drawing Title:

AUDIO VISUAL SYSTEMS RISER - CLASSROOM A

Project No.: UM: S7646 / CD: 04348.00
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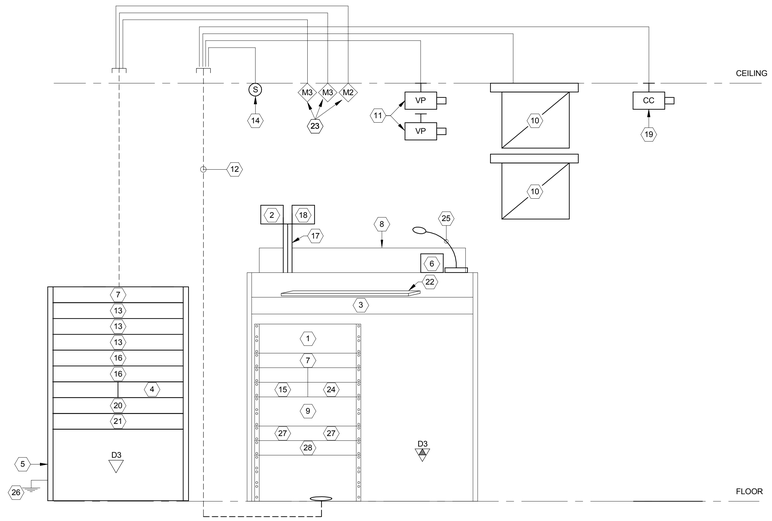
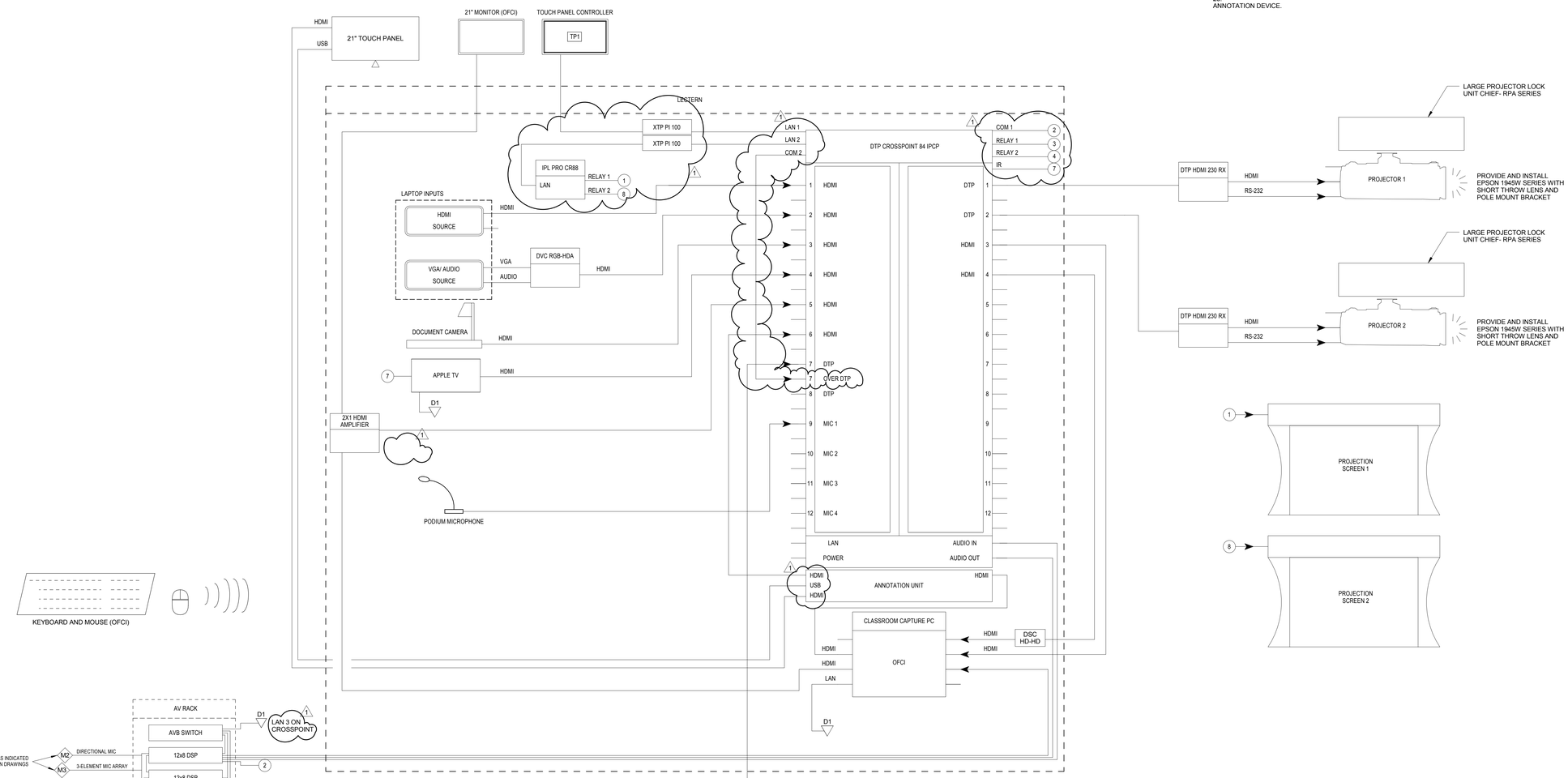
AV0521



2 AV RISER - CLASSROOM TYPE C
NTS

KEYED NOTES

1. RACK MOUNT AV SWITCHER WITH INTEGRATED INPUTS / OUTPUTS AND MEDIA CONTROLLER. PROVIDE CONTROL OF VIDEO PROJECTORS, PROJECTION SCREENS, CAMERA, CLASSROOM CAPTURE, ETC. CONNECT AS RECOMMENDED BY MANUFACTURER.
2. 21" COMPUTER MONITOR (DELL) OFCI.
3. DOCUMENT CAMERA IN LOCKING DRAWER.
4. WIRELESS MICROPHONE RECEIVER. PROVIDE BELT PACK TRANSMITTER AND LAPEL MICROPHONE. PROVIDE RACK MOUNT.
5. INTEGRATED, SLIDING, PULL-OUT AV RACK MOUNTED IN CUSTOM MILLWORK BY OTHERS.
6. TOUCH PANEL WITH TABLE TOP MOUNT. SECURE TO LECTERN. PROVIDE CUSTOMIZED CONTROL WINDOWS FOR OWNER REVIEW PRIOR TO PROGRAMMING.
7. RACK MOUNT POWER DISTRIBUTION UNIT / SEQUENCER.
8. LECTERN - WITH DRAWER AND REMOVABLE 12 RMU AV RACK TO SUPPORT EQUIPMENT.
9. PC WITH LECTURE CAPTURE SOFTWARE. (OFCI).
10. RECESSED CEILING MOUNTED MOTORIZED PROJECTION SCREEN. PROVIDE LOW VOLTAGE CONTROL THROUGH CONTROLLER.
11. CEILING MOUNTED PROJECTION UNIT WITH CHIEF PL2A LOCKING SYSTEM. PROVIDE POLE MOUNT KIT WITH SHELF FOR TWISTED PAIR RECEIVER. COORDINATE LOCATION FOR OPTIMAL IMAGE PROJECTION ON SCREEN.
12. (1) 1-1/4" CONDUIT FROM FLOOR BOX TO CEILING SPACE. COORDINATE CABLE INSTALLATION WITH DATA CABLE INSTALLATION BY OTHERS.
13. 12X8 AUDIO DSP.
14. RECESSED CEILING MOUNTED SPEAKERS. SUPPORT FROM STRUCTURE. QUANTITY AS SHOWN ON DRAWINGS.
15. PROVIDE APPLE TV WITH RACK MOUNT KIT.
16. 8-CHANNEL AUDIO AMPLIFIER.
17. ERGOTRON LX DUAL MONITOR ARM.
18. 21" TOUCH PANEL.
19. PROVIDE LECTURE CAMERA AND WALL/ CEILING MOUNT KIT. PROVIDE POWER TO CAMERA FROM AV RACK. PROVIDE CONTROL OF CAMERA FROM MEDIA CONTROLLER.
20. AVB SWITCH.
21. ASSISTIVE LISTENING SYSTEM.
22. KEYBOARD & MOUSE (IN DRAWER)
23. CEILING MOUNTED MICROPHONES. QUANTITY AS INDICATED ON DRAWING.
24. 2X1 HDMI AMPLIFIER.
25. PODIUM MICROPHONE.
26. PROVIDE #6 AWG GROUND MINIMUM TO LOCAL TGB IN TELECOM ROOM.
27. PROVIDE REMOTE POWER SUPPLIES IN RACK FOR TWISTED PAIR RECEIVERS LOCATED AT DISPLAYS AND TWISTED PAIR TRANSMITTERS LOCATED REMOTELY. QUANTITY AS REQUIRED.
28. ANNOTATION DEVICE.



1 AV SCHEMATIC- CLASSROOM TYPE C
NTS

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No.	Description	Date
1	ADDENDUM 01	04/03/2017
-	ISSUED FOR BID	03 FEB 2017

Plan North

Drawing Title:

AUDIO VISUAL SYSTEMS RISER - CLASSROOM C

Project No.: UM: S7646 / CD: 04348.00
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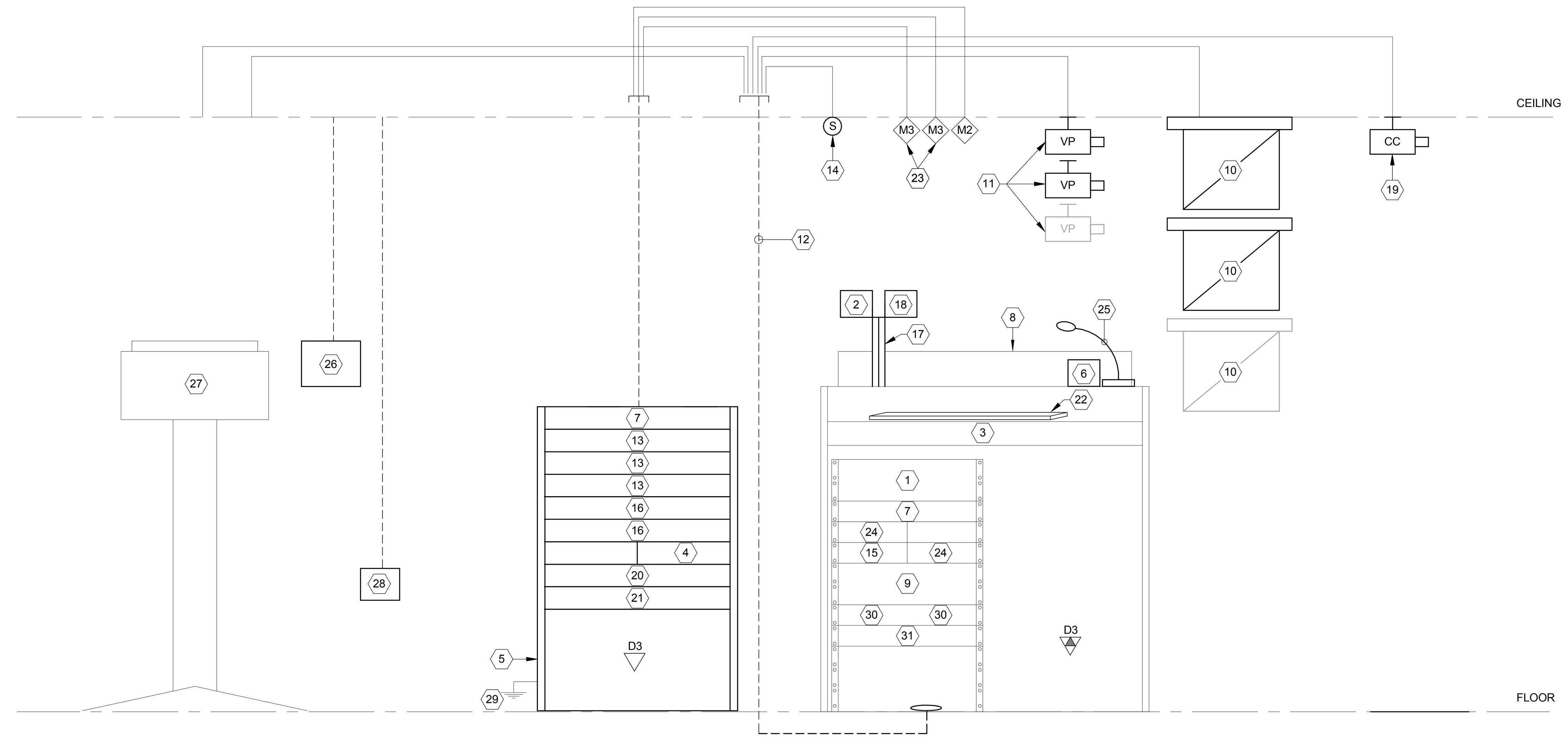
AV0522



