PROJECT MANUAL

FOR THE PROJECT:

THEATRICAL LIGHTING AND SOUND IMPROVEMENTS
AT
CORAL SHORES, KEY WEST, AND MARATHON HIGH SCHOOLS

BY:

Monroe County School District
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CONSTRUCTION DOCUMENTS

February 17, 2017

AGI Project #16020.001

SET NO. ____

TECHNICAL SPECIFICATIONS

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TO THE BEST OF MY KNOWLEDGE, THESE DRAWINGS AND THE PROJECT MANUAL ARE COMPLETE AND COMPLY WITH THE FLORIDA BUILDING CODE.

_____

Robert C. Anston, P.E. #40858

SECTION 01 04 50 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-01 Specification Sections, apply to this Section.

1.2 DESCRIPTION

A. This Section specifies administrative and procedural requirements for cutting and patching.

B. Refer to other Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

Requirements of this Section apply to mechanical and electrical installations. Refer to Division-26 and 27 Sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations.

C. Definition:

1. Cutting and Patching includes cutting into new and/or existing construction to provide for the installation or performance of other work and subsequent fitting and patching required to restore surfaces to their original condition.
2. Refer to other sections of these specifications for specific cutting and patching requirements and limitations applicable to individual units of work.

1.3 BUILDING MODIFICATIONS

A. Modifications to the new and/or existing structure, and its mechanical and electrical parts, shall be provided as indicated and as necessary to accomplish the work of these Contract Documents.

B. Modifications shall include the removal of parts, relocation of parts, termination and relocation of utilities, cutting, patching, cleaning, adjusting and refinishing, and all incidental work related to these tasks.

1.4 ACOUSTICAL AND RATED ASSEMBLY PENETRATIONS

A. Where structural members and/or other construction elements penetrate smoke and fire rated assemblies, and sound barriers, including walls around and floor below mechanical equipment rooms; provide acoustical fire rated sealant between such work and barrier to maintain acoustical attenuation, and smoke and fire integrity of the barrier.

B. All penetrations through fire rated construction shall be fire stopped as per NEC 300-21 using a through penetration fire stop system (XHEZ) listed in the Underwriters Laboratory Fire Resistance Directory.

1.5 SUBMITTALS

A. Cutting and Patching Proposal: Where approval of procedures for cutting and patching is required before proceeding, submit a proposal describing procedures well in advance of the time cutting and patching will be performed and request approval to proceed. Include the following information, as applicable, in the proposal:

1. Describe the extent of cutting and patching required and how it is to be performed; indicate why it cannot be avoided.
2. Describe anticipated results in terms of changes to existing construction; include changes to structural elements and operating components as well as changes in the building's appearance and other significant visual elements.
3. List products to be used and firms or entities that will perform Work.
   Indicate dates when cutting and patching is to be performed.
4. List utilities that will be disturbed or affected, including those that will be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.
5. Where cutting and patching involves addition of reinforcement to structural elements, submit details and engineering calculations to show how reinforcement is integrated with the original structure.
6. Approval by the Architect to proceed with cutting and patching does not waive the Architect's right to later require complete removal and replacement of a part of the Work found to be unsatisfactory.

1.6 QUALITY ASSURANCE

A. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would reduce their load-carrying capacity or load-deflection ratio.

1. Obtain approval of the cutting and patching proposal before cutting and patching the following structural elements:
2. Foundation construction.
3. Bearing and retaining walls.
4. Lintels.
5. Structural decking.
6. Miscellaneous structural metals.
7. Equipment supports.
8. Piping, ductwork, vessels and equipment.

B. Operational and Safety Limitations: Do not cut and patch operating elements or safety related components in a manner that would result in reducing their capacity to perform as intended, or result in increased maintenance, or decreased operational life or safety.

C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces, in a manner that would, in the Architect's opinion, reduce the building's aesthetic qualities, or result in visual evidence of cutting and patching. Remove and replace Work cut and patched in a visually unsatisfactory manner.

1. If possible retain the original installer or fabricator to cut and patch the following categories of exposed Work, or if it is not possible to engage the original installer or fabricator, engage another recognized experienced and specialized firm:
   a. Processed concrete finishes.
   b. Stucco plaster.
   c. Acoustical ceilings.
   d. HVAC enclosures, cabinets or covers.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Use materials that are identical to existing materials. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect. Use materials whose installed performance will equal or surpass that of existing materials.

B. All penetrations through fire rated construction shall be fire stopped as per NEC 300-21 using a through penetration fire stop system (XHEZ) listed in the Underwriters Laboratory Fire Resistance Directory.

PART 3 - EXECUTION

3.1 INSPECTION

A. Before cutting existing surfaces, examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed. Take corrective action before proceeding, if unsafe or unsatisfactory conditions are encountered.

Before proceeding, met at the site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

3.2 PREPARATION

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

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

C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Take all precautions necessary to avoid cutting existing pipe, conduit or ductwork serving the building, but scheduled to be removed or relocated until provisions have been made to bypass them.

3.3 PERFORMANCE

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

1. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.

B. Cutting: Cut existing construction using methods least likely to damage elements to be retained or adjoining construction. Where possible review proposed procedures with the original installer; comply with the original installer's recommendations.

1. In general, where cutting is required use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots neatly to size required with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
3. Cut through concrete and masonry using a cutting machine such as a carborundum saw or diamond core drill.
4. Comply with requirements of applicable Sections of Division-2 where cutting and patching requires excavating and backfilling.
5. By-pass utility services such as pipe or conduit, before cutting, where services are shown or required to be removed, relocated or abandoned. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.

C. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.

1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.
2. 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.
3. Where removal of walls or partitions extends one finished area into another, patch and repair floor and wall surfaces in the new space to provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary to achieve uniform color and appearance.

4. Where patching occurs in a smooth painted surface, extend final paint coat over entire unbroken containing the patch, after the patched area has received primer and second coat.
5. Patch, repair or rehang existing ceilings as necessary to provide an even plan surface of uniform appearance.

3.4 CLEANING

A. Thoroughly clean areas and spaces where cutting and patching is performed or used as access. Remove completely paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged pipe covering to it is original condition.

END OF SECTION 01 04 50

SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

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

B. Related Sections include the following:

1. Division 01 Section "Closeout Procedures" for submitting warranties, Project Record Documents and operation and maintenance manuals.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Engineer's responsive action.

B. Informational Submittals: Written information that does not require Engineer's approval. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTAL PROCEDURES

A. General: Submit submittals in Adobe Portable Document Format (PDF) minimum version 4.0 with Submittal Transmittal to Engineer for review.

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. 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. Engineer and Contractor reserve the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Submittals Schedule: Comply with contract and request for proposal for time requirements for scheduled performance of related construction activities.

D. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows.

Time for review shall commence on Engineer's receipt of submittal.

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. Engineer will advise Contractor when a submittal being processed must be delayed for coordination.
2. If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Allow 10 days for processing each resubmittal.
4. Contractor shall keep a submittal log of to track progress of submittals.
5. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, product delivery time or product substitutions.

E. Identification: Place a permanent label or title block on each submittal for identification. Provide in PDF for electronic submittals.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space beside title block to record Contractor's review and approval markings and action taken by Engineer and Contractor.
3. Include the following information on label for processing and recording action taken:
    a. Project name.
    b. Date.
    c. Name and address of Engineer.
    d. Name and address of Contractor.
    e. Name and address of subcontractor.
    f. Name and address of supplier.
    g. Name of manufacturer.
    h. Number and title of appropriate Specification Section.
    i. Drawing number and detail references, as appropriate.
    j. Other necessary identification.

4. Electronic PDF submittal files shall be named utilizing the specification number followed by a sequential number for the submittal made under the given specification number followed by "r#" if it is a resubmittal, and then followed by a brief description of the submitted item.
    a. The description shall indicate the actual item submitted, shall not be general in nature, and does not have to be that of the specification section heading.
    b. Using the example, "15135-4r2 Differential Pressure Gauge"; 15135 - Meters and Gauges is the relevant specification, the " 4 shows it was the fourth submittal for specification section 15135, "1-2" shows it was the second resubmittal, and the description indicates what item is submitted.
    c. Each specification item shall be submitted in a separate PDF file. PDF files with multiple specification items will be returned without review.

d. Each file shall have sufficient space allowance for the Engineers review stamp(s).
e. Each file shall have the Contractor's review stamp(s) and indicate information required by specification 01330-1.4.E.3 above.

5. All marks made by the Contractor shall be in green pen the will be visible when copied.

F. Deviations: Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals.

G. Additional Copies: Unless additional copies are required for final submittal, and unless Engineer or Contractor observes noncompliance with provisions of the Contract Documents, initial submittal may serve as final submittal.

H. Transmittal: Package each submittal individually and appropriately for transmittal and handling.

Transmit each submittal using a transmittal form. Engineer will discard submittals received from sources other than Contractor.

1. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Engineer on previous submittals, and deviations from requirements of the Contract Documents, including minor variations and limitations.

   Include the same label information as the related submittal.

2. Include Contractor's certification stating that information submitted complies with requirements of the Contract Documents.

END OF SECTION 01 33 00

SECTION 01 42 00 - REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. “Architect”: Architect, Engineer, Architect/Engineer, and A/E are used interchangeably, and refer to the Prime Professional on the project, Anston-Greenlees, Inc.

C. “A/E”: Architect, Engineer, and A/E can be used interchangeably, and refer to the Prime Professional on the project, Anston-Greenlees, Inc.

D. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

E. “Contractor”: The project contractor directly under contract for the project with the Owner.

F. “Sub-contractor”: A contractor under contract directly with the project Contractor.

G. “Owner”: The Florida Department of Management Services, and specifically the Real Estate and Development Division, is the Owner.

H. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "approved," "required," and "permitted" have the same meaning as "directed."

I. “Engineer”: Architect, Engineer, and A/E can be used interchangeably, and refer to the Prime Professional on the project, Anston-Greenlees, Inc.

J. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled”, and "specified" have the same meaning as "indicated."

K. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

L. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

M. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

N. "Provide": Furnish and install, complete and ready for the intended use.

O. "Installer": Contractor or another entity engaged by the project Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular and specific 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 trades people of the corresponding generic name.

P. "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; and having complied with requirements of authorities having jurisdiction.

Q. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents, unless otherwise indicated.

C. Conflicting Requirements: 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 uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.

1. 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.

D. Copies of Standards: Each entity engaged in construction on Project must be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source and make them available on request.

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

AA	Aluminum Association, Inc.	(202) 862-5100	www.aluminum.org
AABC	Associated Air Balance Council	(202) 737-0202	www.aabchq.com
AAMA	American Architectural Manufacturers	(847) 303-5664	www.aamanet.org
ACI	American Concrete Institute/	(248) 848-3700 ACI International	www.aci-int.org
ADC	Air Diffusion Council	(312) 201-0101	www.flexibleduct.org
AGC	Associated General Contractor	(703) 548-31 18 of America	www.agc.org
AIA	American Institute of Architects	(202) 626-7300	www.e-architect.com
ANSI	American National Standards Institute	(202) 293-8020	www.ansi.org
ASHRAE	American Society of Hearting, Refrigerating and Air-Conditioning Engineers	(800) 527-4723	www.ashrae.org
ASTM	American Society for Testing and Materials	(61 0) 832-9585	www.astm.org
AWI	Architectural Woodwork Institute	(800) 449-8811	www.awinet.org
CLFMI	Chain Link Fence Manufactures Institute	(301) 596-2583	www.chainlinkinfo.org
CRSI	Concrete Reinforcing Steel Institute	(847) 517-1200	www.crsi.org
CSI	Construction Specifications Institute	(800) 689-2900	www.csinet.org
NAAMM	National Association of Architectural Metal Manufacturers	(312) 332-0405	www.naamm.org
NECA	National Electrical Contractors Association	(301) 657-3110	www.necanet.org
NEMA	National Electrical Manufacturers Association	(703) 841-3200	www.nema.org

NFPA	National Fire Protection Association	(800) 344-3555	www.nfpa.org
NHLA	National Hardwood Lumber Association	(800) 933-0218	www.nathardwood.org
NRCA	National Roofing Contractors Association	(800) 323-9545	www.nrca.net
SMACNA	Sheet Metal and Air Conditioning Contractors National Association	(703) 803-2980	www.smacna.org

C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

1. FBC: Florida Building Code
   a. http:llwww.floridabuiIding.orglc/default.aspx
   b. (850) 487-1 824

END OF SECTION 01 42 00

SECTION 01 60 00 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following administrative and procedural requirements: 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. Related Sections include the following:

1. Division 01 Section "References" for applicable industry standards for products specified.
2. Division 01 Section "Closeout Procedures" for submitting warranties for contract closeout.
3. Divisions 2 through 16 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.3 DEFINITIONS

A. Products: Item’s 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 consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," 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 other named manufacturers.

D. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.

E. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

1.4 SUBMITTALS

A. Product List: Submit a list, in tabular from, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.

1. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.
2. Form: Tabulate information for each product under the following column headings:
    a. Specification Section number and title.
    b. Generic name used in the Contract Documents.
    c. Proprietary name, model number, and similar designations.
    d. Manufacturer's name and address.
    e. Supplier's name and address.
    f. Installer's name and address.
    g. Projected delivery date or time span of delivery period.
    h. Identification of items that require early submittal approval for scheduled delivery date.
    i. Refer to specific specification sections for more submittal and shop drawing requirements.