2 AV RISER - CLASSROOM TYPE D
NTS

KEYED NOTES:

1.
RACK MOUNT AV SWITCHER WITH INTEGRATED INPUTS / OUTPUTS AND MEDIA CONTROLLER. PROVIDE CONTROL OF VIDEO PROJECTORS, PROJECTION SCREENS, CAMERA, CLASSROOM CAPTURE, ETC. CONNECT AS RECOMMENDED BY MANUFACTURER.

2.
21" COMPUTER MONITOR (DELL) OFCI.

3.
DOCUMENT CAMERA IN LOCKING DRAWER.

4.
WIRELESS MICROPHONE RECEIVER. PROVIDE BELT PACK TRANSMITTER AND LAPEL MICROPHONE. PROVIDE RACK MOUNT.

5.
INTEGRATED, SLIDING, PULL-OUT AV RACK MOUNTED IN CUSTOM MILLWORK BY OTHERS.

6.
TOUCH PANEL WITH TABLE TOP MOUNT. SECURE TO LECTERN. PROVIDE CUSTOMIZED CONTROL WINDOWS FOR OWNER REVIEW PRIOR TO PROGRAMMING.

7.
RACK MOUNT POWER DISTRIBUTION UNIT / SEQUENCER.

8.
LECTERN - WITH DRAWER AND REMOVABLE 12 RMU AV RACK TO SUPPORT EQUIPMENT.

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11.
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12.
(1) 1-1/4" CONDUIT FROM FLOOR BOX TO CEILING SPACE. COORDINATE CABLE INSTALLATION WITH DATA CABLE INSTALLATION BY OTHERS.

13.
12X8 AUDIO DSP.

14.
RECESSED CEILING MOUNTED SPEAKERS. SUPPORT FROM STRUCTURE. QUANTITY AS SHOWN ON DRAWINGS.

15.
PROVIDE APPLE TV WITH RACK MOUNT KIT.

16.
8-CHANNEL AUDIO AMPLIFIER.

17.
ERGOTRON LX DUAL MONITOR ARM.

18.
21" TOUCH PANEL.

19.
PROVIDE LECTURE CAMERA AND WALL/ CEILING MOUNT KIT. PROVIDE POWER TO CAMERA FROM AV RACK. PROVIDE CONTROL OF CAMERA FROM MEDIA CONTROLLER.

20.
AVB SWITCH.

21.
ASSISTIVE LISTENING SYSTEM.

22.
KEYBOARD & MOUSE (IN DRAWER)

23.
CEILING MOUNTED MICROPHONES. QUANTITY AS INDICATED ON DRAWING.

24.
2X1 HDMI AMPLIFIER.

25.
PODIUM MICROPHONE.

26.
TOUCH PANEL WITH WALL MOUNT. PROVIDE CUSTOMIZED CONTROL WINDOWS TO BE SIMILAR TO LECTERN VIEW.

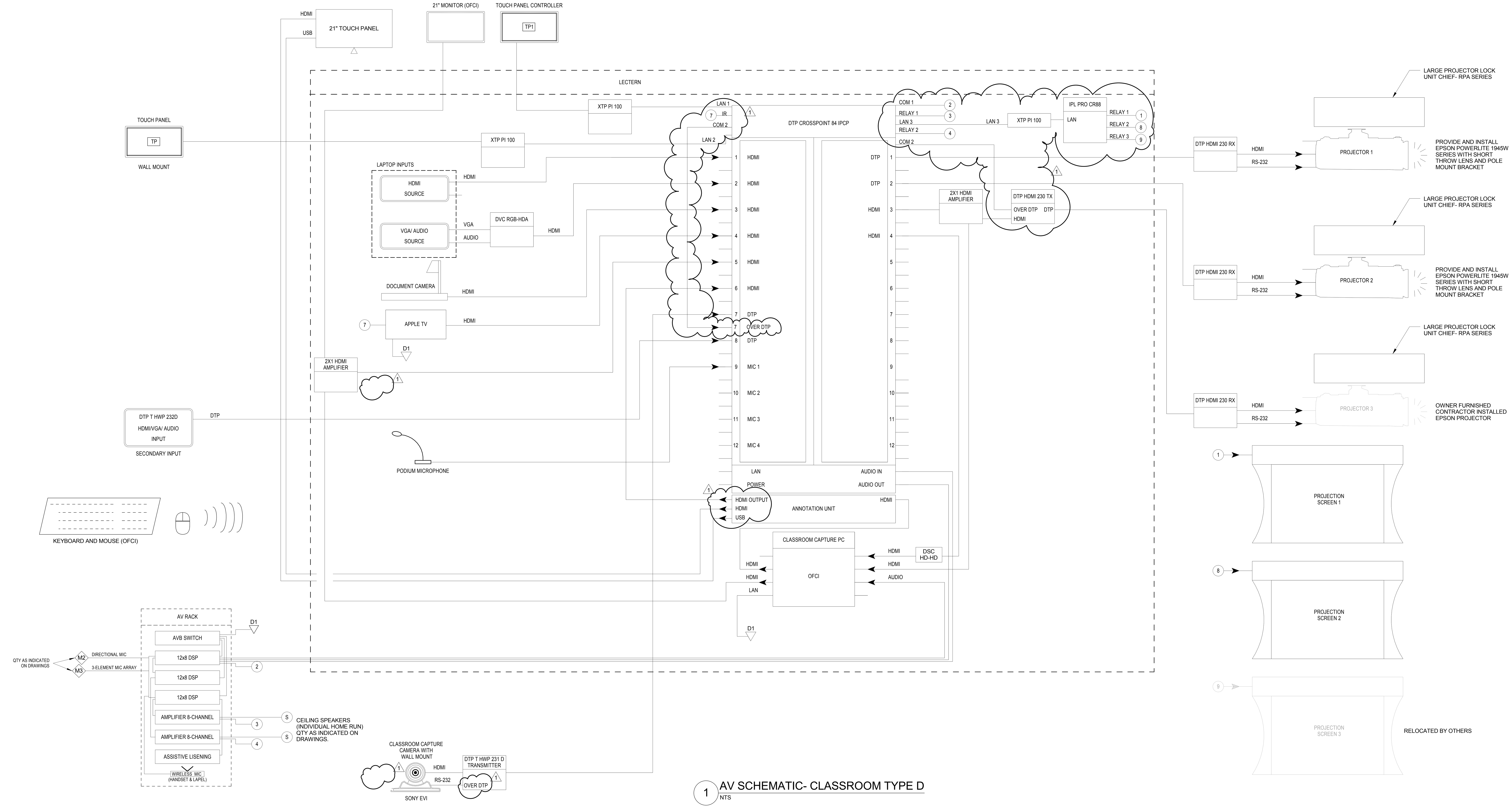
27.
STUDENT PRESENTATION LECTERN.

28.
SECONDARY AV INPUT.

29.
PROVIDE #6 AWG GROUND MINIMUM TO LOCAL TGB IN TELECOM ROOM.

30.
PROVIDE REMOTE POWER SUPPLIES IN RACK FOR TWISTED PAIR RECEIVERS LOCATED AT DISPLAYS AND TWISTED PAIR TRANSMITTERS LOCATED REMOTELY. QUANTITY AS REQUIRED.

31.
ANNOTATION DEVICE.



1 AV SCHEMATIC- CLASSROOM TYPE D
NTS

4/4/2017 4:30:43 PM

UMSL

NEW COLLEGE OF BUSINESS ADMINISTRATION BUILDING PHASE 1 #S7646

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MO #A-4841

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MO #2003015008

Theodore L. Zemper -Electrical Engineer
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No.	Description	Date
1	ADDENDUM 01	04/03/2017
-	ISSUED FOR BID	03 FEB 2017

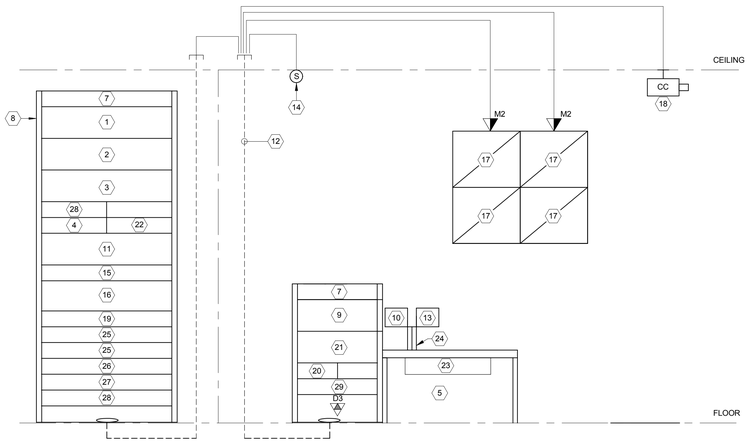
Plan North

Drawing Title:

AUDIO VISUAL SYSTEMS RISER - CLASSROOM D

Project No.: UM: S7646 / CD: 04348.00
Checked by: TZ

AV0523



KEYED NOTES :

1.
RACK MOUNT AV SWITCHER WITH INTEGRATED INPUTS / OUTPUTS AND MEDIA CONTROLLER. PROVIDE CONTROL OF VIDEO WALL, CAMERA, CLASSROOM CAPTURE, ETC. CONNECT AS RECOMMENDED BY MANUFACTURER.

2.
VIDEO WALL QUAD CONROLLER.

3.
VIDEO WALL POWER SUPPLY.

4.
WIRELESS MICROPHONE RECEIVER. PROVIDE BELT PACK TRANSMITTER AND LAPEL MICROPHONE. PROVIDE RACK MOUNT.

5.
LECTERN - HEIGHT ADJUSTABLE WITH ADJACENT RACK.

6.
7" TOUCH PANEL WITH TABLE MOUNT BRACKET. SECURE TO LECTERN. PROVIDE CUSTOMIZED CONTROL WINDOWS FOR OWNER REVIEW PRIOR TO PROGRAMMING.

7.
RACK MOUNT POWER DISTRIBUTION UNIT / SEQUENCER.

8.
FLOOR MOUNTED RACK/CABINET.

9.
PC WITH LECTURE CAPTURE SOFTWARE (OFCI).

10.
21" TOUCH PANEL

11.
CATV TUNER.

12.
(2) 1-1/4" CONDUIT FROM FLOOR BOX TO CEILING SPACE.

13.
21" MONITOR (OFCI).

14.
RECESSED CEILING MOUNTED SPEAKERS. SUPPORT FROM STRUCTURE. QUANTITY AS SHOWN ON DRAWINGS.

15.
PROVIDE AUDIO DSP TO ACCOMMODATE INPUTS AND OUTPUTS.

16.
RACK MOUNT AMPLIFIER.

17.
VIDEO WALL. 55" LCD MONITORS.

18.
PROVIDE LECTURE CAMERA AND WALL MOUNT KIT. PROVIDE POWER TO CAMERA FROM AV RACK. PROVIDE CONTROL OF CAMERA FROM MEDIA CONTROLLER.

19.
ASSISTIVE LISTENING SYSTEM.

20.
PROVIDE BARCO CLICK SHARE BASE MODULE. PROVIDE ANTENNA TO EXTEND SIGNAL TO ENTIRE ROOM AS RECOMMENDED BY MANUFACTURER.

21.
PROVIDE DESK MOUNT DOCUMENT CAMERA IN LECTERN DRAWER.

22.
PROVIDE APPLE TV WITH RACK MOUNT.

23.
KEYBOARD AND MOUSE IN KEYBOARD TRAY.

24.
ERGOTRON LX DUAL MONITOR ARM.

25.
12X8 AUDIO DSP. PROGRAM FOR MIX-MINUS OPERATION.

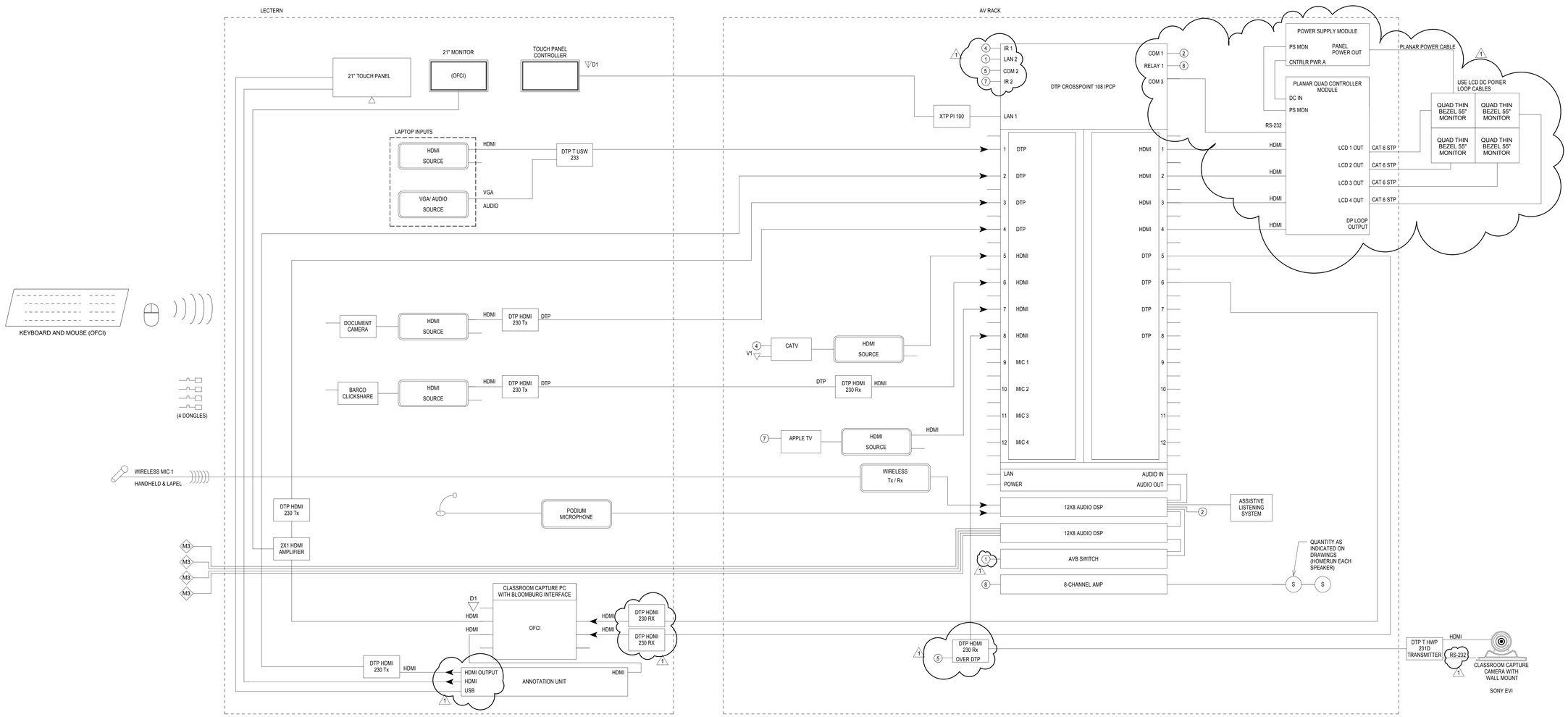
26.
AVB SWITCH.

27.
8-CHANNEL AUDIO AMPLIFIER.

28.
2X1 HDMI AMPLIFIER.

29.
ANNOTATION DEVICE.

2 AV RISER - TRADING CLASSROOM RISER
NTS



1 AV SCHEMATIC- TRADING ROOM
NTS

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NEW COLLEGE OF BUSINESS ADMINISTRATION BUILDING PHASE 1
#S7646

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No.	Description	Date
1	ADDENDUM 01	04/03/2017
-	ISSUED FOR BID	03 FEB 2017

Plan North

Drawing Title:

AUDIO VISUAL SYSTEMS RISER - TRADING ROOM

Project No.: UM: S7646 / CD: 04348.00
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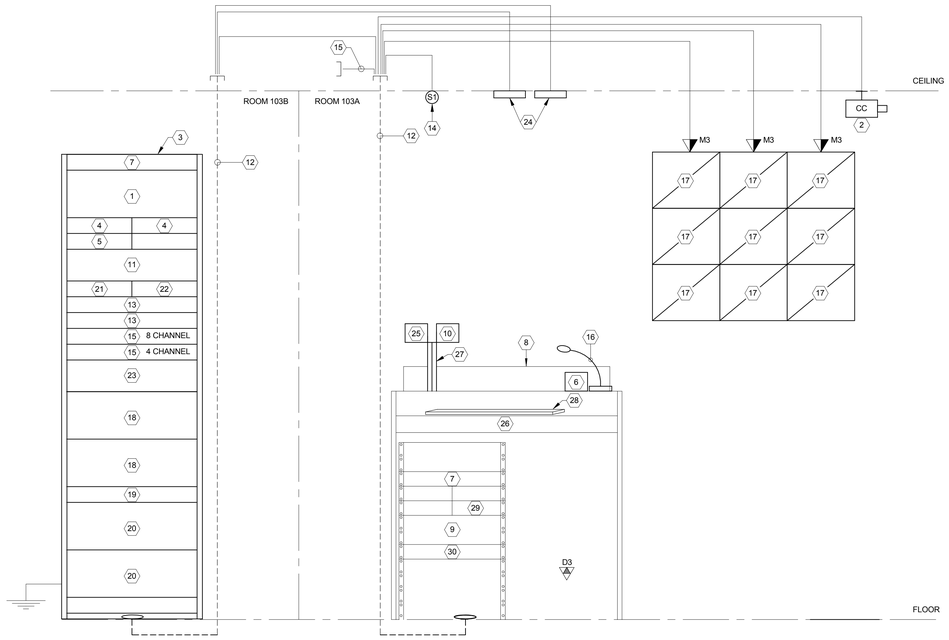
AV0524



2 AV RISER - MBA CLASSROOM
NTS

KEYED NOTES :

1.
RACK MOUNT AV SWITCHER WITH INTEGRATED INPUTS / OUTPUTS. PROVIDE CONTROL OF VIDEO WALL, CAMERA, CLASSROOM CAPTURE, AUDIO INPUTS/OUTPUTS, ETC. CONNECT AS RECOMMENDED BY MANUFACTURER.

2.
PROVIDE USB LECTURE CAMERA AND WALL MOUNT KIT. PROVIDE USB TWISTED PAIR EXTENDER/RECEIVER FOR ROUTING SIGNAL TO AV RACK. PROVIDE POWER TO CAMERA FROM AV RACK. PROVIDE CONTROL OF CAMERA FROM MEDIA CONTROLLER.

3.
FLOOR MOUNTED AV CABINET - LOCKABLE.

4.
WIRELESS MICROPHONE RECEIVER. PROVIDE BELT PACK TRANSMITTER AND LAPEL MICROPHONE. PROVIDE RACK MOUNT. PROVIDE ANTENNA FOR COVERAGE THROUGHOUT SPACE.

5.
USB EXTENDER UNIT.

6.
7" TOUCH PANEL WITH TABLE MOUNT BRACKET. SECURE TO LECTERN. PROVIDE CUSTOMIZED CONTROL WINDOWS FOR OWNER REVIEW PRIOR TO PROGRAMMING.

7.
RACK MOUNT POWER DISTRIBUTION UNIT / SEQUENCER.

8.
LECTERN - WITH DRAWER AND REMOVABLE 12 RMU AV RACK TO SUPPORT EQUIPMENT.

9.
PC WITH LECTURE CAPTURE SOFTWARE (OFCI).

10.
21" TOUCH PANEL

11.
MEDIA CONTROLLER. PROVIDE CONTROL OF VIDEO WALL, CAMERA, CLASSROOM CAPTURE, AUDIO CONFERENCING ETC. CONNECT AS RECOMMENDED BY MANUFACTURER.

12.
(2) 1-1/4" CONDUIT FROM FLOOR BOX TO CEILING SPACE.

13.
PROVIDE AUDIO DSP TO ACCOMMODATE INPUTS/OUTPUTS.

14.
RECESSED CEILING MOUNTED SPEAKERS. SUPPORT FROM STRUCTURE. QUANTITY AS SHOWN ON DRAWINGS. PROVIDE TEMPLATE TO CEILING INSTALLER TO CUT CEILING.

15.
WIRELESS AUDIO CONFERENCE RECEIVER.

16.
PODIUM MICROPHONE.

17.
VIDEO WALL. 55" LCD MONITORS.

18.
RACK MOUNT AMPLIFIER

19.
ASSISTIVE LISTENING SYSTEM. PROVIDE ANTENNA FOR COVERAGE THROUGHOUT SPACE.

20.
PROVIDE VIDEO WALL PROCESSOR, CONTROL MODULES AND POWER SUPPLIES FOR A 3x3 VIDEO WALL. CONNECT AND CABLE AS RECOMMENDED BY MANUFACTURER.

21.
PROVIDE BARCO CLICK SHARE BASE MODULE. PROVIDE ANTENNA TO EXTEND SIGNAL TO ENTIRE ROOM AS RECOMMENDED BY MANUFACTURER.

22.
PROVIDE APPLE TV WITH RACK MOUNT.

23.
PROVIDE CATV TUNER.

24.
RECESSED CEILING MOUNTED AUDIO ACCESS POINT (AP). SUPPORT FROM STRUCTURE. PROVIDE TEMPLATE TO CEILING INSTALLER TO CUT CEILING. PAINT BLACK.

25.
21" COMPUTER MONITOR (DELL) OFCI.