3. Submittal: Within 10 days after date of commencement of the Work, submit electronic copies of product list and shop drawings. Include a written explanation for omissions of data and for variations from Contract requirements.
4. Architect's Action: Architect will respond in writing to Contractor within 15 days of receipt of complete submittal. Architect's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Architect's response, or lack of response, does not constitute a waiver of requirement that products comply with the Contract Documents.

B. Substitution Requests: Submit three copies of each request for consideration at least 15 days prior to the bid due date. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
    a. Statement indicating why specified material or product cannot be provided.
    b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
    c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
    d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
    e. Samples, where applicable or requested.
    f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
    g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
    h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
    i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
    j. Cost information, including a proposal of change, if any, in the Contract Sum.
    k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
    I. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within 7 calendar days of receipt of a request for substitution. Architect will notify Contractor of acceptance of proposed substitution by addendum, within the allowable addendum period, prior to bid date. Any substitution request that is not accepted by an official addendum shall be deemed un-acceptable.
    a. Form of Acceptance: Addendum.
    b. Use product specified if Architect does not make a decision on use of a proposed substitution within time allocated.

C. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 1 Section "Submittal Procedures." Show compliance with requirements.

1.5 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. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.6 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.

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.
5. Store products to allow for inspection and measurement of quantity or counting of units.
6. Store materials in a manner that will not endanger Project structure.
7. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
8. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
9. Protect stored products from damage.

1.7 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.

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: Forms are included with the Specifications. Prepare a written document using appropriate form properly executed.
3. Refer to Divisions 2 through 16 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 1 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT OPTIONS

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 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. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.

B. Product Selection Procedures: Procedures for product selection include the following:

1. Product: Where Specification paragraphs or subparagraphs titled "Product" name a single product and manufacturer, provide the product named.
   a. Substitutions may be considered, unless otherwise indicated.

2. Manufacturer/Source: Where Specification paragraphs or subparagraphs titled "Manufacturer" or "Source" name single manufacturers or sources, provide a product by the manufacturer or from the source named that complies with requirements.
   a. Substitutions may be considered, unless otherwise indicated.

3. Products: Where Specification paragraphs or subparagraphs titled "Products" introduce a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
4. Manufacturers: Where Specification paragraphs or subparagraphs titled "Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
5. Basis-of-Design Products: Where Specification paragraphs or subparagraphs titled "Basis-of-Design" are included and also introduce or refer to a list of manufacturers' names, provide either the specified 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 "Comparable Products" Article to obtain approval for use of an unnamed product.

2.2 PRODUCT SUBSTITUTIONS

A. Timing: Architect will consider requests for substitution if received within 15 days prior to bid date. Requests received after that time may be considered or rejected at discretion of Architect.

B. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect may reject requests without action:

1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
2. Requested substitution does not require extensive revisions to the Contract Documents.
3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
4. Substitution request is fully documented and properly submitted.
5. Requested substitution will not adversely affect Contractor's Construction Schedule.
6. Requested substitution has received necessary approvals of authorities having jurisdiction.
7. Requested substitution is compatible with other portions of the Work.
8. Requested substitution has been coordinated with other portions of the Work.
9. Requested substitution provides specified warranty.
10. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
11. Requested substitution specifically identifies any deviations from the requirements of the specifications and how that deviation is addressed, deleted, or modified.

2.3 COMPARABLE PRODUCTS

A. Where products or manufacturers are specified by name, submit the following, in addition to other required submittals, to obtain approval of an unnamed product:

1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION

NOT USED

END OF SECTION 01 60 00

SECTION 01 70 00 - EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 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. General installation of products.
4. Progress cleaning.
5. Starting and adjusting.
6. Protection of installed construction.
7. Correction of the Work.

B. Related Sections include the following:

1. Division 01 Section "Cutting and Patching" for procedural requirements for cutting and patching necessary for the installation or performance of other components of the Work.

1.3 SUBMITTALS

A. Certificates: Submit documentation of coordination with any required inspections, testing, and approvals from the authority having jurisdiction, and evidence of the execution of any required easements.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of utilities and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other existing construction affecting the Work.

C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
   a. Description of the Work.
   b. List of detrimental conditions, including substrates.
   c. List of unacceptable installation tolerances.
   d. Recommended corrections.

2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and 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 authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

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

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. 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 minimum headroom clearance of 8 feet in spaces without a suspended ceiling. Six feet, 6 inches will be permitted in spaces dedicated to mechanical and electrical systems.

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

F. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.

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.

G. 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.

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

3.4 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 materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.

3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

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: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Cutting and Patching: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

1. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.

H. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

I. 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.

J. 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.

K. 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.

3.5 STARTING AND ADJUSTING

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

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

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

D. 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 I Section "Quality Requirements."

3.6 PROTECTION OF INSTALLED CONSTRUCTION

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

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

3.7 CORRECTION OF THE WORK

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

1. Comply with requirements in Division 1 Section "Cutting and Patching."
2. 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 01 70 00

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

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

1. Inspection procedures.
2. Project Close Out Documents.
3. Operation and maintenance manuals.
4. Warranties.
5. Instruction of Owner's personnel.
6. Final cleaning.
7. Spare parts list summary.
8. Related Sections include the following:
    a. Refer to Contract for requirements for Applications for Payment for Substantial and Final Completion.
    b. Division 1 Section "Execution Requirements" for progress cleaning of Project site.
    c. Divisions 2 through 27 Sections for specific closeout and special cleaning requirements for products of those Sections.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.

1. If applicable, prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
2. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
3. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
4. Complete startup testing of systems.
5. Submit test/adjust/balance records.
6. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.

7. Complete final cleaning requirements, including floor waxing and touchup painting.
8. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
9. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
    a. Multiple Inspections: The Architect's Agreement with the Owner includes one Substantial Completion Inspection for the entire project.
        aa. If the Contractor wants additional Inspections, they will be conducted at the Contractor's expense. Cost of multiple Substantial Completion Inspections will be billed at the Architect's and Engineers' hourly rates as identified in the Architect Owner Agreement.
        bb. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
            aaa. The Architect's Agreement with the Owner includes one reinspection to determine if the Substantial Completion Punch List has been completed. Cost of more than one re-inspection will be at the Contractor's expense and will be billed at the Architect's and Engineers' hourly rates as identified in the Architect Owner Agreement.
        cc. Results of completed inspection will form the basis of requirements for Final Completion.

1.4 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment according to Contract requirements.
2. Submit copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed by Contractor. The copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Complete and submit the Owner Training Log in the format provided at the end of this section.
4. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
    a. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

aa. The Architect's Agreement with the Owner includes one inspection to determine Final Completion. Cost of more than one inspection will be at the Contractor's expense and will be billed at the Architect's and Engineers' hourly rates.

5. Submit Contractor Close Out Documents prior to requesting the final inspection. Close Out Documents are to consist of the documents listed on the attached Checklist, and any additional documents required elsewhere in the specifications.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:
   a. Project name.
   b. Date.
   c. Name of Architect and Construction Manager.
   d. Page number.

1.6 PROJECT RECORD DOCUMENTS

A. General: Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

B. Record Drawings: Maintain and submit one set of black-line white prints of Contract Drawings and Shop Drawings.

1. Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
   a. Give particular attention to information on concealed elements that cannot be readily identified and recorded later.
   b. Accurately record information in an understandable drawing technique.
   c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
   d. Mark Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. Where Shop Drawings are marked, show cross-reference on Contract Drawings.

aa. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.
bb. Mark important additional information that was either shown schematically or omitted from original Drawings.
cc. Note Construction Change Directive numbers, Change Order numbers, alternate numbers, and similar identification where applicable.
dd. Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location. Organize into manageable sets; bind each set with durable paper cover sheets. Include identification on cover sheets.

2. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications. Mark copy to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
   a. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
   b. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
   c. Note related Change Orders, Record Drawings, and Product Data, where applicable.

1.7 EXTRA STOCK - SPARE PARTS LIST

A. Submit a list summarizing all of the spare parts required by each specific section of the specifications, and provide the requested spare parts. Refer to specification section 2 through 27 for spare parts requirements. Obtain a signed receipt indicating the date, time, location, and the person to whom the part were delivered and received.

1.8 WARRANTIES

A. All work shall be warranted for a period of 1 year unless a longer warranty period is stated elsewhere in the specifications. All warranty periods shall start on date of the approved substantial completion of the final phase of work.

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.

PART 3 - EXECUTION

3.1 DEMONSTRATION AND TRAINING

A. Instruction: Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system. Complete a log of activities as indicated in attached Owner Training Log.

1. Provide instructors experienced in operation and maintenance procedures.
2. Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.
3. Schedule training with Owner, with at least seven days' advance notice.
4. Coordinate instructors, including providing notification of dates, times, length of instruction, and course content.
5. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections. For each training module, develop a learning objective and teaching outline. Include instruction for the following:
   a. System design and operational philosophy.
   b. Review of documentation.
   c. Operations.
   d. Adjustments.
   e. Troubleshooting.
   f. Maintenance.
   g. Repair.
   h. Review spare parts list

3.2 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 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. Remove tools, construction equipment, machinery, and surplus material from Project site.
   d. 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. Provide floor waxing as specified elsewhere in the construction documents.

e. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.

f. Sweep concrete floors broom clean in unoccupied spaces.

g. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.

h. 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.

i. Remove labels that are not permanent.

j. 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.

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

aaa. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

bbb. Replace parts subject to unusual operating conditions.

ccc. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.

ddd. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.

eee. Clean ducts, blowers, and coils if units were operated without filters during construction.

fff. 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.

ggg. Leave Project clean and ready for occupancy.

2. 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.

END OF SECTION 01 77 00

SECTION 02 07 00 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Bidding Requirements, Contractual Conditions, and General Requirements of Division One shall apply to all work hereunder.

1.2 WORK INCLUDED

A. Coordinate and verify existing conditions, including utilities, prior to commencement of selective demolition.

B. Remove portions of existing slabs/walks as required and shown.

C. Remove designated building equipment, fixtures, partitions and components. Remove partial items as required.

D. Cap and identify exposed utilities.

E. Provide temporary partitions as necessary to allow continued building occupancy by Owner during phased construction.

F. Maintain approved means of egress from existing building exits as required by code.

G. Other items of demolition as indicated on drawings.

1.3 SUBMITTALS

A. Permits and notices authorizing demolition.

B. Permit for transport and disposal of debris.

C. Schedule: Indicating demolition procedures and operational sequence for review and acceptance by Architect/Engineer prior to start of work. Include coordination for shut-off, capping and continuation of utility services as required.

1.4 JOB CONDITIONS

A. Occupancy: Areas to be demolished will be vacated and discontinued in use prior to start work.

1.5 PROTECTION

A. Do not interfere with use of adjacent existing buildings or parking areas. Maintain free and safe passage to and from.

1. Do not close or obstruct streets, walks or other occupied or used facilities without permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
2. Do not close or obstruct corridors or passageways within the existing building except as shown on the Demolition Plans.

B. Prevent damage, movement or settlement of structure. Provide and place bracing or shoring and be responsible for safety and support of structure. Assume liability for such movement, settlement, damage or injury.

C. Cease operations and notify the Architect/Engineer and Owner immediately, if safety of structure appears to be endangered. Take precautions to properly support structure. Do not resume operations until safety is restored.

D. Provide, erect and maintain barricades, lighting, and guardrails as required by applicable regulatory advisory to protect occupants of building and workers.

1. Erect temporary covered passageways as required by authorities having jurisdiction.

E. Explosives: Use of explosives will not be permitted.

F. Damages: Promptly repair damages caused to adjacent facilities by demolition operations at no cost to Owner.

G. Refer to drawings for additional protection requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Except where noted otherwise, maintain possession of materials being demolished. Immediately remove from site.

B. Equipment and articles of value remain the property of the Owner. Notify Architect prior to removal and obtain acceptance regarding method of removal.

C. Items of salvageable value only to Contractor may be removed from area as work progresses. Salvaged items must be transported from site as they are removed.

PART 3 - EXECUTION

3.1 PREPARATION

A. Erect weatherproof closures for exterior openings. Maintain exit requirements.

B. Erect and maintain dustproof partitions as required to prevent spread of dust, fumes and smoke to other parts of the building. On completion, remove partitions and repair damaged surfaces to match adjacent surfaces.

C. Coordinate installation and removal of temporary partitions with the Owner to facilitate Owner's use of building.

D. During removal of any existing parapets or roofing, provide proper protection from falling objects entrances which are to be kept open during normal working hours.

E. Carry out demolition work to cause as little inconvenience to adjacent occupied building areas as possible.

3.2 DEMOLITION

A. Demolish in an orderly and careful manner as required to accommodate new work, including that required for connection to the existing building. Protect existing foundations and supporting structural members.

B. Perform demolition in accordance with applicable authorities having jurisdiction.

C. Immediately repair all demolition performed in excess of that required, at no cost to the Owner.

D. Pollution Controls: Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt rising and scattering in air to lowest practical level.

E. Comply with governing regulations pertaining to environmental protection.

1. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding and pollution. Do not use water at interior of building.
2. Clean adjacent structures and improvements of dust, dirt and debris caused by demolition operations, as directed by Architect or governing authorities. Return adjacent areas to condition existing prior to start of work. Supply and maintain dust mats at all dust partition doors.

3.3 DISPOSAL

A. Burning of materials on site is not permitted.

B. Remove from site any contaminated, vermin infested, or dangerous materials encountered and dispose of by safe means so as not to endanger health of workers and public.

C. Remove demolished materials, debris, tools and equipment from site upon completion of work. Leave site in a condition acceptable to the Architect/Engineer.

D. Transport materials removed from demolished structures and dispose of off site at an approved location.

END OF SECTION 02 07 00

SECTION 07 27 00 - FIRESTOPPING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:

1. This Section includes the firestopping of all penetrations through fire-rated walls, and ceilings as herein specified and required by code.