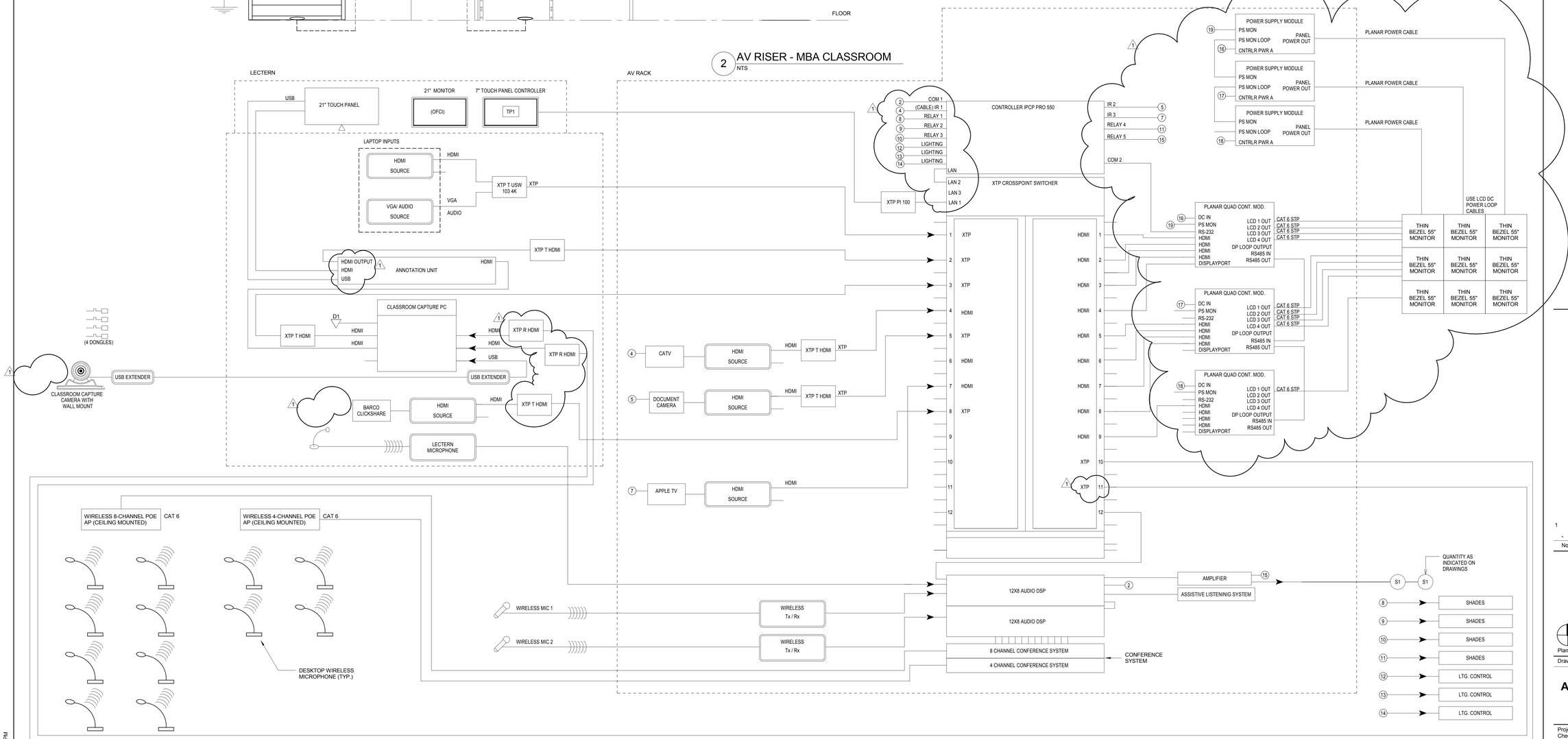
26.
DOCUMENT CAMERA IN LOCKING DRAWER.

27.
ERGOTRON LX DUAL MONITOR ARM.

28.
KEYBOARD & MOUSE (IN DRAWER)

29.
2X1 HDMI AMPLIFIER.

30.
ANNOTATION DEVICE.



1 AV SCHEMATIC- MBA ROOM BASE BID
NTS

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NEW COLLEGE OF BUSINESS ADMINISTRATION BUILDING PHASE 1
#S7646

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No.	Description	Date
1	ADDENDUM 01	04/03/2017
-	ISSUED FOR BID	03 FEB 2017

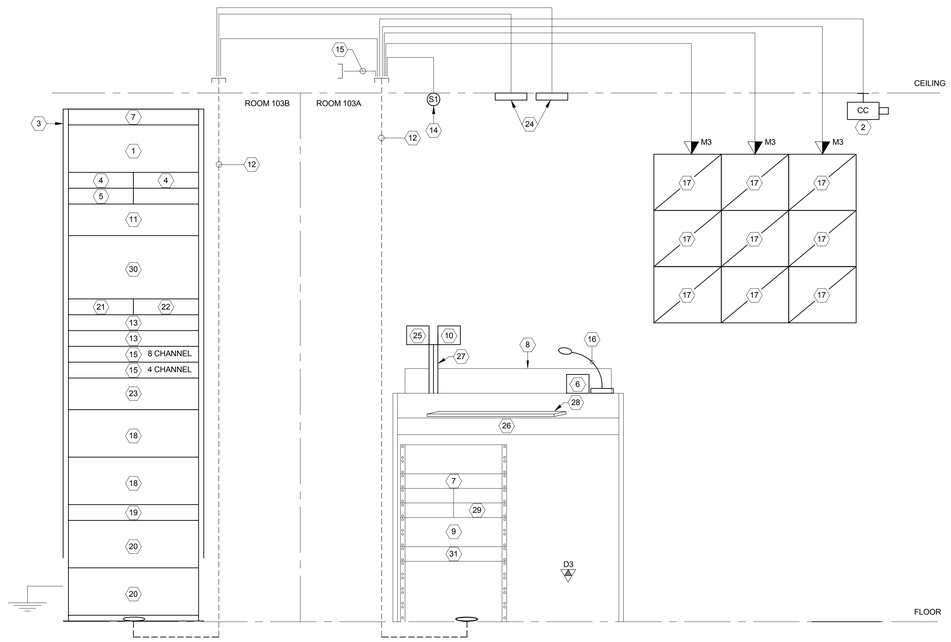
Plan North

Drawing Title:

AUDIO VISUAL SYSTEMS RISER - MBA ROOM - BASE BID

Project No.: UM: S7646 / CD: 04348.00
Checked by: TZ

AV0525



2 AV RISER - MBA CLASSROOM - ALTERNATE BID
NTS

KEYED NOTES :

1.
RACK MOUNT AV SWITCHER WITH INTEGRATED INPUTS / OUTPUTS. PROVIDE CONTROL OF VIDEO WALL, CAMERA, CLASSROOM CAPTURE, AUDIO INPUTS/OUTPUTS, ETC. CONNECT AS RECOMMENDED BY MANUFACTURER.

2.
PROVIDE USB LECTURE CAMERA AND WALL MOUNT KIT. PROVIDE USB TWISTED PAIR EXTENDER/RECEIVER FOR ROUTING SIGNAL TO AV RACK. PROVIDE POWER TO CAMERA FROM AV RACK. PROVIDE CONTROL OF CAMERA FROM MEDIA CONTROLLER.

3.
FLOOR MOUNTED AV CABINET - LOCKABLE.

4.
WIRELESS MICROPHONE RECEIVER. PROVIDE BELT PACK TRANSMITTER AND LAPEL MICROPHONE. PROVIDE RACK MOUNT. PROVIDE ANTENNA FOR COVERAGE THROUGHOUT SPACE.

5.
USB EXTENDER UNIT.

6.
7" TOUCH PANEL WITH TABLE MOUNT BRACKET. SECURE TO LECTERN. PROVIDE CUSTOMIZED CONTROL WINDOWS FOR OWNER REVIEW PRIOR TO PROGRAMMING.

7.
RACK MOUNT POWER DISTRIBUTION UNIT / SEQUENCER.

8.
LECTERN - WITH DRAWER AND REMOVABLE 12 RMU AV RACK TO SUPPORT EQUIPMENT.

9.
PC WITH LECTURE CAPTURE SOFTWARE (OFCI).

10.
SMART PODIUM.

11.
MEDIA CONTROLLER. PROVIDE CONTROL OF VIDEO WALL, CAMERA, CLASSROOM CAPTURE, AUDIO CONFERENCING ETC. CONNECT AS RECOMMENDED BY MANUFACTURER.

12.
(2) 1-1/4" CONDUIT FROM FLOOR BOX TO CEILING SPACE.

13.
PROVIDE AUDIO DSP TO ACCOMMODATE INPUTS/OUTPUTS.

14.
RECESSED CEILING MOUNTED SPEAKERS. SUPPORT FROM STRUCTURE. QUANTITY AS SHOWN ON DRAWINGS. PROVIDE TEMPLATE TO CEILING INSTALLER TO CUT CEILING.

15.
WIRELESS AUDIO CONFERENCE RECEIVER.

16.
PODIUM MICROPHONE.

17.
VIDEO WALL. 55" LCD MONITORS.

18.
RACK MOUNT AMPLIFIER

19.
ASSISTIVE LISTENING SYSTEM. PROVIDE ANTENNA FOR COVERAGE THROUGHOUT SPACE.

20.
PROVIDE VIDEO WALL PROCESSOR, CONTROL MODULES AND POWER SUPPLIES FOR A 3x3 VIDEO WALL. CONNECT AND CABLE AS RECOMMENDED BY MANUFACTURER.

21.
PROVIDE BARCO CLICK SHARE BASE MODULE. PROVIDE ANTENNA TO EXTEND SIGNAL TO ENTIRE ROOM AS RECOMMENDED BY MANUFACTURER.

22.
PROVIDE APPLE TV WITH RACK MOUNT.

23.
PROVIDE CATV TUNER.

24.
RECESSED CEILING MOUNTED AUDIO ACCESS POINT (AP). SUPPORT FROM STRUCTURE. PROVIDE TEMPLATE TO CEILING INSTALLER TO CUT CEILING. PAINT BLACK.

25.
21" COMPUTER MONITOR (DELL) OFCI.