B. Definitions:

1. Fire Barrier: Any floor, wall, or ceiling which is indicated as having a fire-resistance rating.
2. Firestopping: Materials or devices used to seal openings that have been made in fire-rated floors, walls, and/or ceilings for the purposes of passing building service penetrations such as electrical conduits, electrical data of communications cabling, plumbing or mechanical pipes, HVAC or mechanical ducting of any type.

C. Related Work Specified Elsewhere:

1. CUTTING AND PATCHING: Section 010450.

1.2 QUALITY ASSURANCE

A. Reference Standards:

1. Underwriters Laboratories Inc. (UL):
   a. Building Materials Directory, latest edition.
   b. Fire Resistance Directory, latest edition.
   c. UL1479 - Fire Tests of Through-Penetration Firestops.

2. Factory Mutual (FM):
   a. FMS P7825 - Approval Guide 1989; Factory Mutual System; 1989 or later editions.

3. American Society for Testing and Materials (ASTM):
   a. E 814 - Standard Method of Fire Tests of Through-Penetration Firestops.
   b. E 84 - Surface Burning Characteristics of Building Materials.

B. Testing Requirements:

1. All materials shall be tested as firestop systems in accordance with ASTM E 814 (UL1479) or equivalent. Systems designs shall provide a fire-resistance rating equal to or exceeding the fire-resistance rating of the floor, wall, or ceiling assembly in which it is being installed.

Testing shall have been conducted or witnessed by an independent testing agency acceptable to the authorities having jurisdiction.

C. Environmental and In Service Requirements:

1. All materials supplied under this Specification, when installed as firestop systems, shall be suitable for use in the specified environment, and to the expected service conditions of the installation.
2. Environmental Conditions: The following conditions shall be considered in selection of appropriate materials for environmental conditions:
    a. Water Sealing: Openings requiring water sealing (such as openings through exterior walls or below grade subject to hydrostatic pressure) shall be sealed using appropriate waterproofing methods and materials subject to Engineer's approval. FIRESTOPPING SHALL BE INDEPENDENT AND IN ADDITION TO THIS FUNCTION.
    b. Water-Resistance: All firestopping materials and firestop designs shall be water-resistant and shall be insoluble in water when dried or cured (where said drying and/or curing is required for firestop functionally). All firestopping materials shall be capable of maintaining functionally under conditions of high humidity or transient exposure to water.
    c. Ambient Installation Temperatures: Firestop materials supplied shall be capable of being installed under prevailing temperature conditions unless provisions have been made to heat or cool the area of installation as required.

3. In-Service Conditions: The following conditions (along with any other specifications or requirements pertinent to this document) shall be considered in the selection of materials and designs for firestopping.
    a. Ampacity Derating: Materials and system designs shall not require ampacity derating in power cable installations.
    b. Materials Compatibility: Materials supplied under this Specification shall be compatible with all materials used in the system including materials used in or on penetrants, as well as all construction materials used in conjunction with the system. No solvent based materials shall be used unless specific test documentation is provided certifying compatibility with all contact materials.
    c. Flammability and Outgassing: All materials supplied under this Specification shall pose no particular fire hazard in storage, installation, cure or under in-service conditions.
    d. Installations Subject to Movement of Penetrants: Openings with penetrants subject to movement or vibration shall be sealed with products and systems designed to accommodate such movement without reduction or loss of functionality.
    e. Installations Subject to Frequent Retrofit: Materials and designs provided for through-penetrations where changes or penetrations will be made on a frequent basis, shall be capable of retrofit without damage to the system.

1.3 SUBMITTALS

A. Manufacturer's Data:

1. Submit manufacturer's technical information and installation instructions for each manufactured product.

B. Certification:

1. Submit certificates indicating that said materials conform to specified requirements.
2. Submit evidence of UL Classification, FM Approval, or equivalent third party testing. Submit certificate that such listings are current and subject to follow-up service inspection by listing body.

1.4 DELIVERY, STORAGE AND HANDLING

A. Coordinate delivery of products to minimize storage time at Project Site.

B. Deliver products to Project Site in original unopened containers bearing the name of the manufacturer, product name, type, and testing agency's identification mark.

C. Store products in accordance with manufacturer's instructions and provide protection from damage and exposure to the elements. All materials shall be stored in locations providing the temperature conditions as detailed by the manufacturer's written instructions. All damaged or deteriorated materials shall be removed from the Project Site.

1.5 JOB CONDITIONS

A. Sequencing/Scheduling:

1. Perform firestopping work after completion of work which penetrates fire barriers, but prior to covering up or eliminating access to the penetration. Coordinate with installers of such other work.

B. Protection:

1. Protect installed work during and after curing period.
2. Protect installed work from damage from construction operations using substantial barriers if necessary.
3. Repair damaged materials in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Provide firestopping materials of the following manufacturers provided compliance with specification requirements:

1. International Protective Coatings (IPC) Corporation.

2. 3M.
3. Blo Fireshield, Inc.
4. Dow Corning Corporation.

B. DO NOT substitute for products required by the tested assembly.

2.2 MATERIALS

A. Firestopping Materials:

1. Provide penetration seal assemblies whose fire-resistance ratings have been determined by testing in the configurations required and which have fire-resistance ratings at least as high as that of the fire-rated assembly in which they are to be installed.
2. Use the materials required for the tested assemblies indicated on the schedule. Where no tested assembly is indicated for a particular penetration, use any tested assembly which complies with the requirements of the specifications.
3. Provide products which:
   a. Allow normal expansion and contraction movement of the penetrating item without failure of the penetration seal.
   b. Emit no hazardous, combustible, or irritating by-products during installing or curing period.
   c. Do not require special tools for installation.

B. Labels:

1. Red, permanent marking using the words "FIRE-RATED ASSEMBLY - DO NOT DISTURB - SEE MAINTENANCE INSTRUCTIONS" or equivalent as approved by the authorities having jurisdiction.
2. For marking fire barriers, use wording "FIRE BARRIER - PROTECT ALL OPENINGS" in a manner acceptable to the authorities having jurisdiction.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Pre-Installation Inspection:

1. Inspect all fire barriers for penetrations of any type; mark or otherwise identify all penetrations indicating action required: 1) repair; 2) firestopping. Conduct inspection prior to covering up or enclosing walls or ceilings.
2. In the configuration of a particular penetration does not conform to the configuration to suit the assembly, do not use the firestopping assembly in other configurations except as specifically stated in the test report or as approved by the authorities having jurisdiction.

3.2 PREPARATION

A. Prepare penetration in accordance with the material manufacturer's instructions.

B. All contact surfaces, including penetrants and construction surfaces, shall be free of loose dirt, scale or rust, as well as grease or oil.

C. Power to exposed cables shall be shut off, all cable jacketing inspected, and any damage shall be reported to the Electrical Installer and repaired by same before proceeding.

D. Provide drop cloths or other protection as needed to protect surrounding areas.

3.3 INSTALLATION

A. Install penetration seals as per design requirements in strict accordance with manufacturer's instructions.

B. Inspect installation including sealant materials and any damming or support materials to verify integrity of installation. Where system design permits, remove damming or support materials only after it has been determined that sealant materials have fully cured or dried.

C. Install any covering materials or finish as per design requirements and manufacturer's instructions.

3.4 PERMANENT IDENTIFICATION OF PENETRATIONS

A. Mark each fire barrier above lay-in ceilings with words identifying it as a fire barrier at intervals required by authorities having jurisdiction, but not less than 20-feet per 2.02, Paragraph B., herein.

3.5 REPAIRS AND MODIFICATIONS

A. Identify damaged and/or improperly installed seals for repair or modification.

B. Modifications to penetrants shall be accomplished as per the firestop manufacturer's recommendations.

C. Only materials used in the original seal and designated by the manufacturer as suitable for said repair shall be used for this purpose.

3.6 FIELD QUALITY CONTROL

A. All seals shall be inspected for proper installation, drying, curing, adhesion as appropriate for the materials and systems being used. Where necessary, repairs shall be made and repaired installations shall be reinspected.

B. Access of work areas shall remain in place until designated inspector is notified that installation has been completed and is ready for inspection as required.

C. Obtain the services of firestopping material manufacturer's representative to instruct installers and to inspect the completed installations for correctness.

3.7 CLEANING

A. Clean up excess material adjacent to penetrations sealed as work progresses by methods and with cleaning materials approved by the manufacturers of the materials and of products to be cleaned.

END OF SECTION 07 27 00

SECTION 26 05 00 - ELECTRICAL METHODS AND REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to work of this section.

B. Furnish and install all electrical wiring, systems, equipment and accessories in accordance with the specifications and drawings. Capacities and ratings of motors, cable, panelboards, etc., and arrangement for specified items in general are shown on drawings.

C. All ampacities herein specified or indicated on the drawings are based on copper conductors, with the conduit and raceways accordingly sized. Aluminum conductors are not permitted.

1.2 MINIMUM REQUIREMENTS

A. References to the National Electrical Code (NEC), Underwriters Laboratories, Inc. (UL), Florida Building Code, and National Fire Protection Association (NFPA) are a minimum installation requirement standard. Design drawings and other specification sections shall govern in those instances where requirements are greater than those specified in NEC.

B. The rules and regulations of the Federal, State, local, civil authorities and utility companies in force at the time of execution of the contract shall become a part of this specification. In addition, the following codes and standards shall apply:

1. Florida Building Code (FBC) 5th Edition (2014): This code includes The 2014 FBC Building, Mechanical, Plumbing, Fuel Gas and Energy Conservation Volumes. Further, see “Referenced Standards” in the FBC, Building Chapter 35; FBC, Plumbing Chapter 14; FBC, Mechanical Chapter 15; FBC, Fuel Gas Chapter 8, FBC, Energy Conservation Chapter 5.) (Effective June 30, 2015)
2. 5th Edition of the Florida Fire Prevention Code (FFPC): (This code also includes the Florida versions of NFPA 1 and NFPA 101.) (Effective December 31, 2014)
3. 2011 National Electrical Code
4. State Requirements for Educations Facilities – 2014 Edition.

C. No work shall be done unless the Superintendent of the Contractor is on the job site. Work shall be properly protected, all rubbish removed promptly, and exposed work shall be carefully cleaned prior to final acceptance.

D. The term "provide" shall include labor, materials, and equipment necessary to furnish and install, complete and operable, the item or system indicated.

E. In decisions arising from discrepancies, interpretation of Drawings and Specifications, substitutes, and other pertinent matters, the decision of the Owner's representative's approval shall be final.

1.3 SPECIFICATIONS AND DRAWINGS

A. Plans show location of fixtures and equipment and are intended to depict the general intent of the work in scope, layout and quality of workmanship. They are not intended to show in minute detail every or all accessories intended for the purpose of executing the work, but it is understood that such details are a part of this work.

B. Where Drawings and Specifications conflict, it shall be the responsibility of this Contractor to bring such conflict to the attention of the Architect/Engineer for clarification. In general, the Architectural Drawings shall take precedence over the Mechanical Drawings with reference to building construction. All changes from the Drawings necessary to make the work conform with the building as constructed and to fit the work of other trades or to conform to the rules of authorities having jurisdiction, shall be made by the Contractor at his own expense.

C. Keep a record of the locations of concealed work and of any field changes in Contract Drawings and Specifications for each trade and, upon completion of the job, supply "As-Built" Drawings and Specifications showing in pencil on sepia reproducibles, any deviations from the original Drawings, indicating in the Specifications each manufacturer's name underlined or inserted whose product was used on the job. These Drawings shall indicate dimensions of buried utility lines from building walls. One set of sepia reproducibles of the original tracings will be furnished upon request for this purpose.

1.4 STANDARDS

A. All material and equipment shall be listed, labeled or certified by Underwriters Laboratories, Inc., where such standards have been established. Equipment and material which are not covered by UL Standards will be accepted provided equipment and material is listed, labeled, certified or otherwise determined to meet safety requirements of a nationally recognized testing laboratory. Equipment of a class which no nationally recognized testing laboratory accepts, certifies, lists, labels, or determines to be safe, will be considered if inspected or tested in accordance with national industrial standards, such as NEMA, or ANSI. Evidence of compliance shall include certified test reports and definitive shop drawings.

B. Definitions:

1. Listed: Equipment is "listed" if of a kind mentioned in a list which:
   a. Is published by a nationally recognized laboratory which makes periodic inspection of production of such equipment.
   b. States that such equipment meets nationally recognized standards or has been tested and found safe for use in a specified manner.

2. Labeled: Equipment is labeled if:

a. It embodies a valid label, symbol, or other identifying mark of a nationally recognized testing laboratory such as Underwriters Laboratories, Inc.
b. The laboratory makes periodic inspections of the production of such equipment.
c. The labeling indicates compliance with nationally recognized standards or tests to determine safe use in a specified manner.

3. Certified: Equipment is "certified" if:
   a. Equipment has been tested and found by a nationally recognized testing laboratory to meet nationally recognized standards or to be safe for use in a specified manner.
   b. Production is periodically inspected by a nationally recognized testing laboratory.
   c. It bears a label, tag, or other record of certification.

4. Nationally recognized Testing Laboratory: A testing laboratory which is approved, in accordance with OSHA regulations, by the Secretary of Labor.

1.5 QUALIFICATIONS (PRODUCTS AND SERVICES)

A. Manufacturers Qualifications: The manufacturer shall regularly and presently produce, as one of the manufacturer's principal products, the equipment and material specified for this project, and shall have manufactured the item for at least five years, unless otherwise noted elsewhere in the specifications or on the drawings.

B. Product Qualification:

1. Manufacturer's product shall have been in satisfactory operation on three installations of similar size and type, as this project, for approximately three years.
2. The Owner reserves the right to require the contractor to submit a list of installations where the products have been in operation before approval of said products.

C. Service Qualifications: There shall be a permanent service organization maintained or trained by the manufacturer which will render satisfactory service to this installation within four hours of receipt of notification that service is needed. Submit name and address of service organizations.

1.6 MANUFACTURED PRODUCTS

A. Materials and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items, for which replacement parts should be available. Items not meeting this requirement, but which otherwise meet technical specifications, and merits of which can be established through reliable test reports or physical examination of representative samples, will be considered.

B. When more than one unit of the same class of equipment is required, such units shall be the product of a single manufacturer.

C. Equipment Assemblies and Components:

1. All components of an assembled unit need not be products of the same manufacturer, however, the assembled unit shall be the responsibility of a single manufacturer and warranted as such.
2. Manufacturers of equipment assemblies, which include components made by others, shall assume complete responsibility for the final assembled unit.
3. Components shall be compatible with each other and with the total assembly for the intended service.
4. Constituent parts which are similar shall be the product of a single manufacturer.

D. All factory wiring shall be identified on the equipment being furnished and on all wiring diagrams.

1.7 EQUIPMENT REQUIREMENTS

A. Equipment voltage ratings shall be in accordance with the requirements indicated on the drawings or as specified.

B. Prior to bid, written approval shall be obtained by the Contractor for any equipment that differs from those specified on the drawings and specifications. The Contractor shall be prepared to submit samples of the equipment when requested at no cost to the Architect/Engineer.

1. The Contractor shall furnish drawings showing all installation details, shop drawings, technical data and other pertinent information as required to determine that the equipment is equivalent in quality and function to the equipment specified.
2. Approval by the Architect/Engineer of the equal equipment does not relieve the Contractor of the responsibility of furnishing and installing the equipment at no additional cost to the Owner.
3. Any other items required for the satisfactory installation of the equal equipment shall be furnished and installed at no additional cost to the Owner. This includes but shall not be limited to additions or changes to branch circuits, circuit protective devices, conduits, wire, feeders, controls, panels and correlation with other work, subject to the jurisdiction and approval of the Architect/Engineer.

C. Catalogue numbers, where given, are intended to give a basis for design, quality and function. Any other incidental equipment needed for a complete and functional installation shall be provided at no additional cost.

1.8 EQUIPMENT PROTECTION

A. Equipment and material shall be protected during shipment and storage against physical damage, dirt, moisture, cold and rain.

B. During installation, equipment, controls, controllers, circuit protective devices, etc., shall be protected against entry of foreign matter; and be vacuum cleaned both inside and outside before testing, operating and painting.

C. Damaged equipment shall be, as determined by the Architect/Engineer, placed in first class operating condition or be returned to the source of supply for repair or replacement.

D. Painted surfaces shall be protected with factory installed removable heavy kraft paper, sheet vinyl or equal.

E. Damaged paint on equipment and materials shall be refinished with the same quality of paint and workmanship as used by the manufacturer so repaired areas are not obvious.

1.9 WORK PERFORMANCE

A. Arrange, phase and perform work to assure electrical service for other buildings at all times.

B. New work shall be installed and connected to existing work neatly and carefully. Disturbed or damaged work shall be replaced or repaired to its prior conditions.

C. Coordinate location of equipment and conduit with other trades to minimize interferences.

D. Obtain and pay for all required installation inspections and deliver certificates approving installations to the Owner unless directed otherwise.

1.10 EQUIPMENT INSTALLATION AND REQUIREMENTS

A. Equipment location shall be as close as practical to locations shown on the drawings. Where architectural features govern location of work, refer to architectural drawings.

B. Working spaces shall not be less than specified in the National Electrical Code for all voltages specified.

C. Inaccessible Equipment:

1. Where the Owner/Architect/Engineer determines that the Contractor has installed equipment not conveniently accessible for operation and maintenance, equipment shall be removed and reinstalled as directed at no additional cost to the Owner.
2. "Conveniently accessibility" is defined as being capable of being reached without the use of ladders, or without climbing or crawling under or over obstacles such as motors, pumps, belt guards, transformers, piping, and duct work.

D. Equipment and Material:

1. New equipment and material shall be installed, unless otherwise specified.
2. Equipment and material shall be designed to assure satisfactory operation and operating life for environmental conditions where being installed. NEC and other code requirements shall apply to the installation in areas requiring special protection such as explosion-proof, watertight and weatherproof construction.

E. Utility Services:

1. Determine utility connection requirements and include in the base bid all costs to the Owner for utility service. Provide all required materials and labor for any power service shutdown and turn on for phasing.
2. Include all costs for temporary service, temporary routing of service or any other requirements of a temporary nature associated with the utility service.

F. Continuity of Service:

1. No service shall be interrupted or changed without permission from the Architect and the Owner. Written permission shall be obtained before any work is started.
2. When interruption of services is required, all persons concerned shall be notified and a prearranged time agreed upon.

G. Concrete Work:

1. Provide all cast-in-place concrete shown on the documents unless noted otherwise. Concrete work shall conform to all applicable Division 02 and 03 specification sections.
2. Provide all anchor bolts, metal shapes and templates required to be cast in concrete or used to form concrete for support of electrical equipment.

1.11 EQUIPMENT IDENTIFICATION

A. In addition to the requirements of the National Electrical Code, install an identification nameplate which will clearly indicate information required for use and maintenance of items such as switchboard, panelboards, cabinets, safety switches, separately enclosed circuit breakers, motor starters, communications systems cabinets, control devices and other significant equipment.

B. Nameplates shall be laminated white phenolic resin with a black core with engraved lettering, a minimum of 3/16-inch high. Nameplates that are furnished by manufacturer as a standard catalog item, or where other method of identification is herein specified, are exceptions. Hand written marker is not acceptable.

1.12 SUBMITTALS

A. The Architect/Engineer's approval shall be obtained for all equipment and material before delivery to the job site. Delivery, storage or installation of equipment or material which has not had prior approval will not be permitted at the job site. Submittals shall be made for all equipment and systems as indicated in the respective specification section.

B. All submittals shall include adequate descriptive literature, catalog cuts, shop drawings and other data necessary for the Architect/Engineer to ascertain that the proposed equipment and materials comply with specification and drawing requirements. Catalog cuts submitted for approval shall be legible and clearly identify equipment being submitted.

C. Submittals for individual systems and equipment assemblies which consist of more than one item or component shall be made for the system or assembly as a whole. Partial submittals will not be considered for approval. Submittals shall be submitted for all applicable products and materials specified in each individual section of these specifications.

D. Make submittals for the equipment and materials in accordance with the following:

1. Mark the submittals, "SUBMITTED UNDER SECTION_____".
2. Submittals shall be marked to show specification reference including the section and paragraph numbers.
3. The submittals shall include the following:
    a. Information that confirms compliance with contract requirements. Include the manufacturer's name, model or catalog numbers, catalog information, technical data sheets, shop drawings, pictures, nameplate data and test reports as required. Provide any additional information specifically requested in the individual specification section or on the drawings.

4. Electronic PDF submittal files shall be named utilizing the specification number followed by a sequential number for the submittal made under the given specification number followed by "r#" if it is a resubmittal, and then followed by a brief description of the submitted item.
    a. The description shall indicate the actual item submitted, shall not be general in nature, and does not have to be that of the specification section heading.
    b. Using the example, "230519-4r2 Differential Pressure Gauge"; 230519 – Meters and Gauges is the relevant specification, the "4" shows it was the fourth submittal for specification section 230519 02,"r2" shows it was the second resubmittal, and the description indicates what item is submitted.
    c. Each specification item shall be submitted in a separate PDF file. PDF files with multiple specification items will be returned without review.
    d. Each file shall have sufficient space allowance for the Architects and Engineer's review stamp(s).
    e. Each file shall have the Constructions Managers review stamp(s) and indicate information required by specification 260500.1.12.F.

E. Shop drawings on paper 11"X17" or smaller in size shall be submitted in a tabbed and indexed three ring binder. The binder shall not exceed 11-5/8" height. Partial submittals are unacceptable. The index shall indicate the related specification section number.

F. The Construction manager will certify that all Division 26 shop drawings are in conformance with the plans and specifications. Deviations from the plans and specifications shall be noted, and the specific area of the deviation clouded and in contrasting color (green) with a complete explanation for the reasons for the deviation.

G. Carefully examine all shop drawings and mark-up as necessary before submitting to the Architect/Engineer for review. The consultant will only consider shop drawings bearing the contractor's stamp of approval.

H. The engineer's review shall not relieve the contractor from the responsibility for deviations from drawings and specifications. The engineer's review shall be construed to apply only to general arrangement and shall not relieve the contractor from the responsibility for the correctness of details and dimensions and provision of the correct equipment.

I. The contractor shall retain copies of all reviewed shop drawings on the job site for reference.

J. In addition to the requirement of SUBMITTALS, the Owner reserves the right to request the manufacturer to arrange for the Owner's representative(s) to see typical active systems in operation, when there has been no prior experience with the manufacturer or the type of equipment being submitted.

K. Operation and Maintenance Manuals:

1. Maintenance manuals shall be complete and shall be furnished in a loose leaf binder or in the manufacturer's standard binder. Information shall be sufficient to enable a qualified technician to perform normal first line maintenance and repair. A parts list shall be included which shall include those replacement parts recommended by the equipment manufacturer, quantity of parts, current price and availability of each part.
2. Operation manuals shall be clear and concise and shall describe, in detail, the information required to properly operate the equipment specified. The manuals shall include complete catalog cuts and as-built wiring diagrams.
3. Operation and maintenance manuals shall be submitted for approval prior to final close-out.

1.13 CUTTING, PATCHING, EXCAVATION, BACKFILL, AND LAYOUT

A. Provide openings and excavation required for the installation of the electrical work. Patch work and backfill as required. Finished work shall match the existing adjoining work.

B. Verify all conditions affecting the work to be performed under this contract.

C. Carefully verify measurements at the site, determine the exact location of chases and openings required. Provide sleeves, inserts, supports, concrete work, and hangers as required. No columns, beams, joists, building foundations nor any other structural building component shall be cut, drilled or disturbed in any way without prior approval. Conflicts shall immediately be brought to the attention of the Architect/Engineer.

D. All excavation on sites containing existing buildings and existing services, shall be done with hand shovel to avoid damage to existing services. Where hand shovel is not practical extreme caution shall be taken when performing excavation. The contractor will be responsible for locating any existing utilities and adjusting manhole and handhole locations and conduit routing as necessary. Any damage incurred by the Contractor shall be repaired by the Contractor in a manner approved by the Architect/Engineer at no cost to the Owner and with no extension of time limitation.

1.14 EXPERIENCE

A. The Contractor performing this work shall be a licensed, reputable firm, regularly performing the type of work incorporated in this project and who also maintains, as part of the firm, a service department with qualified personnel who regularly perform this type of work. The Contractor shall, upon request, show evidence of at least two jobs of similar character and size installed within the preceding two years.

1.15 ELECTRICAL WORK FOR MECHANICAL SYSTEMS

A. Factory installed starters, controllers, and control equipment mounted in manufactured mechanical equipment necessary for mechanical equipment operation shall be furnished under Division 23 Mechanical.

B. Power wiring for motors and installation of starters not provided integral with equipment shall be under Division 26 Electrical.

C. Temperature, humidity, pressure and similar controls essential to the operation of mechanical systems, and wiring and conduit thereof, including interlock wiring, shall be under Division 23 of Specifications, installed in accordance with requirements of Division 26.

D. Motors shall be furnished under Division 23 Mechanical of capacity required to operate equipment specified, but shall not be less than that specified.

E. All low voltage (120V and under) temperature control wiring for Division 15 equipment shall be provided under by Division 23.

F. Division 23 shall provide conduit when required for control wiring, installed in accordance with Division 26 requirements.

1.16 MOTORS

A. All motors shall be furnished and installed under Division 15 Mechanical and shall be wired under Division 16 Electrical.

1.17 REMOVAL OF RUBBISH

A. Contractor shall keep premises free from accumulations of waste material or rubbish caused by his employees or work. At completion of work, he shall remove all his tools, scaffolding, surplus materials, and rubbish from building and site. He shall leave premises and his work in a clean orderly condition acceptable to the Architect/Engineer.

1.18 QUIET OPERATION AND VIBRATION

A. All equipment provided under this section shall operate under all conditions of load free of objectionable sound and vibration. Sound and vibration conditions considered objectionable shall be corrected in an approved manner.

B. Vibration and sound control shall be by means of approved vibration eliminators or sound attenuators in a manner as specified and as recommended by the manufacturer.

1.19 CLEANING AND ADJUSTMENTS

A. Upon completion of the work, Contractor shall clean and re-lamp all light fixtures, clean and identify all equipment, adjust and test all equipment and apparatus which he has installed and make certain such apparatus and mechanisms are in proper working order and ready to test.

B. During construction protect all conduit and equipment from damage and dirt. Cap the open ends of all conduit and equipment.

1.20 STORAGE OF MATERIALS

A. All materials stored on site shall be properly protected from injury or deterioration. Materials shall not be stored in contact with ground or floor.

B. Do not remove manufacturer's packing materials until ready to install. Materials showing signs of corrosion, improper handling or storage shall be replaced at no cost to the Owner.

C. Provide continuous protection for all equipment already installed.

1.21 WATERPROOFING

A. Where any work pierces waterproofing including waterproof concrete, the method of installation shall be as approved by the Owner before the work is done.