26.
DOCUMENT CAMERA IN LOCKING DRAWER.

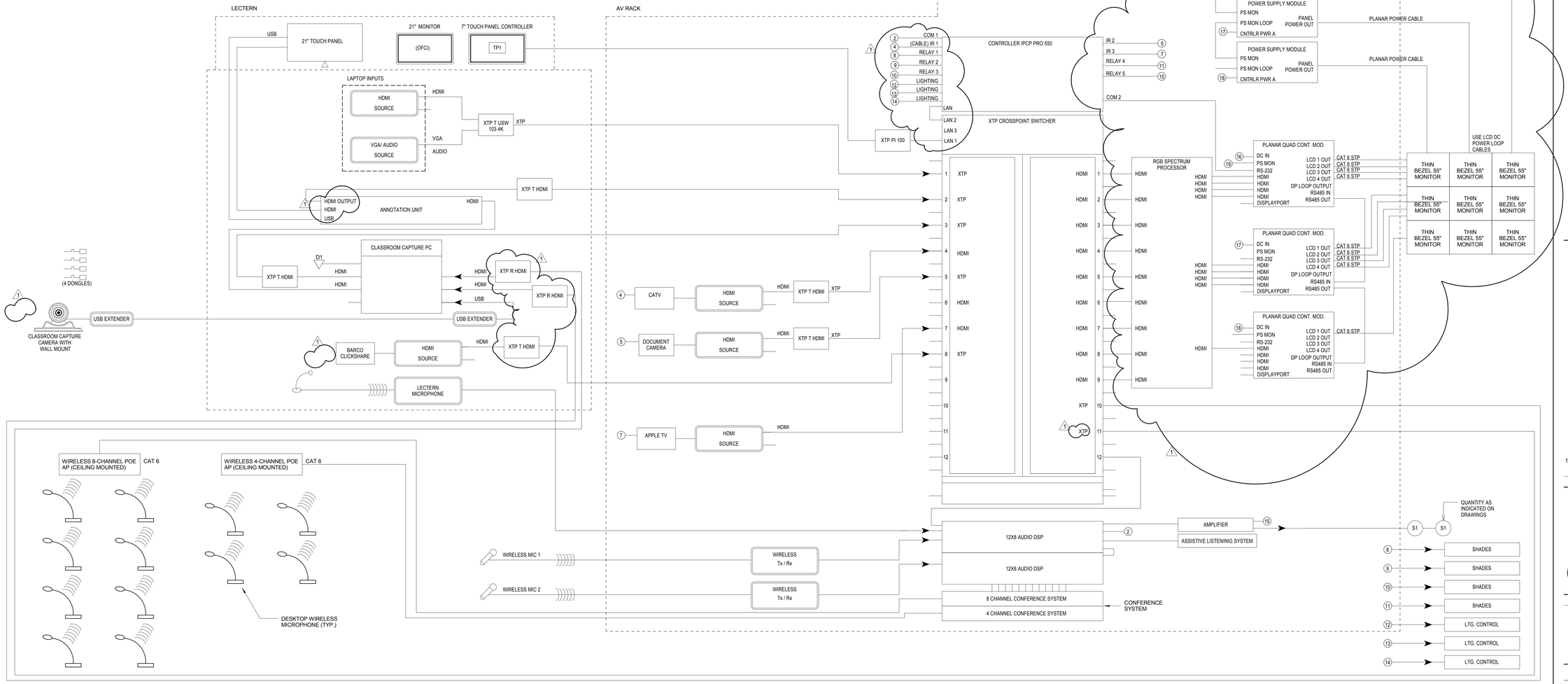
27.
ERGOTRON LX DUAL MONITOR ARM.

28.
KEYBOARD & MOUSE (IN DRAWER)

29.
2X1 HDMI AMPLIFIER.

30.
MEDIA WALL PROCESSOR.

31.
ANNOTATION DEVICE



1 AV SCHEMATIC- MBA ROOM - ALTERNATE BID
NTS

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NEW COLLEGE OF BUSINESS ADMINISTRATION BUILDING PHASE 1 #S7646

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No.	Description	Date
1	ADDENDUM 01	04/03/2017
-	ISSUED FOR BID	03 FEB 2017

Plan North

Drawing Title:

AUDIO VISUAL SYSTEMS RISER - MBA ROOM - ALTERNATE

Project No.: UM: S7646 / CD: 04348.00
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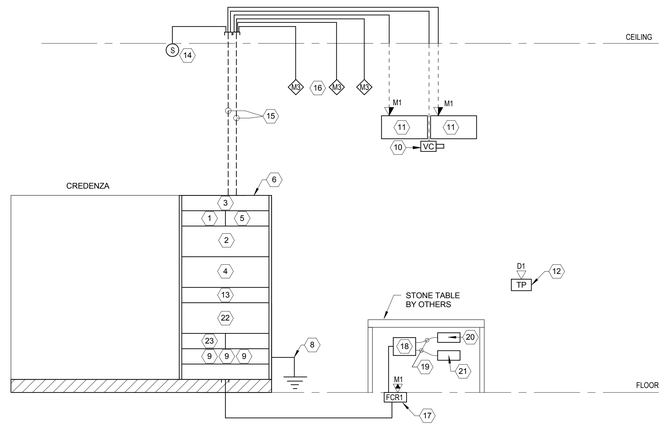


KEYED NOTES

1.
APPLE TV WITH RACK MOUNT.

2.
RACK MOUNT AV SWITCHER WITH INTEGRATED INPUTS/OUTPUTS AND MEDIA CONTROLLER. PROVIDE CONTROL OF MONITOR, VIDEO CONFERENCE UNIT, CAMERA, BARCO UNIT, APPLE TV, ETC.

3.
RACK MOUNT POWER DISTRIBUTION UNIT / SEQUENCER.

4.
PROVIDE VIDEO CONFERENCE UNIT WITH RACK MOUNT KIT.

5.
BARCO CLICK SHARE BASE UNIT.

6.
PROVIDE AND INSTALL A SLIDING, ROTATING RACK IN MILLWORK.

7.
PROVIDE BLANK PANEL PLATES IN BETWEEN RACK MOUNTED EQUIPMENT.

8.
PROVIDE GROUND TO TGB LOCATED IN TELECOM ROOM FROM AV RACK. SIZE: 6 AWG MINIMUM.

9.
PROVIDE REMOTE POWER SUPPLIES IN RACK FOR TWISTED PAIR RECEIVERS LOCATED AT DISPLAYS AND TWISTED PAIR TRANSMITTERS LOCATED REMOTELY. QUANTITY AS REQUIRED.

10.
VIDEO CAMERA UTILIZED WITH VIDEO CONFERENCING. COORDINATE PROGRAMMING WITH CUSTOMIZED PRESETS. PROVIDE WALL MOUNT SHELF TO SUPPORT CAMERA AND CONCEAL CABLING BEHIND MONITOR.

11.
WALL MOUNTED MONITOR WITH LOW PROFILE BRACKET.

12.
WALL MOUNTED TOUCH PANEL. PROVIDE CUSTOMIZED CONTROL WINDOWS FOR OWNER REVIEW PRIOR TO PROGRAMMING.

13.
12X8 AUDIO DSP WITH VOIP INTERFACE.

14.
PROVIDE RECESSED CEILING MOUNTED SPEAKERS. SUPPORT FROM STRUCTURE. QUANTITY AS SHOWN ON DRAWINGS.

15.
(2) 1-1/4" CONDUIT FROM JUNCTION BOX IN MILLWORK TO ACCESSIBLE CEILING. ROUTE VIDEO, SPEAKER, MIC AND CONTROL CABLING IN CONDUIT.

16.
3-ELEMENT CEILING MOUNTED MICROPHONE ARRAYS.

17.
INSTALL SHIELDED CAT 6 CABLE AND JACK WITH FACEPLATE IN FLOOR BOX. PROVIDE SHIELDED PATCH CABLE TO SWITCHER FOR TRANSMISSION AND POWER TO RACK.

18.
INSTALL AV SWITCHER TO UNDERSIDE OF STONE TABLE.

19.
AV PATCH CORDS FROM SWITCHER TO AV TERMINATION BRACKET INSTALLED TO UNDERSIDE OF TABLE.

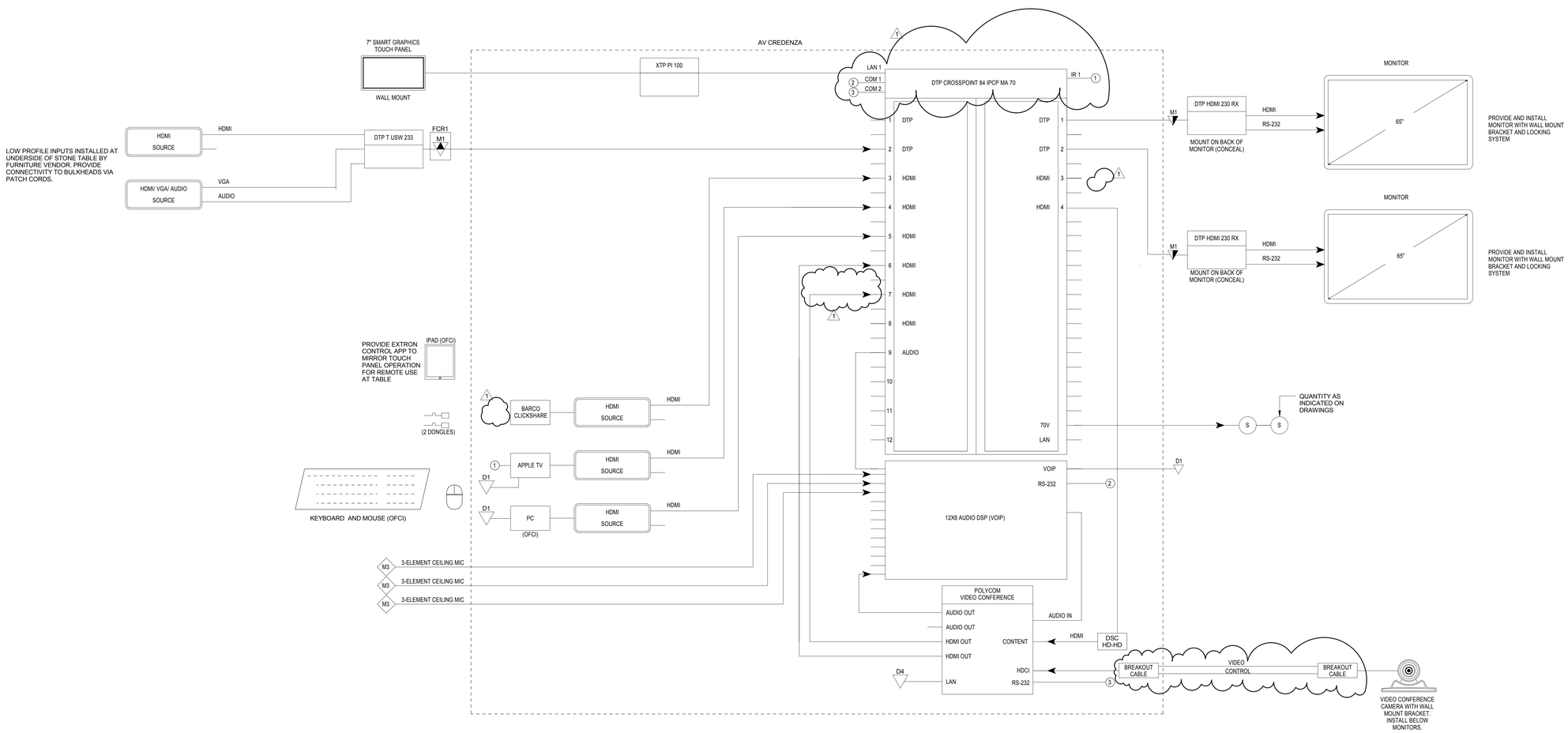
20.
AV TERMINATION BRACKET WITH VGA, AUDIO AND HDMI INPUT BY OTHERS.