B. Provide all necessary sleeves, caulking and flashing required to make openings absolutely watertight. Waterproof flashing materials shall be compatible with base materials.

1.22 TESTS

A. Contractor shall make all tests required to establish the adequacy, quality, safety, completed status and satisfactory operation of all systems to the satisfaction of the Architect/Engineer. Provide all instruments, labor and services necessary to conduct tests.

B. All conductors for major feeders and services (400 amps and up) shall be megged to test insulation and connection integrity prior to permanent energization.

1.23 INSTRUCTIONS

A. Fully instruct Owner's personnel in the care and operation of electrical systems, including all communications, sound and fire alarm systems and furnish a letter to the Architect/Engineer advising the particular person(s) who have received such instruction.

1.24 WARRANTY

A. Equipment shall be started, tested, adjusted, and placed in satisfactory operating condition. Furnish a letter addressed to the Architect/Engineer advising that the completed systems have been installed in accordance with the Plans and Specifications and that they are in proper operating condition. The Owner shall receive a written warranty covering all defects in workmanship and material for a minimum period of one year from date of substantial completion. Any defects appearing within this year period shall be repaired or replaced without additional cost to the Owner. Refer to individual specification sections for additional warranty requirements. Longer, extended warranty periods shall apply where specified in any individual specification section.

1.25 ACCEPTANCE

A. Before requesting final inspection:

1. Complete all work required. If any items are held in abeyance as incomplete for final inspection, list such items together with explanation for delay.
2. Submit statement that equipment is properly installed, adjusted, tested and operation is satisfactory.
3. Submit copy of other data as may be outlined in these specifications.

B. Copies of the above data shall be submitted to the Architect/Engineer prior to requesting final inspection.

1.26 SINGULAR NUMBER

A. Where any device or part of equipment is referred to in these specifications in the singular number (such as "the switch"), such reference shall be deemed to apply to as many such devices as are required to complete the installation as shown on the drawings.

1.27 EXISTING ELECTRICAL SYSTEMS

A. Existing power, lighting and low voltage systems that are to remain shall be protected during construction and shall remain in operation while the building is occupied. Any and all areas that are occupied during construction shall have operational systems, including fire alarm, intercom/paging, and voice/data cabling infrastructure system. Any damage to any existing systems shall be repaired or replaced as necessary to place it back into acceptable operational

condition. All electrical systems are deemed to be operational and in satisfactory condition. At the contractors option, the following systems may be fully tested prior to any work in the building and any existing problems or trouble on these systems shall be reported to the Owner in writing. Any new problems discovered during or after construction that are not documented will be the responsibility of the Contractor to correct at no additional cost to the Owner.

1. Any TV or AV systems
2. Fire Alarm System
3. Sound and intercom systems
4. Voice and Data Network system, including any existing fiber backbone
5. Security systems

1.28 PHASING OF POWER AND SYSTEMS

A. Existing power, voice/data network system, fire alarm, and security systems may need to be phased. These systems shall be operational when the building is occupied. All costs for labor and materials necessary to accomplish any required phasing shall be included. Any downtime required for the transition from the old system to the new system shall be coordinated with the Owner and approved by the Owner. Costs for any necessary overtime and use of the Owner's custodial staff after hours shall be included in the bid.

B. Provide all required temporary power, control and low voltage wiring as necessary to maintain operation of these systems during phasing of the construction.

C. Provide temporary power connections for all required tempoaray HVAC equipment, including existing equipment being used for temporary use, and for all rental HVAC equipment.

1.29 MULIT-WIRE BRANCH CIRCUITS

A. All multi-wire branch circuits shall comply with Article 210.4 of the 2011 National Electrical Code. Provide all required handle ties where applicable multi-wire branch circuits are indicated on the drawings.

END OF SECTION 26 05 00

SECTION 26 05 19 - WIRES AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-01 Specification sections, apply to work of this section.

B. This section is a Division-26 Basic Electrical Materials and Methods section, and is part of each Division-23 and -26 section making reference to electrical wires and cables specified herein.

1.2 DESCRIPTION OF WORK

A. Extent of electrical wire and cable work is indicated by drawings and schedules.

B. Types of electrical wire, cable, and connectors specified in this section include the following:

1. Copper conductors.
2. Fixture wires.
3. Flexible cords and cables.
4. Wirenut connectors.

C. Applications of electrical wire, cable, and connectors required for project are as follows:

1. For motor-branch circuits.
2. For power distribution circuits
3. For lighting circuits
4. For appliance and equipment circuits

1.3 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of electrical wire and cable products of types, sizes, and ratings required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer's Qualifications: Firm with at least 3 years of successful installation experience with projects utilizing electrical wiring and cabling work similar to that required for this project.

C. NEC Compliance: Comply with NEC requirements as applicable to construction, installation and color coding of electrical wires and cables.

D. UL Compliance: Comply with applicable requirements of UL Std 83, "Thermoplastic-Insulated Wires and Cables", and Std 486A, "Wire Connectors and Soldering Lugs for Use with Copper Conductors".

E. UL Compliance: Provide wiring/cabling and connector products which are UL-listed and labeled.

F. NEMA/ICEA Compliance: Comply with NEMA/ICEA Std Pub/ No.'s WC 5, "Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy", and WC-30, "Color Coding of Wires and Cables", pertaining to electrical power type wires and cables.

G. IEEE Compliance: Comply with applicable requirements of IEEE Stds 82, "Test Procedures for Impulse Voltage Tests on Insulated Conductors", and Std 241, "IEEE Recommended Practice for Electric Power Systems in Commercial Buildings" pertaining to wiring systems.

H. ASTM Compliance: Comply with applicable requirements of ASTM B1, 2, 3, 8, and D-753. Provide copper conductors with conductivity of not less than 98% at 20oC (68oF).

PART 2 - PRODUCTS

2.1 AVAILABLE MANUFACTURERS

A. Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

1. Wire and Cable:
   a. American Wire and Cable Co.
   b. Anaconda-Ericsson Inc; Wire and Cable Div.
   c. Belden Div; Cooper Industries

2. Connectors:
   a. AMP, Inc.
   b. Appleton Electric Co.
   c. Burndy Corporation
   d. Thomas and Betts Corp.

2.2 WIRES, CABLES, AND CONNECTORS

A. General: Provide electrical wires, cables, and connectors of manufacturer's standard materials, as indicated by published product information; designed and constructed as recommended by manufacturer, for a complete installation, and for application indicated. Except as otherwise indicated, provide copper conductors with conductivity of not less than 98% at 20oC (68oF).

B. Building Wires: Provide factory-fabricated wires of sizes, ampacity ratings, and materials for applications and services indicated. Where not indicated, provide proper wire selection as determined by Installer to comply with project's installation requirements, NEC and NEMA

standards. Select from the following UL types, those wires with construction features which fulfill project requirements:

1. Type THHN, THWN, THHW, XHHW, THHN/THWN: Unless otherwise indicated, all conductors for dry locations requiring a conductor temperature rating 75oC (167oF) or less. Insulation shall be flame retardant, moisture and heat resistant, thermoplastic. Conductor shall be annealed copper.
2. Type THWN, THHW, XHHW, THHN/THWN: Unless otherwise indicated, all conductors for wet or dry locations requiring a conductor temperature rating of 75oC (167oF) or less. Insulation shall be flame retardant, moisture and heat resistant thermoplastic. Conductor shall be annealed copper.
3. Type THHN, THHW, XHHW: Unless otherwise indicated, all conductors for dry locations requiring a conductor temperature rating of 90oC (194oF) or less. Insulation shall be flame retardant, moisture and heat resistant thermoplastic. Conductor shall be annealed copper.
4. Type XHHW-2: Unless otherwise indicated, all conductors for wet locations requiring a conductor temperature rating of 90oC (194oF) or less. Insulation shall be flame retardant, moisture and heat resistant thermoplastic. Conductor shall be annealed copper.
5. Conductors for use at 600 volts or below shall be 600 volt rated. Wire No. 12 and smaller may be solid or stranded and wire No. 10 and larger shall be stranded only. Stranded conductors shall terminate in crimp type lugs.
6. Motor circuit branch wiring and associated control wiring: Provide type THHN insulation in dry and damp locations. Provide type THHW insulation in wet locations. All motor wiring to be stranded copper.
7. Wiring in fluorescent fixture channels: Provide conductors with a 90°C temperature rating, type THHN or TFFN insulation.

C. Cables: Provide UL-type factory-fabricated cables of sizes, ampacity ratings, and materials and jacketing/sheathing as indicated for services indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements, NEC and NEMA standards.

D. Connectors:

1. General: Provide UL-type factory-fabricated, metal connectors of sizes, ampacity ratings, materials, types and classes for applications and for services indicated. Where not indicated, provide proper selection as determined by Installer to comply with project's installation requirements, NEC and NEMA standards. Select from the following, those types, classes, kinds, and styles of connectors to fulfill project requirements:
   a. Type: Pressure.
   b. Class: Insulated.
   c. Kind: Copper (for Cu to Cu connection).
   d. Style: Butt connection.
   e. Style: Elbow connection.
   f. Style: Combined "T" and straight connection.
   g. Style: "T" connection.
   h. Style: Split-bolt parallel connection.
   I. Style: Tap connection.

j. Style: Pigtail connection.
k. Style: Wirenut connection.

PART 3 - EXECUTION

3.1 INSTALLATION OF WIRES AND CABLES

A. General: Install electrical cables, wires, and wiring connectors as indicated, in compliance with applicable requirements of NEC, NEMA, Ul, and NECA's "Standard of Installation", and in accordance with recognized industry practices.

B. Coordinate wire/cable installation work including electrical raceway and equipment installation work, as necessary to properly interface installation of wires/cables with other work.

C. Pull conductors simultaneously where more than one conductor is being installed in the same raceway.

D. Use pulling compound or lubricant, where necessary; compound used must not deteriorate conductor or insulation.

E. Use pulling means including, fish tape, cable, rope and basket weave or wire/cable grips which will not damage cables or raceway. Any cable damaged during installation shall be completely replaced.

F. Keep conductor splices to minimum. No joints shall be made in conductor except at junction boxes, outlet boxes or splice boxes. Newly installed conductors shall not be spliced unless specifically noted on the drawings. Splices shall not be permitted underground.

G. Install splices and tapes which possess equivalent-or-better mechanical strength and insulation ratings than conductors being spliced.

H. Use splice and tap connectors which are compatible with conductor material.

I. Tighten electrical connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Std 486A and B.

J. At least eight inches (8") of slack wire shall be left in every outlet box whether it be in use, or left for future use.

K. Color code wiring as follows:

1. 120/208 volt, 3 phase, 4 wire: phase A-black, phase B-red, phase C-blue, neutral-white; ground conductor-green.
2. 277/480 volt, 3 phase, 4 wire: phase A-brown, phase B-orange, phase C-yellow, neutral-gray; ground conductor-green.

L. Wire and cable boxes and reels shall bear the date of manufacture and must not bear dates by more than one year preceeding contract date.

M. Minimum conductor sizes, except as specifically identified on the drawings, shall be as follows:

1. No. 12 - Branch circuits of any kind, except as specified otherwise below.
2. No. 14 - Signal systems, fire alarm system, unless specifically noted otherwise.
3. No. 10 - Exit light circuits, emergency circuits, security lighting, and exterior light circuits.

3.2 FIELD QUALITY CONTROL

A. Prior to energization, test wires and cables for electrical continuity and for short-circuits.

END OF SECTION 26 05 19

SECTION 26 05 26 - GROUNDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-01 Specification sections, apply to work of this section.

B. Division-26 Basic Electrical Materials and Methods section apply to work of this section.

1.2 DESCRIPTION OF WORK

A. Extent of grounding work is indicated by drawings and schedules.

B. Types of grounding specified in this section include the following:

1. Solid grounding

C. Applications of grounding work in this section including the following:

1. Underground metal water piping
2. Metal building frames
3. Grounding electrodes
4. Grounding rods
5. Service equipment
6. Enclosures
7. Equipment
8. Communications systems

1.3 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of electrical connectors, terminals and fittings, of types and ratings required, and ancillary grounding materials, including stranded cable, copper braid and bus, ground rods and plate electrodes, whose products have been in satisfactory use in similar service for not less than 3 years.

B. Installer: Qualified with at least 3 years of successful installation experience on projects with electrical grounding work similar to that required for project.

C. NEC Compliance: Comply with NEC requirements as applicable to materials and installation of electrical grounding systems, associated equipment and wiring. Provide grounding products which are UL-listed and labeled.

D. UL Compliance: Comply with applicable requirements of UL Standards Nos. 467 and 869 pertaining to electrical grounding and bonding.

E. IEEE Compliance: Comply with applicable requirements of IEEE Standard 142 and 241 pertaining to electrical grounding.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's data on grounding systems and and accessories.

B. Shop Drawings: Submit layout drawings of grounding systems and accessories including, but not limited to, ground wiring, copper braid and bus, ground rods, and plate electrodes.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering grounding products which may be incorporated in the work include, but not limited to, the following:

1. Burndy Corp.
2. Crouse-Hinds Co.
3. Electrical Components Div.; Gould Inc.
4. Thomas and Betts Corp.

2.2 GROUNDING SYSTEMS

A. Materials and Components:

1. General: Except as otherwise indicated, provide electrical grounding systems indicated; with assembly of materials, including, but not limited to, cables/wires, connectors, terminals (solderless lugs), grounding rods/electrodes and plate electrodes, bonding jumper braid, surge arresters, and additional accessories needed for complete installation. Where more than one type unit meets indicated requirements, selection is Installer's option. Where materials or components are not indicated, provide products complying with NEC, UL, IEEE, and established industry standards for applications indicated.