21.
AV TERMINATION BRACKET WITH HDMI INPUT BY OTHERS.

22.
PC (OFCI)

23.
USB EXTENDER.

2 AV RISER DIAGRAM - DEANS CONFERENCE ROOM 7
NTS



1 AV SCHEMATIC- DEANS CONFERENCE ROOM
NTS

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-	ISSUED FOR BID	03 FEB 2017

Plan North

Drawing Title:

AUDIO VISUAL SYSTEMS RISERS - DEANS CONFERENCE ROOM

Project No.: UM: S7646 / CD: 04348.00
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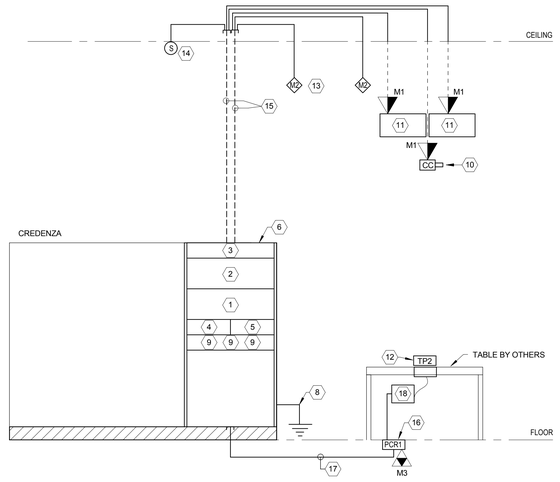
AV0527

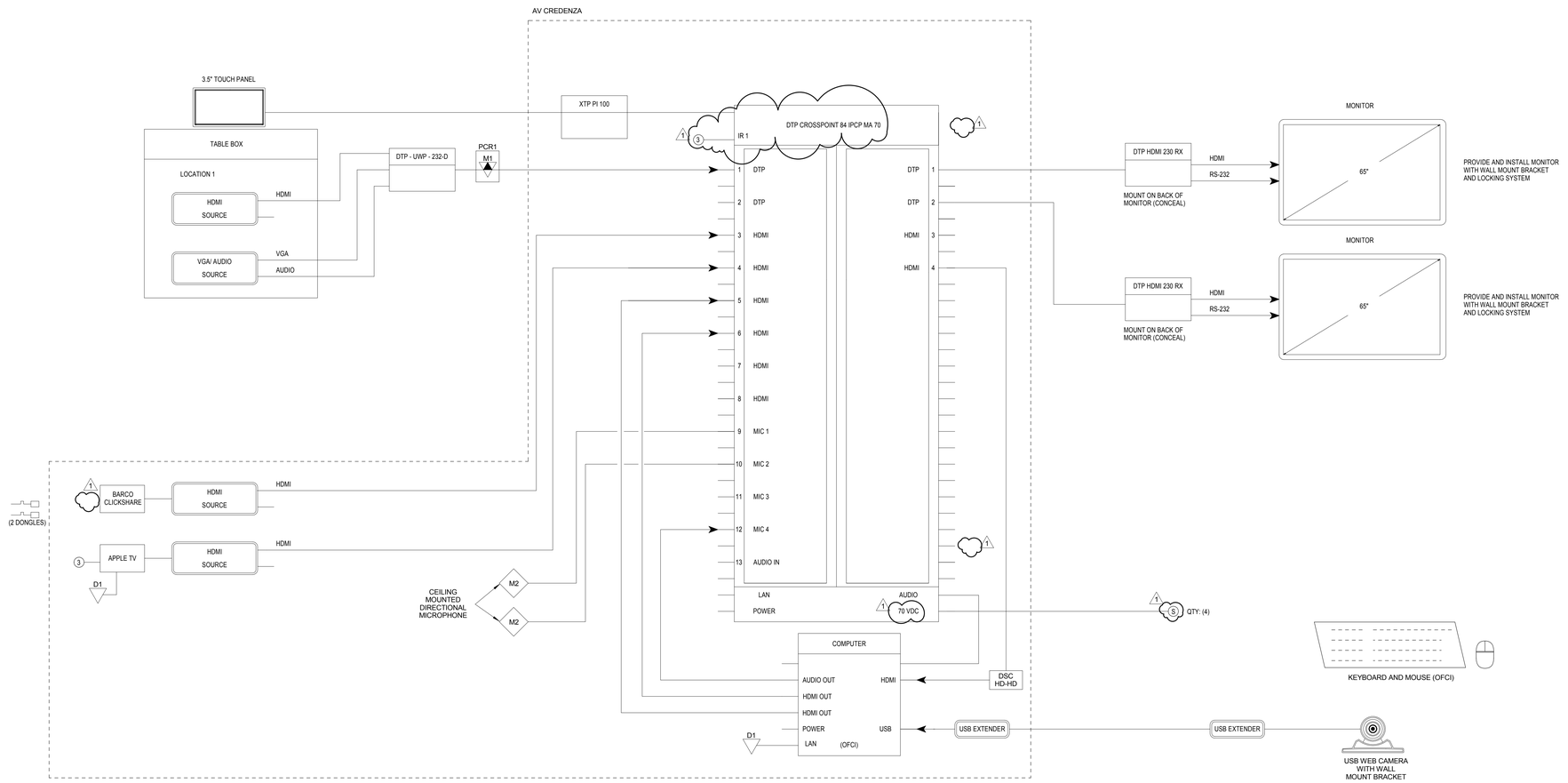


KEYED NOTES

1. PC WITH CLASSROOM CAPTURE SOFTWARE.
2. RACK MOUNT AV SWITCHER WITH INTEGRATED INPUTS/OUTPUTS AND MEDIA CONTROLLER. PROVIDE CONTROL OF MONITOR, CAMERA, BARCO CLICK SHARE, APPLE TV, ETC.
3. RACK MOUNT POWER DISTRIBUTION UNIT / SEQUENCER.
4. APPLE TV AND RACK MOUNT.
5. BARCO CLICK SHARE BASE UNIT.
6. PROVIDE AND INSTALL SLIDING, ROTATING RACK IN CREDENZA.
7. PROVIDE BLANK PANEL PLATES IN BETWEEN RACK MOUNTED EQUIPMENT.
8. PROVIDE GROUND TO TGB LOCATED IN TELECOM ROOM FROM AV RACK. SIZE: #6 AWG MINIMUM.
9. PROVIDE REMOTE POWER SUPPLIES IN RACK FOR TWISTED PAIR RECIEVERS LOCATED AT DISPLAYS AND TWISTED PAIR TRANSMITTERS LOCATED REMOTELY. QUANTITY AS REQUIRED.
10. WEB BASED CAMERA UTILIZED WITH VIDEO CONFERENCING. COORDINATE PROGRAMMING WITH CUSTOMIZED PRESETS. PROVIDE WALL MOUNT SHELF TO SUPPORT CAMERA AND CONCEAL CABLING ABOVE MONITOR.
11. WALL MOUNTED MONITOR WITH LOW PROFILE BRACKET. COORDINATE INSTALLATION WITH WALL MOUNT BRACKET.
12. DESK MOUNTED TABLE TOP BOX WITH 3.5" TOUCH PANEL. CONNECT TO AV SWITCHER. PROVIDE CUSTOMIZED CONTROL WINDOWS FOR OWNER REVIEW PRIOR TO PROGRAMMING. INTEGRATE WITH AV INPUT BOX. PROVIDE AC MODULE AND HDMI, VGA, 3.5mm AUDIO CABLE CONNECTORS.
13. PROVIDE CEILING MOUNTED SUSPENDED MICROPHONES. INSTALL AS RECOMMENDED BY MANUFACTURER. PROGRAM MIC EQ PRESETS BASED ON ROOM USE.
14. PROVIDE RECESSED CEILING MOUNTED SPEAKERS. SUPPORT FROM STRUCTURE. QUANTITY AS SHOWN ON DRAWINGS.
15. (2) 1-1/4" CONDUIT FROM JUNCTION BOX IN MILLWORK TO ACCESSIBLE CEILING. ROUTE VIDEO, SPEAKER, MIC AND CONTROL CABLING IN CONDUIT.
16. INSTALL SHEILDED CAT6 CABLE WITH JACK IN FACEPLATE IN FLOORBOX. PROVIDE SHEILDED PATCH CORD FOR SWITCHER TRANSMISSION AND POWER TO RACK.
17. UTILIZE 1-1/4" CONDUIT FROM FLOOR BOX TO MILLWORK.
18. MOUNT SWITCHER/TRANSMITTER TO UNDERSIDE OF TABLE AND EXTEND PATCHCORDS FOR HDMI, VGA, 3.5 AUDIO TO TABLE BOX/TOUCH PANEL. COORDINATE WITH DIVISION 26 FOR POWER.

2 AV RISER DIAGRAM - FACULTY CONFERENCE ROOM

NTS



1 AV SCHEMATIC- FACULTY CONFERENCE ROOM

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NEW COLLEGE OF BUSINESS ADMINISTRATION BUILDING PHASE 1
#S7646

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No.	Description	Date
1	ADDENDUM 01	04/03/2017
-	ISSUED FOR BID	03 FEB 2017

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Drawing Title:

AUDIO VISUAL SYSTEMS RISERS - FACULTY CONFERENCE ROOM

Project No.: UM: S7646 / CD: 04348.00
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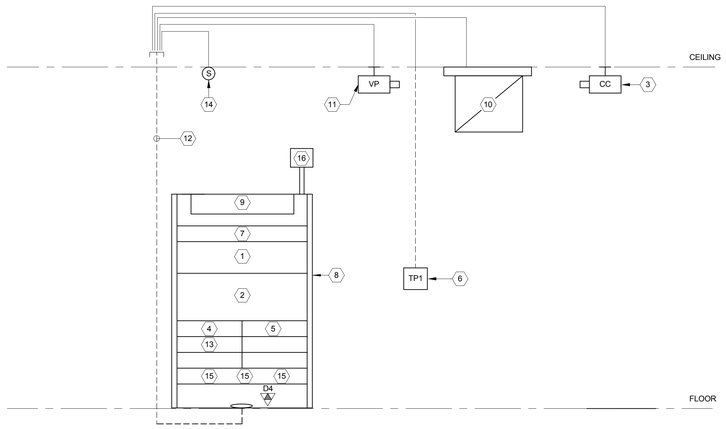


KEYED NOTES :

1.
RACK MOUNT AV SWITCHER WITH INTEGRATED INPUTS / OUTPUTS AND MEDIA CONTROLLER. PROVIDE CONTROL OF VIDEO PROJECTOR, PROJECTION SCREEN, CAMERA, CLASSROOM CAPTURE, ETC. CONNECT AS RECOMMENDED BY MANUFACTURER.

2.
PC WITH CLASSROOM CAPTURE SOFTWARE. (OFCI).

3.
PROVIDE USB LECTURE CAMERA AND WALL MOUNT KIT. PROVIDE USB TWISTED PAIR EXTENDER/RECEIVER FOR ROUTING SIGNAL TO AV RACK. PROVIDE POWER TO CAMERA FROM AV RACK. PROVIDE CONTROL OF CAMERA FROM MEDIA CONTROLLER.

4.
WIRELESS MICROPHONE RECEIVER. PROVIDE BELT PACK TRANSMITTER AND LAPEL MICROPHONE. PROVIDE RACK MOUNT.

5.
USB EXTENDER UNIT.

6.
PROVIDE TOUCH PANEL WITH TABLE TOP MOUNT. SECURE TO LECTERN. PROVIDE CUSTOMIZED CONTROL WINDOWS FOR OWNER REVIEW PRIOR TO PROGRAMMING.

7.
RACK MOUNT POWER DISTRIBUTION UNIT / SEQUENCER.

8.
LECTERN -SEMINAR ROOM SOLUTIONS.

9.
WIRELESS KEYBOARD AND MOUSE.

10.
RECESSED CEILING MOUNTED MOTORIZED PROJECTION SCREEN. PROVIDE LOW VOLTAGE CONTROL THROUGH CONTROLLER. 113" DIAGONAL.

11.
CEILING MOUNTED PROJECTION UNIT WITH CHIEF PL2A LOCKING SYSTEM. PROVIDE POLE MOUNT KIT WITH SHELF FOR TWISTED PAIR RECEIVER. COORDINATE LOCATION FOR OPTIMAL IMAGE PROJECTION ON SCREEN.

12.
(2) 1-1/4" CONDUIT FROM FLOOR BOX TO CEILING SPACE.

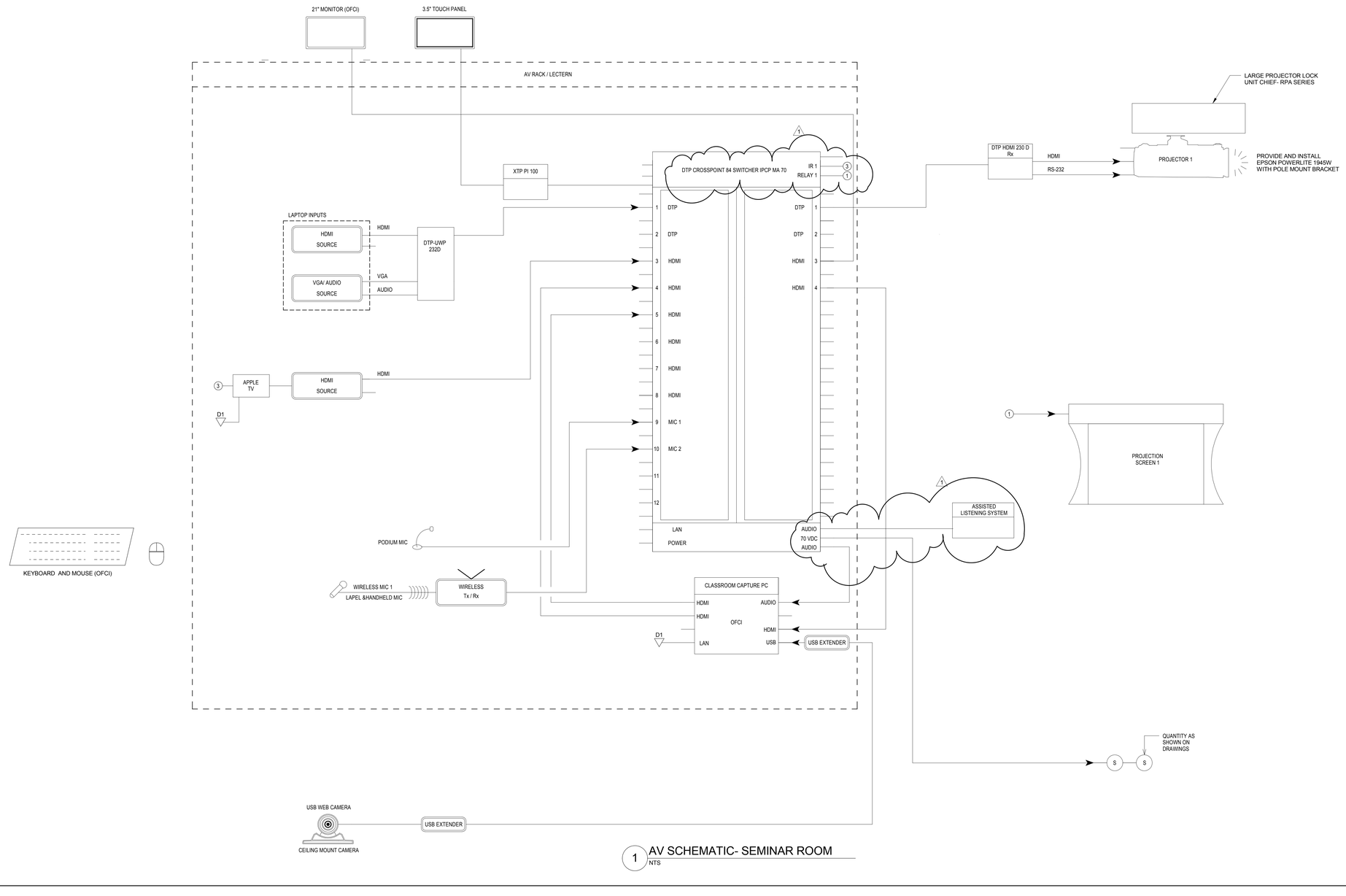
13.
APPLE TV WITH RACK MOUNT.

14.
RECESSED CEILING MOUNTED SPEAKERS. SUPPORT FROM STRUCTURE. QUANTITY AS SHOWN ON DRAWINGS.

15.
PROVIDE REMOTE POWER SUPPLIES IN RACK FOR TWISTED PAIR RECEIVERS AT DISPLAYS AND TWISTED PAIR TRANSMITTERS AT LOCATED REMOTELY. QUANTITY AS REQUIRED.

16.
21" MONITOR (OFCI). PROVIDE SINGLE ARM MONITOR BRACKET.

2 AV RISER - SEMINAR ROOM
NTS



1 AV SCHEMATIC- SEMINAR ROOM
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-	ISSUED FOR BID	03 FEB 2017

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Drawing Title:

AUDIO VISUAL SYSTEMS RISERS - SEMINAR ROOM

Project No.: UM: S7646 / CD: 04348.00
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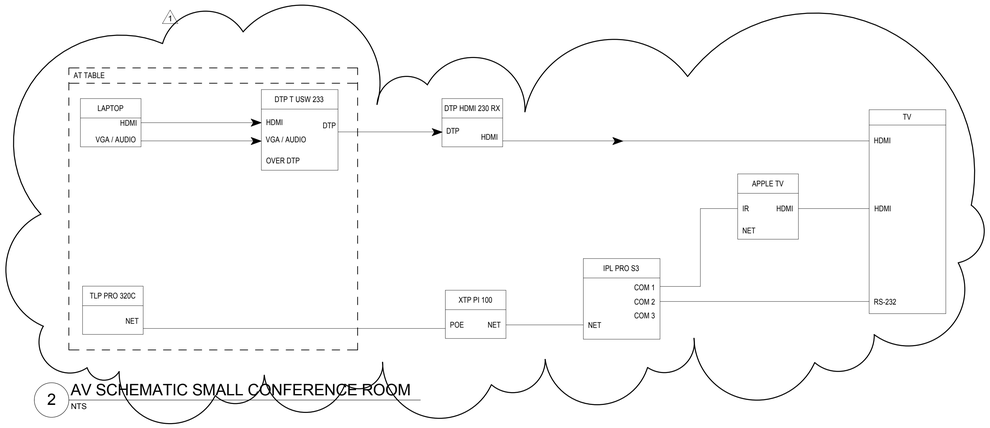
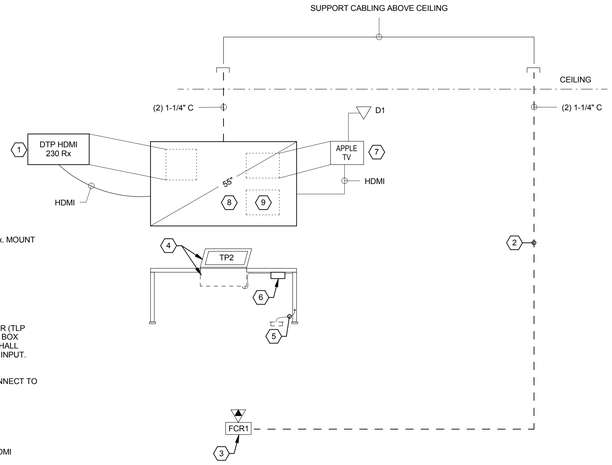


2 AV SCHEMATIC SMALL CONFERENCE ROOM
NTS



KEYED NOTES

1.
TERMINATE SHIELDED CAT 6 CABLE AT RECEIVER; EXTRON DTP HDMI 4K 230 Rx. MOUNT TO REAR OF MONITOR. PROVIDE HDMI INPUT TO MONITOR.

2.
SHIELDED CAT 6 CABLE AS RECOMMENDED BY MANUFACTURER.

3.
TERMINATE CABLING IN FLOORBOX AT SHEILDED RJ-45 FACEPLATE.

4.
RECESSED TABLE TOP CUBBY WITH FLIPTOP 3.5" TOUCH SCREEN CONTROLLER (TLP PRO 320C). PROGRAM FOR OPERATION OF ALL EQUIPMENT IN ROOM. PROVIDE BOX TEMPLATE TO FURNITURE PROVIDER TO PROVIDE CUT OUT IN TABLE CUBBY SHALL INCLUDE: 1) AC POWER MODULE, 2) VGA INPUT, 3) 3.5mm AUDIO INPUT, 4) HDMI INPUT.

5.
PROVIDE SHEILDED CAT 6 PATCH CORD TO FACEPLATE IN FLOORBOX AND CONNECT TO AV SWITCHER.

6.
TERMINATE VGA, AUDIO, HDMI CABLES FOR CONNECTIONS TO DTP T USW 233 TRANSMITTER MOUNTED TO UNDERSIDE OF TABLE.

7.
MOUNT APPLE TV DEVICE ABOVE CEILING AND CONNECT TO MONITOR WITH HDMI CABLE.

8.
55" COMMERCIAL DISPLAY WITH AUDIO SPEAKERS. PROVIDE WALL MOUNT WITH LOCKING BRACKET.

9.
EXTRON IPL PRO S3 FOR CONTROL OF MONITOR AND APPLE TV.

1 TYPICAL BREAKOUT ROOM / SMALL CONFERENCE ROOM
NTS

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Drawing Title:

AUDIO VISUAL SYSTEMS RISER DIAGRAMS

Project No.: UM: S7646 / CD: 04348.00
Checked by: TZ

AV0530

VISUAL DISPLAY SCHEDULE

ROOM NAME AND NUMBER	LOCATION	DISPLAY TYPE	MOUNTING	ASPECT RATIO	HEIGHT	WIDTH	DIAGONAL	BLACK DROP	BLACK DROP (BOTTOM)	SEAM	MOTOR LOCATION	TAB-TENSIONED	CONTROLS	REMARKS
CLASSROOM TYPE A - 001	NORTHWEST CORNER	PROJECTION SCREEN, FRONT	3	4:03	84"	112"	140"	N/A	N/A	N/A	END MOUNTED , LEFT	YES	1, 8	2,4
CLASSROOM TYPE C - 002	SOUTH WALL	PROJECTION SCREEN, FRONT	3	16:10	60"	96"	114"	N/A	N/A	N/A	END MOUNTED , LEFT	YES	1, 8	2,4
CLASSROOM TYPE C - 002	SOUTH WALL	PROJECTION SCREEN, FRONT	3	16:10	60"	96"	114"	N/A	N/A	N/A	END MOUNTED , LEFT	YES	1, 8	2,4
CLASSROOM TYPE C - 004	SOUTH WALL	PROJECTION SCREEN, FRONT	3	16:10	60"	96"	114"	N/A	N/A	N/A	END MOUNTED , LEFT	YES	1, 8	2,4
CLASSROOM TYPE C - 004	SOUTH WALL	PROJECTION SCREEN, FRONT	3	16:10	60"	96"	114"	N/A	N/A	N/A	END MOUNTED , LEFT	YES	1, 8	2,4
CLASSROOM TYPE D - 003	WEST WALL	PROJECTION SCREEN, FRONT	3	16:10	60"	96"	114"	N/A	N/A	N/A	END MOUNTED , LEFT	YES	1, 8	2,4
CLASSROOM TYPE D - 003	EAST WALL	PROJECTION SCREEN, FRONT	3	16:10	60"	96"	114"	N/A	N/A	N/A	END MOUNTED , LEFT	YES	1, 8	2,4
CLASSROOM TYPE D - 003	SOUTH WALL	PROJECTION SCREEN, FRONT	3	16:10	60"	96"		N/A	N/A	N/A	N/A	N/A		10
SEMINAR ROOM - 005	EAST WALL	PROJECTION SCREEN, FRONT	3	16:10	60"	96"	114"	N/A	N/A	N/A	END MOUNTED , LEFT	YES	1, 8	2,4
SEMINAR ROOM - 106	WEST WALL	PROJECTION SCREEN, FRONT	3	16:10	60"	96"	114"	N/A	N/A	N/A	END MOUNTED , LEFT	YES	1, 8	2,4
BREAKOUT ROOM - 006	WEST WALL	FLAT PANEL	1, 7	16:9			55"	N/A	N/A	N/A	N/A	N/A		
TRADING ROOM - 108	WEST WALL	VIDEO WALL - 2X2	1, 9				55"	N/A	N/A	N/A	N/A	N/A		8
prof. MBA ROOM 103A	WEST WALL	VIDEO WALL - 3X3	1, 9				55"	N/A	N/A	N/A	N/A	N/A		9
CONFERENCE ROOM 236	SOUTH WALL	FLAT PANEL	1, 7				65"	N/A	N/A	N/A	N/A	N/A		
CONFERENCE ROOM 236	SOUTH WALL	FLAT PANEL	1, 7				65"	N/A	N/A	N/A	N/A	N/A		
DEAN'S CONFERENCE ROOM 202F	NORTHEAST WALL	FLAT PANEL	1, 7				65"	N/A	N/A	N/A	N/A	N/A		
DEAN'S CONFERENCE ROOM 202F	NORTHEAST WALL	FLAT PANEL	1, 7				65"	N/A	N/A	N/A	N/A	N/A		
CONFERENCE ROOM 217	WEST WALL	FLAT PANEL	1, 7				55"	N/A	N/A	N/A	N/A	N/A		