B. Conductors: Unless otherwise indicated, provide electrical grounding conductors for grounding connections matching power supply wiring materials and sized according to NEC.

C. Ground Rods: Solid copper or copper clad, minimum 3/4" dia. x 10'. Provide longer rods if necessary for required resistivity.

D. Electrical Grounding Connection Accessories: Provide electrical insulating tape, heat-shrinkable insulating tubing, welding materials, bonding straps, as recommended by accessories manufacturers for type services indicated.

PART 3 - EXECUTION

3.1 INSPECTION

A. Installer must examine areas and conditions under which electrical grounding connections are to be made and notify Contractor in writing of conditions detrimental to proper completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 INSTALLATION OF ELECTRICAL GROUNDING

A. General: Install electrical grounding systems where shown, in accordance with applicable portions of NEC, with NECA's "Standard of Installation", and in accordance with recognized industry practices, to ensure that products comply with requirements and serve intended functions.

B. Coordinate with other electrical work as necessary to interface installation of electrical grounding system work with other work.

C. Install clamp-on connectors only on thoroughly cleaned metal contact surfaces, to ensure electrical conductivity and circuit integrity.

D. All ground connections to water service entrance shall be installed to be exposed and visible for inspection at all times. Insulation shall not be installed over ground connections.

E. A water pipe, by itself, is not an adequate grounding electrode and must be supplemented by dual grounding electrodes, a minimum of 8 feet apart, and effectively bonded together. The supplemental ground shall be per Code with the "Footing type electrode" installed as required by current National Electrical Code. Provide a new service entrance grounding electrode system including bonding to metallic cold water pipe, structural steel and building re-bar, if available.

F. All ground connections shall be made on surfaces which have been cleaned of all paint, dirt, oil, etc., so that connections are bare metal to bare metal contact. All ground connections shall be tight and shall be made with U.L. listed grounding devices, fittings, bushings, etc.

G. Duplex receptacles of any amperage shall be grounding type and shall have a separate grounding contact. A separate jumper shall be installed between the grounding terminal on the device and the metallic box. The Contractor may provide U.L. listed self-grounding receptacles in lieu of providing the separate jumper.

H. Single and duplex receptacles shall have all grounded metal mechanically bonded together. Pressure bonding only is not acceptable.

I. In all cases where flexible metallic conduit, nonmetallic rigid conduit or liquid tight flexible conduit is used, a green wire ground conductor shall be used to provide ground continuity between the equipment of device and the conduit raceway system.

J. Provide a separate green wire ground conductor for each branch circuit originating from each panelboard. This ground shall be used to ground the device or load fed, and shall be bonded to components of the raceway system, such as junction boxes, starter or disconnect switch enclosures, equipment cases, etc. The green wire ground conductor shall terminate in the panelboard at the green wire ground bus. Ground conductors for branch circuits shall be of size indicated in NEC, except minimum size ground conductor shall be No. 12 AWG.

K. Each branch feeder originating at the switchboard(s) shall have a green wire ground conductor originating at the ground bus in the switchboard and terminating at the green wire ground bus in the panelboard. This green wire ground conductor shall be of size indicated in NEC except in no instance smaller than No. 8 AWG.

L. The green wire ground conductor is in addition to the neutral conductor and in no case shall the neutral conductor serve as the grounding means.

M. Multiple conductors in a single lug not permitted. Each grounding conductor shall terminate in its own terminal lug.

N. Grounding connections shall be tested and certified by the installer. The service entrance ground and each building ground shall have a maximum of 5 ohms resistance to ground. Supplemental grounding shall be provided if necessary.

END OF SECTION 26 05 26

SECTION 26 05 29 - SUPPORTING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-01 Specification sections, apply to work of this section.

B. This section is a Division-26 Basic Electrical Materials and Methods section, and is a part of each Division-26 section making reference to electrical supporting devices specified herein.

1.2 DESCRIPTION OF WORK

A. Extent of supports, anchors, sleeves, and seals is indicated by drawings and schedules and/or specified in other Division-16 sections.

B. Types of supports, anchors, sleeves, and seals specified in this section include the following:

1. Clevis hangers
2. C-clamps
3. I-beam clamps
4. One-hole conduit straps
5. Round steel rods
6. Lead expansion anchors
7. Toggle bolts
8. Wall and floor seals

C. Supports, anchors, sleeves, and seals furnished as part of factory-fabricated equipment, are specified as part of that equipment assembly in other Division-26 sections.

1.3 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of supporting devices, of types, sizes, and ratings required, whose products have been in satisfactory use in similar service for not less than 3 years.

B. NEC Compliance: Comply with NEC requirements as applicable to construction and installation of electrical supporting devices.

PART 2 - PRODUCTS

2.1 MANUFACTURED SUPPORTING DEVICES

A. General: Provide supporting devices which comply with manufacturer's standard materials, design and construction in accordance with published product information, and as required for complete installation; and as herein specified. Where more than one type of supporting device meets indicated requirements, selection is Installer's option.

B. Supports: Provide supporting devices of types, sizes, and materials indicated; and having the following construction features:

1. Clevis Hangers: For supporting 2" rigid metal con duit; galvanized steel; with 1/2" dia. hole for round steel rod; approximately 54 pounds per 100 units.
2. Reducing Couplings: Steel rod reducing coupling, 1/2" x 5/8"; black steel; approximately 16 pounds per 100 units.
3. C-Clamps: Black malleable iron; 1/2" rod size; approximately 70 pounds per 100 units.
4. I-Beam Clamps: Black steel, 1-1/4" x 3/16" stock; 3/8" cross bolt; flange width 2"; approximately 52 pounds per 100 units.
5. One-Hole Conduit Straps: For supporting 3/4" rigid metal conduit; galvanized steel; approximately 7 pounds per 100 units.
6. Hexagon Nuts: For 1/2" rod size; galvanized steel; approximately 4 pounds per 100 units.
7. Round Steel Rod: Black steel; 1/2" dia.; approximately 67 pounds per 100 feet.
8. Offset Conduit Clamps: For supporting 2" rigid metal conduit; black steel; approximately 200 pounds per 100 units.

C. Anchors: Provide anchors of types, sizes, and materials indicated, with the following construction features:

1. Lead Expansion Anchors: 1/2", approximately 38 pounds per 100 units.
2. Toggle Bolts: Springhead; 3/16" x 4", approximately 5 pounds per 100 units.

D. Available Manufacturers: Subject to compliance with requirements, manufacturers offering anchors which may be incorporated in the work include, but are not limited to, the following:

1. Abbeon Cal Inc.
2. Ackerman Johnson Fastening Systems, Inc.
3. Elcen Metal Products Co.
4. Ideal Industries, Inc.
5. Joslyn Mfg. and Supply Co.
6. McGraw Edison Co.
7. Rawlplug Co., Inc.
8. Star Expansion Co.
9. Expansion Bolt Co.

E. Sleeves and Seals: Provide sleeves and seals, of types, sizes, and materials indicated, with the following construction features:

1. Wall and Floor Seals: Provide factory-assembled watertight wall and floor seals, of types and sizes indicated; suitable for sealing around conduit, pipe, or buting passing through concrete floors and walls. Construct seals with steel sleeves, malleable iron body, neoprene sealing grommets and rings, metal pressure rings, pressure clamps, and cap screws.

F. U-Channel Strut Systems: Provide U-channel strut system for supporting electrical equipment, 12-gage hot-dip galvanized steel, of types and sizes indicated; construct with 9/16" dia. holes, 8" o.c. on top surface, with standard finish, and with the following fittings which mate and match U-channel.

1. Fixture hangers
2. Channel hangers
3. Thinwall conduit clamps
4. Rigid conduit clamps
5. Conduit hangers
6. U-bolts

G. Available Manufacturers: Subject to compliance with requirements, manufacturers offering channel systems which may be incorporated in the work include, but are not limited to, the following:

1. Greenfield Mfg. Co.; Inc.
2. Midland-Ross Corp.
3. OZ/Gedney Div.; General Signal Corp.
4. Power-Strut Div.; Van Huffel Tube Corp.
5. Unistrut Div.; GTE Products Corp.

H. Pipe Sleeves: Provide pipe sleeves of one of the following:

1. Sheet Metal: Fabricate from galvanized sheet metal; round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate sleeves from the following gage metal: 3" and smaller, 20-gage; 4" to 6", 16-gage; over 6", 14-gage.
2. Steel Pipe: Fabricate from Schedule 40 galvanized steel pipe; remove burrs.
3. Iron Pipe: Fabricate from cast-iron or ductile-iron pipe; remove burrs.
4. Plastic Pipe: Fabricate from Schedule 80 PVC plas tic pipe; remove burrs.

I. Sleeve Seals: Provide sleeves for piping which penetrates foundation walls below grade, or exterior walls. Calk between sleeve and pipe with non-toxic, UL-classified calking material to ensure watertight seal.

PART 3 - EXECUTION

3.1 INSTALLATION OF SUPPORTING DEVICES

A. Install hangers, anchors, sleeves, and seals as indicated, in accordance with manufacturer's written instructions and with recognized industry practices to insure supporting devices comply

with requirements. Comply with requirements of NECA and NEC for installation of supporting devices.

B. Coordinate with other electrical work, including raceway and wiring work, as necessary to interface installation of supporting devices with other work. Coordinate support locations with other structural and mechanical trades. Supports shall not be attached to mechanical or electrical piping, conduit, ductwork, ceiling grid system or any other non-structural member.

C. Install hangers, supports, clamps, and attachments to support piping properly from building structure. Arrange for grouping of parallel runs of horizontal conduits to be supported together on trapeze type hangers where possible. Install supports with spacings indicated and in compliance with NEC requirements.

END OF SECTION 26 05 29

SECTION 26 05 30 - ELECTRICAL CONNECTIONS FOR EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-01 Specification sections, apply to work of this section.

B. This section is a Division-26 Basic Electrical Materials and Methods section, and is part of each Division-23 and 26 section making reference to electrical connections for equipment specified herein.

1.2 DESCRIPTION OF WORK

A. Extent of electrical connections for equipment is indicated by drawings and schedules. Electrical connections are hereby defined to include connections used for providing electrical power to equipment.

B. Applications of electrical power connections specified in this section include the following:

1. From electrical source to motor starters.
2. From motor starters to motors.
3. To lighting fixtures.
4. To grounds including earthing connections.
5. To equipment of communication, CCTV and alarm systems.

C. Electrical connections for equipment, not furnished as integral part of equipment, are specified in Division-23 and other Division-26 sections, and are work of this section.

D. Motor starters and controllers, not furnished as integral part of equipment, are specified in applicable Division-26 sections, and are work of this section.

E. Refer to Division-23 specification sections and drawings for motor starters and controllers furnished integrally with equipment; not work of this section. Connections to this equipment is work of this section.

F. Junction boxes and disconnect switches required for connecting motors and other electrical units of equipment are specified in applicable Division-26 sections, and are work of this section.

G. Raceways and wires/cables required for connecting motors and other electrical units of equipment are specified in applicable Division-26 sections, and are work of this section.

H. Refer to other Division-26 and Division-23 sections for low voltage control system wiring; not work of this section.

1.3 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of electrical connectors and terminals, of types and ratings required, and ancillary connection materials, including electrical insulating tape, soldering fluxes, and cable ties, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer's Qualifications: Firm with at least 2 years of successful installation experience with projects utilizing electrical connections for equipment similar to that required for this project.

C. NEC Compliance: Comply with applicable requirements of NEC as to type products used and installation of electrical power connections (terminals and splices), for junction boxes, motor starters, and disconnect switches.

D. IEEE Compliance: Comply with Std 241, "IEEE Recommended Practice for Electric Power Systems in Commercial Buildings" pertaining to connections and terminations.

E. ANSI Compliance: Comply with applicable requirements of ANSI/NEMA and ANSI/EIA standards pertaining to products and installation of electrical connections for equipment.

F. UL Compliance: Comply with UL Std 486A, "Wire Connectors and Soldering Lugs for Use with Copper Conductors", including, but not limited to, tightening of electrical connectors to torque values indicated. Provide electrical connection products and materials which are UL-listed and labeled.

G. ETL Compliance: Provide electrical connection products and materials which are ETL-listed and labeled.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

1. AMP Incorporated
2. Appleton Electric Co.
3. Arrow-Hart Div., Crouse-Hinds Co.
4. Burndy Corporation
5. General Electric Co.
6. Gould, Inc.
7. Harvey Hubbell Inc.

8. Square D Company
9. Thomas and Betts Corp.

2.2 MATERIALS AND COMPONENTS

A. General: For each electrical connection indicated, provide complete assembly of materials, including but not necessarily limited to, pressure connectors, terminals (lugs), electrical insulating tape, electrical solder, electrical soldering flux, heat-shrinkable insulating tubing, cable ties, solderless wirenuts, and other items and accessories as needed to complete splices and terminations of types indicated.

B. Metal Conduit, Tubing, and Fittings:

1. General: Provide metal conduit, tubing, and fit tings of types, grades, sizes, and weights (wall thicknesses) indicated for each type service. Where types and grades are not indicated, provide proper selection as determined by Installer to fulfill wiring requirements and comply with NEC requirements for raceways. Provide products complying with Division-16 basic electrical materials and methods section "Raceways", and in accordance with the following listing of metal conduit, tubing, and fittings:
   a. Rigid steel conduit.
   b. Rigid metal conduit fittings.
   c. Electrical metallic tubing.
   e. Liquid-tight flexible metal conduit.
   f. Liquid-tight flexible metal conduit fittings.
   g. Flexible metal conduit.
   h. Flexible metal conduit fittings.