MOUNTING:
1. SURFACE WALL MOUNTED
2. SUSPENDED
3. SUSPENDED WITH AUTOMATIC CEILING CLOSURE (FLUSH)
4. ARTICULATING ARM
5. CEILING MOUNTED
6. TILT ENABLED
7. LEVEL ADJUSTMENT
8. RECESSED WALL
9. VIDEO WALL EXTENDING MOUNT

SEAM:
1. PROVIDE SCREEN IN SIZE INDICATED WITHOUT SEAM.

BLACKDROP:
1. AS NEEDED AT TOP OF SCREEN FOR BOTTOM OF SCREEN TO BE 46" ABOVE FLOOR.

REMARKS:
1. WIDE ANGLE
2. MATTE WHITE
3. HIGH GAIN
4. PROVIDED BY GC. COORDINATE INSTALLATION
5. TOUCH SENSITIVE DISPLAY
6. INTEGRATED PC
7. INTEGRATED WITH PROJECTION UNIT
8. QUANTITY OF 4
9. QUANTITY OF 9
10. UNIT IS REPURPOSED.

CONTROLS:
1. 3-POSITION SWITCH
2. LOCKING COVER PLATE
3. KEY OPERATED
4. IR REMOTE
5. RF REMOTE
6. RS-232 TO AV EQUIPMENT
7. MANUAL
8. LOW VOLTAGE CONTROLLER. INCLUDE FOR TOUCH SCREEN CONTROL
9. CEC
10. PROVIDE _____ CONTROL SWITCHES.

MEDIA OUTLET SCHEDULE

SUBSCRIPT	CONDUIT STUB SIZE (INCHES)	NUMBER OF GANGS (FACEPLATE)	NUMBER OF PORTS: 4 (FACEPLATE)	MODULE TYPE/ QUANTITY: RJ-45: DATA JACKS	HDMI 1.4	VGA					3.5MM STEREO	BLANK	HORIZONTAL CABLE TYPE/ QUANTITIES: 4 PAIR CAT 6 UTP	HDMI 1.4 PRETERMINATED						PULL STRING	REFER TO DETAIL	NOTES	DEVICE DESCRIPTION
M1	1-1/4	1	MM	1									1									D	MULTIMEDIA OUTLET
M2	1-1/4	1	MM	2									2									B,D	MULTIMEDIA /VIDEO OUTLET
M3	1-1/4	2	MM	3									3									D	MULTIMEDIA /VIDEO OUTLET
M4	1-1/4	2	MM		1	1					1			1								B,D	MULTIMEDIA/VIDEO/ DATA OUTLET

NOTES:
A. - COORDINATE WITH TELEPHONE SYSTEM MANUFACTURER TO MATCH HANDSET MOUNTING LUG REQUIREMENTS.
B. - MOUNT MODULES AND RECEPTACLE AT CEILING (AT WAP LOCATION IF REQUIRED). COORDINATE WITH AUTHORITY HAVING JURISDICTION TO LOCATE DEVICES ABOVE CEILING.
C. - AD - HEIGHT AS DETAILED.
D. - FLUSH MOUNTED MODULAR MULTIMEDIA FACEPLATE.
E. - TBD

*PROVIDE REQUIRED MOUNTING PLATES TO ALLOW FOR INSTALLATION IN FURNITURE OR SURFACE MOUNTED RACEWAY AS REQUIRED.

UMSL CoBA		Acquisition					Rough-In					Installation					
SYSTEM & EQUIPMENT CATEGORY		Not Required	Cannon Design	Contractor/Bid	UMSL	Undecided	Not Required	Cannon Design	Contractor/Bid	UMSL	Undecided	Not Required	Cannon Design	Contractor/Bid	UMSL	Undecided	Comments
Technology Systems																	
Telecommunications																	
Site Infrastructure		X					X					X					
Structured Cabling - Entrance		X					X					X					
Structured Cabling-Voice				X					X					X			
Structured Cabling-Data				X					X					X			
Structured Cabling-Wireless				X					X					X			
Data Racks, Wire Mgt, Cable Runway				X					X					X			
Signal Grounding				X					X					X			
Cable Tray (Corridors)		X					X					X					
Pathways, J-Hooks (Corridors)				X					X					X			
Pathways, Conduit sleeves, Stubs, TRAs				X					X					X			
Network Electronics					X				X						X		
Wireless Access Electronics					X				X						X		WAP provided and installed by UMSL. Wiring/Bracket by EC.
PoE Electronics					X				X						X		
Network Servers					X				X						X		
Telephone System/Phones					X				X						X		
UPS Equipment - Rack Mounted					X				X						X		
Facilities																	
Video Distribution				X					X					X			
TVs, TV Brackets				X					X					X			
Security																	
Access Control					X				X					X			Access control device provided by UMSL.
Door Entry Intercom/Latch Retraction					X				X					X			
Video Surveillance		X					X					X					
Panic / In Duress		X					X					X					
Mass Notification		X					X					X					
Audio-Visual																	
Racks/Cabinets/Credenzas				X					X					X			
Switches/Amplifiers				X					X					X			
Speakers				X					X					X			
Projection Units				X					X					X			
Projection Screens				X					X					X			
Flat Panel Monitors				X					X					X			
Smart Boards				X					X					X			
Lecterns				X					X					X			
Blocking				X					X					X			
Floor Boxes/Wall Boxes				X					X					X			
Cabling				X					X					X			
Cameras				X					X					X			
Microphones				X					X					X			
Touch Panels				X					X					X			
PC's/Laptops					X				X						X		
Annotation Devices				X					X					X			
Document Cameras		X					X					X					
Video Conference Equipment				X					X					X			
Lighting Integration				X					X					X			Provided within electrical scope.
UPS Equipment - Rack Mounted																	

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Drawing Title:

AUDIO VISUAL SYSTEMS SCHEDULES

Project No.: UM: S7646 / CD: 04348.00
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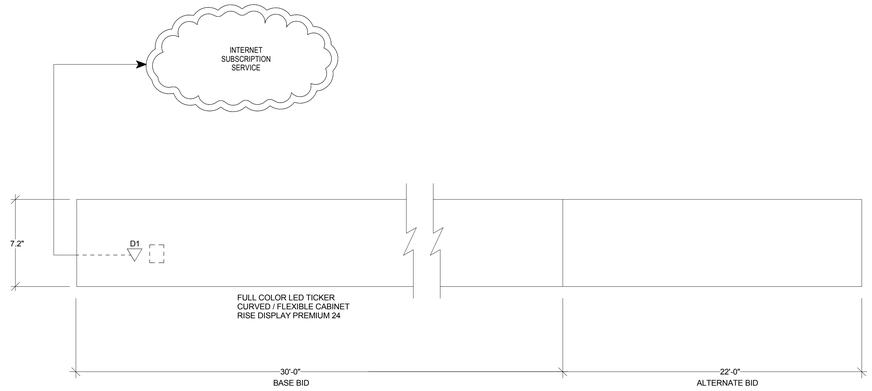
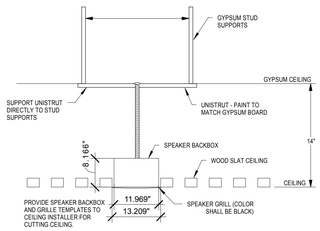
AV0601





2 MBA CLASSROOM SPEAKER INSTALLATION
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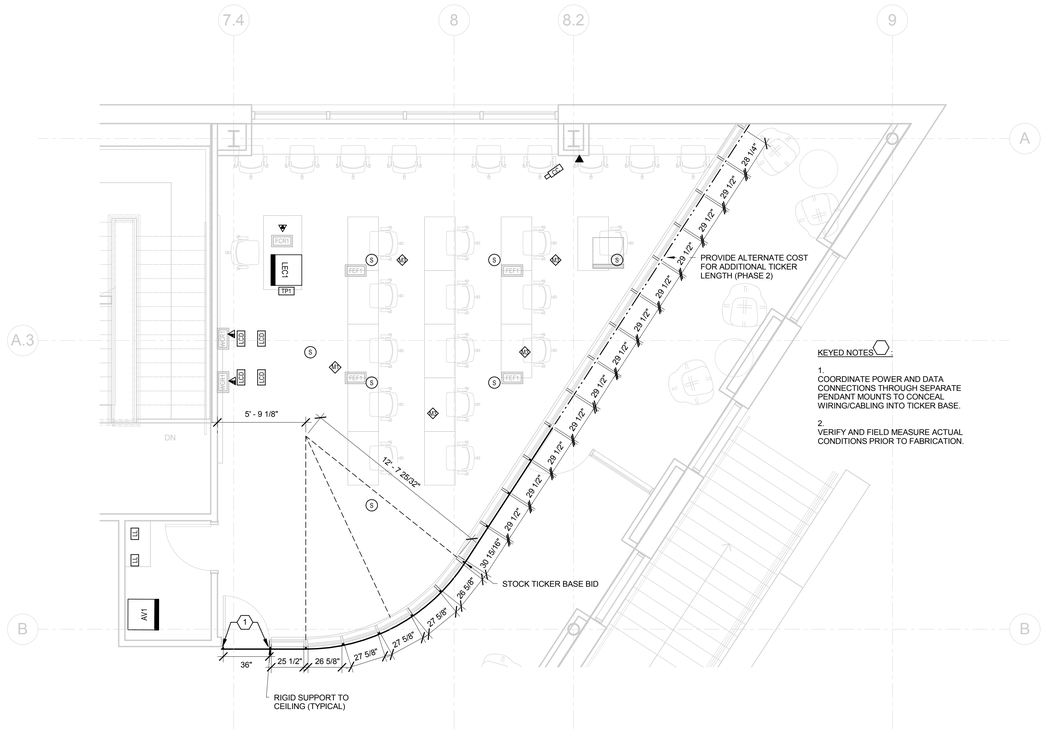

1 LED TICKER DISPLAY
1/4" = 1'-0"

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AUDIO VISUAL SYSTEMS DETAILS

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