C. Wires, Cables, and Connectors:

1. General: Provide wires, cables, and connectors complying with Division-16 basic electrical materials and methods section "Wires and Cables".
2. Wires/Cables: Unless otherwise indicated, provide wires/cables (conductors) for electrical connections which match, including sizes and ratings, of wires/cables which are supplying electrical power. Provide copper conductors with conductivity of not less than 98% at 20oC (68oF).
3. Connectors and Terminals: Provide electrical con nectors and terminals which mate and match, including sizes and ratings, with equipment terminals and are recommended by equipment manufacturer for intended applications.

PART 3 - EXECUTION

3.1 INSPECTION

A. Inspect area and conditions under which electrical connections for equipment are to be installed and notify Contractor in writing of conditions detrimental to proper completion of the work. Do

not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 INSTALLATION OF ELECTRICAL CONNECTIONS

A. Install electrical connections as indicated; in accordance with equipment manufacturer's written instructions and with recognized industry practices, and complying with applicable requirements of UL, NEC, and NECA's "Standard of Installation", to ensure that products fulfill requirements.

B. Coordinate with other work, including wires/cables, raceway and equipment installation, as necessary to properly interface installation of electrical connections for equipment with other work.

C. Connect electrical power supply conductors to equipment conductors in accordance with equipment manufacturer's written instructions and wiring diagrams. Mate and match conductors of electrical connections for proper interface between electrical power supplies and installed equipment.

D. Provide the following electrical work as work of this section, complying with requirements of Division 15 sections:

1. Power supply wiring from power source to power connection on chiller, fans, air handling units, pumps, duct heaters, water heaters, air compressor, air dryer, and unit control panels. Include starters, disconnects, time clocks, receptacles and required electrical devices, except where specified as furnished, or factory-installed, by manufacturer. Make all final electrical connections.

E. Maintain existing electrical service and feeders to occupied areas and operational facilities, unless otherwise indicated, or when authorized otherwise in writing by Owner, or Architect/Engineer. Provide temporary service during interruptions to existing facilities. When necessary, schedule momentary outages for replacing existing wiring systems with new wiring systems. When that "cutting-over" has been successfully accomplished, remove, relocate, or abandon existing wiring as indicated.

F. Cover splices with electrical insulating material equivalent to, or of greater insulation resistivity rating, than electrical insulation rating of those conductors being spliced. No new conductors shall be spliced unless specifically noted on the drawings.

G. Prepare cables and wires, by cutting and stripping covering armor, jacket, and insulation properly to ensure uniform and neat appearance where cables and wires are terminated. Exercise care to avoid cutting through tapes which will remain on conductors. Also avoid "ringing" copper conductors while skinning wire.

H. Trim cables and wires as short as practicable and arrange routing to facilitate inspection, testing, and maintenance.

I. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturers published torque tightening values for equipment connectors. Accomplish tightening by utilizing proper torquing tools, including torque screwdriver, beam-type torque wrench, and ratchet wrench with adjustable torque settings. Where manufacturer's torquing requirements are not available, tighten connectors and terminals to comply with torquing values contained in UL's 486A.

J. Provide flexible conduit for motor connections, and other electrical equipment connections, where subject to movement and vibration.

K. Provide liquid-tight flexible conduit for connection of motors and other electrical equipment where subject to movement and vibration, and also where connections are subjected to one or more of the following conditions:

1. Exterior location.
2. Moist or humid atmosphere where condensate can be expected to accumulate.
3. Corrosive atmosphere.
4. Water spray.
5. Dripping oil, grease, or water, including kitchen areas.

3.3 FIELD QUALITY CONTROL

A. Upon completion of installation of electrical connections, and after circuitry has been energized with rated power source, test connections to demonstrate capability and compliance with requirements. Ensure that direction of rotation of each motor fulfills requirement. Correct malfunctioning units at site, then retest to demonstrate compliance.

END OF SECTION 26 05 30

SECTION 26 05 33 - RACEWAYS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to work of this section.

B. This section is a Division-26 Basic Electrical Materials and Methods section, and is part of each Division-26 section making reference to electrical raceways specified herein.

1.2 DESCRIPTION OF WORK

A. Extent of raceway work is indicated by drawings and schedules. Types of raceways specified in this section include the following:

1. Electrical metallic tubing (EMT).
2. Liquid tight flexible metal conduit.
3. Rigid metal conduit.
4. Flexible metal conduit.
5. Rigid non-metallic conduit.

1.3 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of raceway systems of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects with electrical raceway work similar to that required for this project.

C. Codes and Standards:

1. NEMA Compliance: Comply with applicable requirements of NEMA Standards Publications pertaining to raceways.
2. UL Compliance and Labeling: Comply with applicable requirements of UL safety standards pertaining to electrical raceway systems. Provide raceway products and components which have been UL-listed and labeled.
3. NEC Compliance: Comply with applicable requirements of NEC pertaining to construction and installation of raceway systems.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data, including specifications and installation instructions, for each type of raceway system required. Include data substantiating that materials comply with requirements.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

A. General: Provide metal conduit, tubing, and fittings of types, grades, sizes, and weights (wall thicknesses) for each service indicated. Die-cast fittings are not acceptable.

B. Rigid Steel Conduit: Provide rigid steel, zinc-coated, threaded type conforming to FS WW-C-581, ANSI C80.1 and UL 6.

C. Rigid Metal Conduit Fittings: Cast malleable iron, galvanized or cadmium plated, conforming to FS W-F-408, ANSI C80.4.

1. Use compression type fittings for raintight connections.
2. Use compression type fittings for other miscellaneous connections.

D. Electrical Metallic Tubing (EMT): FS WW-C-563, ANSI C80.3 and UL 797.

E. EMT Fittings: FS W-F-408, ANSI C80.4. Die cast or malleable iron.

1. Use compression fittings for raintight connections.
2. Use compression type for concrete type connections.
3. Use compression type fittings for miscellaneous connections.
4. Set screw fitting may be used only where conduits and associated fittings are concealed from view.

F. Liquid-Tight Flexible Metal Conduit: Provide liquid-tight flexible metal conduit; construct of single strip, flexible, continuous, interlocked, and double-wrapped steel; galvanized inside and outside; coat with liquid-tight jacket of flexible polyvinyl chloride (PVC). Shall be Sealtite or equal.

G. Liquid-Tight Flexible Metal Conduit Fittings: FS W-F-406, Type 1, Class 3, Style G. Provide cadmium plated, malleable iron fittings with compression type steel ferrule and neoprene gasket sealing rings, with insulated, or non-insulated throat.

H. Flexible Metal Conduit: FS WW-C-566 and UL 1. Formed from continuous length of spiral wound, interlocked zinc-coated strip steel.

I. Flexible Metal Conduit Fittings: Provide conduit fittings for use with flexible steel conduit of threadless hinged clamp type.

1. Straight Terminal Connectors: One piece body, female end with clamp and deep slotted machine screw for securing conduit, and male threaded end provided with locknut.
2. 45o or 90o Terminal Angle Connectors: Two-piece body construction with removable upper section, female end with clamp and deep slotted machine screw for securing conduit, and male threaded end provided with locknut.

2.2 NONMETALLIC CONDUIT

A. General: Provide nonmetallic conduit, ducts, and fittings of types, sizes, and weights for each service indicated. Where types and grades are not indicated, provide proper selection determined by Installer to fulfill wiring requirements which comply with provisions of NEC for raceways.

B. Electrical Plastic Conduit:

1. Heavy Wall Conduit: Schedule 40, 90 C, UL-rated, construct of polyvinyl chloride and conforming to NEMA TC-2, for direct burial, or normal above ground use, UL-listed and in conformity with NEC Article 352, ANSI C33.91.

C. PVC Conduit and Tubing Fittings: NEMA TC 3, mate and match to conduit or tubing type and material.

2.3 MANUFACTURERS

A. Subject to compliance with requirements, provide conduit bodies of one of the following:

1. Appleton Electric; Div of Emerson Electric Co.
2. Arrow-Hart Div; Crouse-Hinds Co.
3. Bell Electric Div; Square D Co.
4. Gould, Inc.
5. Killark Electric Mfg. Co.
6. O-Z/Gedney Div; General Signal Co.
7. Spring City Electrical Mfg. Co., or equivalent.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine areas and conditions under which raceways are to be installed, and substrate which will support raceways. Notify Architect in writing of conditions detrimental to proper completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSTALLATION OF RACEWAYS

A. General: Install raceways as indicated; in accordance with manufacturer's written installation instructions, and in compliance with NEC, and NECA's "Standards of Installation". Install units plumb and level, and maintain manufacturer's recommended clearances.

B. Coordinate with other work including wires/cables, boxes, and panel work, as necessary to interface installation of electrical raceways and components with other work.

3.3 INSTALLATION OF CONDUITS

A. General: Install concealed conduits in new construction work, either in walls, slabs, or above hung ceilings. Run conduits concealed in existing work where practical or specifically indicated on the drawings.

1. Mechanically fasten together metal conduits, enclosures, and raceways for conductors to form continuous electrical conductor. Connect to electrical boxes, fittings, and cabinets to provide electrical continuity and firm mechanical assembly.
2. Avoid use of dissimilar metals throughout system to eliminate possibility of electrolysis. Where dissimilar metals are in contact, coat surfaces with corrosion inhibiting compound before assembling.
3. Install miscellaneous fittings such as reducers, chase nipples, 3-piece unions, split couplings, and plugs that have been specifically designed and manufactured for their particular application. Install expansion fittings in raceways every 200' of linear run or wherever structural expansion joints are crossed.

B. Conduit Installation: Follow minimum requirements in all areas as follows:

1. Use rigid steel galvanized conduit where exposed in the central plant, where exposed to weather or subject to saturation with liquids, and where exposed to potential mechanical damage. Also use rigid steel galvanized conduit for all risers from underground, except as allowed for conduits used for communications systems. All rigid elbows and rigid risers to cabinets shall be applied with bitumastic paint where below grade.
    a. Raceways above ground and exposed to the exterior for new fiber backbone shall be either galvanized rigid steel or intermediate aluminum. EMT or pvc will not be permitted. All supports, fasteners, connectors, etc., shall be galvanized steel, stainless steel, or a rigid type aluminum.

2. Use steel EMT above hung ceilings in offices, corridors, toilets, and other areas with hung ceilings. EMT may be used in mechanical and electrical rooms, except for the central plant and other areas requiring rigid steel galvanized conduit as in (1.) above.
3. Use PVC heavy wall direct buried rated (Schedule 40) when raceways run below grade, under floors on grade or in concrete. All bends and elbows greater than 45 degrees shall be galvanized rigid steel conduit. All risers from underground to cabinets and boxes when conduit is to be exposed shall be rigid steel conduit.
4. Underground telecommunications conduits for voice/data, fire alarm, intercom, and TV may be all direct buried rated Schedule 40 PVC.

5. Conduit in walls to recessed panels and boxes shall be in accordance with NEC. PVC up to first point of termination with 4'-0" maximum in wall and EMT above 4'-0".
6. Use flexible conduit in movable partitions and from outlet boxes to lighting fixtures, and final 24" of connection to motors, control items or any equipment subject to movement or vibration, and in cells of precast concrete panels. Flexible conduit shall not exceed 6 feet long.
7. Use liquid-tight flexible conduit where subjected to one or more of the following conditions:
    a. Exterior location.
    b. Moist or humid atmosphere where condensate can be expected to accumulate. Mechanical rooms.
    c. Corrosive atmosphere.
    d. Subjected to water spray or dripping oil, water, or grease, including kitchen equipment connections.

8. Use hot-dipped galvanized conduit where conduit is routed outdoors or in anyway exposed to weather.
9. Surface mounted raceways in finished areas are not permitted.
10. Electrical contractor will be responsible for the following for all underground conduits:
    a. Trenching and Excavation
    b. Backfill
    c. Compaction
    d. Entrances into and exits from buildings shall be underground, concealed. See Specification Sections 01731 and 01732.

11. MC cable or other armored cabling systems shall not be permitted.

C. Cut conduits straight, properly ream, and cut threads for heavy wall conduit deep and clean.

D. Field bend conduit with benders designed for purpose so as not to distort nor vary internal diameter.

E. Minimum conduit size shall be 1/2" unless noted otherwise. Homeruns shall be a minimum 3/4".

F. Fasten conduit terminations in sheet metal enclosures by two (2) locknuts, and terminate with bushings and grounded. Install locknuts inside and out side enclosure.

G. Conduits are not to cross pipe shafts, or ventilating duct openings.

H. Keep conduits a minimum distance of 6" from parallel runs of flues, hot water pipes or other sources of heat. Wherever possible, install horizontal raceway runs above water and steam piping.

I. Use of running threads at conduit joints and terminations is prohibited. Where required, use 3-piece union or split coupling.

J. Complete installation of electrical raceways before starting installation of cables/wires within raceways.

K. Install conduits so as not to damage or run through structural members. Avoid horizontal or cross runs in building partitions or side walls.

L. Exposed Conduits in Unfinished Areas:

1. Install exposed conduits and extensions from concealed conduit systems neatly, parallel with, or at right angles to walls of building.
2. Install exposed conduit work as not to interfere with ceiling inserts, lights or ventilation ducts or outlets.
3. Support all conduits by use of hangers, clamps, or clips. Support conduits on each side of bends and on spacing not to exceed following: up to 1": 6'-0"; 1-1/4" and over: 8'-0". All conduits shall be adequately supported to prevent any noticable deflection, vibration or rattle.
4. Run conduits for outlets on waterproof walls exposed. Set anchors for supporting conduit on waterproof wall in waterproof cement.
5. Exposed conduits on the outside of buildings is not permitted.

M. Conduit Fittings:

1. Construct locknuts for securing conduit to metal enclosure with sharp edge for digging into metal, and ridged outside circumference for proper fastening.
2. Bushings for terminating conduits smaller than 1- 1/4" are to have flared bottom and ribbed sides, with smooth upper edges to prevent injury to cable insulation.
3. Install insulated type bushings for terminating conduits 1-1/4" and larger. Bushings are to have flared bottom and ribbed sides. Upper edge to have phenolic insulating ring molded into bushing.
4. All bushings of standard or insulated type to have screw type grounding terminal.
5. Miscellaneous fittings such as reducers, chase nipples, 3-piece unions, split couplings, and plugs to be specifically designed for their particular application.

N. Concealed Conduits:

1. Metallic raceways installed underground or in floors below grade, or outside are to have conduit threads painted with corrosion inhibiting compound before couplings are assembled. Draw up coupling and conduit sufficiently tight to ensure watertightness.
2. Conduit in concrete slabs: Separate conduits by not less than diameter of largest conduit to ensure proper concrete bond. Conduits must have a minimum of three-quarter inch (3/4") concrete cover.
3. Embedded conduit diameter is not to exceed one-third (1/3) of slab thickness. Conduit shall not be run in slabs less than 3 inches thick.

O. Painting of Conduit & Boxes:

1. Fire Alarm: All new fire alarm conduit, including underground conduit, shall be spot painted red at a minimum of every 4 feet, nominally. Underground conduit shall be spot painted red after it is laid in trench and made up tight. All fire alarm junction boxes shall be painted red.
2. Intercom System: All new junctions boxes above ceiling shall be painted blue.
3. Instructional TV System: All new junction boxes above ceiling shall be painted green.

4. Security System: All new junction boxes above ceiling shall be painted yellow.
5. 208Y/120 volt Power: All new junction boxes above ceiling shall be painted brown.
6. 480Y/277 volt Power: All new junction boxes above ceiling shall be painted orange.
7. Emergency Power (if applicable):All new junction boxes above ceiling shall be painted pink.

P. Provide a continuous yellow marker tape with metallic tracer 6 inches above all new underground conduit.

Q. Underground Duct Banks and Underground Conduits: All underground conduits shall be installed per the National Electrical Code, in accordance with standard industry practices and in accordance with other sections of these specifications. Conduits in duct banks shall be neatly and securely installed in straight lines with manufactured elbows used for all turns and bends. Provide all required trenching, excavation, backfill, compaction, supports, manholes, etc. for a complete installation. Trenching, excavation, backfill and compaction shall be performed in accordance with applicable sections of these specifications.

1. Coordinate routing of site raceways with all site piping including new chilled water piping and fire protection piping, plus existing sanitary, storm, and other site utilities. Hand dig in congested areas.

R. Low Voltage Control:

1. Mechanical contractor (Division 23) to provide and install all necessary wire and raceway (EMT conduit) for low voltage control such as thermostats, timers etc., unless specifically shown otherwise on the drawings. Raceways shall be installed in accordance with Division 26 sections. Final wire connections shall be by mechanical contractor.

3.4 INSTALLATION OF RACEWAYS AND WIREWAYS

A. General: Mechanically assemble metal enclosures, and raceways for conductors to form continuous electrical conductor, and connect to electrical boxes, fittings and cabinets as to provide effective electrical continuity and rigid mechanical assembly.

1. Avoid use of dissimilar metals throughout system to eliminate possibility of electrolysis. Where dissimilar metals are in contact, coat all surfaces with corrosion inhibiting compound before assembling.
2. Install expansion fittings in all raceways wherever structural expansion joints are crossed.
3. Make changes in direction of raceway run with proper fittings, supplied by raceway manufacturer. No field bends of raceway sections will be permitted.
4. Properly support and anchor raceways for their en tire length by structural materials. Raceways are not to span any space unsupported. Supporting conduits from ceiling grid, other conduits, ductwork or other non-structural members will not be permitted.
5. Use boxes as supplied by raceway manufacturer wherever junction, pull or devices boxes are required. Standard electrical "handy" boxes, etc. shall not be permitted for use with surface raceway installations.
6. Provide watertight seals in all conduits which cross from one temperature to another temperature extreme, such as coolers and freezers.

7. All fire wall and smoke wall penetrations shall be sealed using a UL Listed fire stopping method. Method shall be submitted and approved by the Architect/Engineer.
8. All empty conduits shall have a 1/8" nylon pull rope installed, including all underground conduits.

3.5 COMMUNICATIONS SYSTEMS RACEWAY

A. Communications systems raceways shall be provided for each voice/data, fire alarm, or other system outlet or device indicated on the drawings, where applicable.

END OF SECTION 26 05 33

SECTION 26 05 35 - ELECTRICAL BOXES AND FITTINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-01 Specification sections, apply to work of this section.

B. This section is a Division-26 Basic Electrical Materials and Methods section, and is a part of each Division-26 section making reference to electrical wiring boxes and fittings specified herein.

1.2 DESCRIPTION OF WORK

A. Extent of electrical box and associated fitting work is indicated by drawings and schedules.

B. Types of electrical boxes and fittings specified in this section include the following:

1. Outlet boxes
2. Junction boxes
3. Pull boxes
4. Floor boxes
5. Bushings
6. Locknuts
7. Knockout closures
8. Manholes and handholes

1.3 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of electrical boxes and fittings, of types, sizes, and capacities required, whose products have been in satisfactory use in similar service for not less than 3 years.

B. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects utilizing electrical boxes and fittings similar to those required for this project.

C. NEC Compliance: Comply with NEC as applicable to construction and installation of electrical wiring boxes and fittings.

D. UL Compliance: Comply with applicable requirements UL 50, UL 514-Series, and UL 886 pertaining to electrical boxes and fittings. Provide electrical boxes and fittings which are UL-listed and labeled.

E. NEMA Compliance: Comply with applicable requirements of NEMA Stds/Pub No.'s OS1, OS2, and Pub 250 pertaining to outlet and device boxes, covers, and box supports.

PART 2 - PRODUCTS

2.1 FABRICATED MATERIALS

A. Outlet Boxes: Provide galvanized coated flat rolled sheet-steel outlet wiring boxes, of shapes, cubic inch capacities, and sizes, including box depths as indicated, suitable for installation at respective locations. Construct outlet boxes with mounting holes, and with cable and conduit-size knockout openings in bottom and sides. Provide boxes with threaded screw holes, with corrosion-resistant cover and grounding screws for fastening surface and device type box covers, and for equipment type grounding.

1. Recessed outlet boxes shall be a minimum 4” square by 2-1/2” deep with reducer ring for a standard outlet coverplate. Where surface mounted devices are necessary provide 2-1/2” x 4” x 2-1/2” deep box to fit a standard coverplate. Shallow boxes shall not be permitted for communications outlet boxes.
2. Outlet Box Accessories: Provide outlet box accessories as required for each installation, including box supports, mounting ears and brackets, wallboard hangers, box extension rings, fixture studs, cable clamps and metal straps for supporting outlet boxes, which are compatible with outlet boxes being used to fulfill installation requirements for individual wiring situations. Choice of accessories is Installer's code-compliance option.

B. Device Boxes: Provide galvanized coated flat rolled sheet-steel non-gangable device boxes, of shapes, cubic inch capacities, and sizes, including box depths as indicated, suitable for installation at respective locations. Construct device boxes for flush mounting with mounting holes, and with cable-size knockout openings in bottom and ends, and with threaded screw holes in end plates for fastening devices. Provide cable clamps and corrosion-resistant screws for fastening cable clamps, and for equipment type grounding.

1. Recessed outlet boxes shall be a minimum 4” square by 2-1/2” deep with reducer ring for a standard outlet coverplate. Where surface mounted devices are necessary provide 2-1/2” x 4” x 2-1/2” deep box to fit a standard coverplate. Shallow boxes shall not be permitted for communications outlet boxes.
2. Device Box Accessories: Provide device box accessories as required for each installation, including mounting brackets, device box extensions, switch box supports, plaster ears, and plaster board expandable grip fasteners, which are compatible with device boxes being utilized to fulfill installation requirements for individual wiring situations. Choice of accessories is Installer's code-compliance option.

C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering outlet boxes which may be incorporated in the work include, but are not limited to, the following:

1. Appleton Electric;
2. Bell Electric;

3. Eagle Electric Mfg. Co.; Inc.
4. Midland-Ross Corp.
5. OZ/Gedney; General Signal Co.
6. Pass and Seymour, Inc.
7. RACO Div.; Harvey Hubbell Inc.
8. Thomas & Betts Co.

D. Raintight Outlet Boxes: Provide corrosion-resistant cast-metal raintight outlet wiring boxes, of types, shapes and sizes, including depth of boxes, with threaded conduit holes for fastening electrical conduit, cast-metal face plates with spring hinged watertight caps suitably configured for each application, including face plate gaskets and corrosion-resistant plugs and fasteners.

E. Available Manufacturers: Subject to compliance with requirements, manufacturers offering raintight outlet boxes which may be incorporated in the work include, but are not limited to, the following:

1. Appleton Electric;
2. Crouse-Hinds Co.
3. Bell Electric;
4. Harvey Hubbell, Inc.
5. OZ/Gedney; General Signal Co.
6. RACO Div.

F. Junction and Pull Boxes: Provide galvanized code-gage sheet steel junction and pull boxes; with screw-on covers; of types, shapes and sizes, to suit each respective location and installation; with welded seams and equipped with stainless steel nuts, bolts, screws, and washers.

G. Available Manufacturers: Subject to compliance with requirements, manufacturers offering junction and pull boxes which may be incorporated in the work include, but are not limited to, the following:

1. Appleton Electric; Emerson Electric Co.
2. Arrow-Hart Div.; Crouse-Hinds Co.
3. Electric; Square D Company
4. OZ/Gedney; General Signal Co.
5. Spring City Electrical Mfg. Co.

H. Available Manufacturers: Subject to compliance with requirements, manufacturers offering floor boxes which may be incorporated in the work include, but are not limited to, the following:

1. Arrow-Hart Div.; Crouse-Hinds Co.
2. Harvey Hubbell, Inc.
3. Midland-Ross Corp.
4. Spring City Electrical Mfg. Co.

I. Bushings, Knockout Closures, and Locknuts: Provide corrosion-resistant box knockout closures, conduit locknuts and malleable iron conduit bushings, offset connections, of types and sizes, to suit respective installation requirements and applications.

J. Available Manufacturers: Subject to compliance with requirements, manufacturers offering bushings, knockout closures, locknuts, and connectors which may be incorporated in the work include, but are not limited to, the following:

1. Arrow-Hart Div.; Crouse-Hinds Co.
2. Appleton Electric Co.; Emerson Electric Co.
3. Bell Electric; Square D Co.
4. Midland-Ross Corp.
5. OZ/Gedney Co.; General Signal Co.

K. Manholes and Handholes: Manholes and handholes for exterior use shall be pre-cast concrete with steel traffic rated covers, as manufactured by Brooks or equal. Pre-manufactured composite type boxes (Quazite or approved equal) are permitted where suitable and rated for the use indicated. Manholes and handholes shall be the size necessary for the number of conduits and conductors indicated on the drawings which will enter the enclosure, plus the necessary capacity for the spare conduits and the associated estimated conductor fill. Provide manholes with the appropriate drainage and knockouts for conduits and other necessary access. Traffic covers shall be engraved with the appropriate identification, such as "ELECTRIC" or “COMMUNICATIONS”. Provide plastic protective grommet on all conduit ends for all communications systems conduit inside manholes. Fire alarm conduits shall be marked.

PART 3 - EXECUTION

3.1 INSTALLATION OF ELECTRICAL BOXES AND FITTINGS

A. General: Install electrical boxes and fittings as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in accordance with recognized industry practices to fulfill project requirements.

B. Coordinate installation of electrical boxes and fittings with wire/cable, wiring devices, and raceway installation work.

C. Provide weathertight boxes and fittings for interior and exterior locations exposed to weather or mois ture. Provide weatherproof boxes for all exterior outlet boxes for power and systems, including fire alarm and intercom system boxes.

D. Provide knockout closures to cap unused knockout holes where blanks have been removed.

E. Install electrical boxes in those locations which ensure ready accessibility to enclosed electrical wiring.

F. Avoid installing boxes back-to-back in walls. Provide not less than 24" (600 mm) separation.

G. Position recessed outlet boxes accurately to allow for surface finish thickness. All outlet boxes shall be provided with bracket support behind the box for additional structural support. Mounting boxes directly to the metal framing on one side only is not acceptable. Boxes shall be additionally supported on the back side.

H. Fasten electrical boxes firmly and rigidly to substrates, or structural surfaces to which attached, or solidly embed electrical boxes in concrete or masonry.

I. Outlet boxes shall be structurally supported to the metal studs using a back bracket or other additional means of support. Side mounted attachment only to the metal studs is not acceptable.

J. Each circuit in pull box shall be marked with a tag guide denoting panels which they connect to.

K. Manholes and handholes shall be installed for all underground conduit installations. The minimum number of manholes and handholes shall be as indicated on the drawings. The contractor shall provide any additional handholes or manholes necessary for ease of installation, code compliance or due to voluntary or required re-routing of the underground conduits at no additional cost to the Owner.

END OF SECTION 26 05 35

SECTION 26 05 53 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-01 Specification sections, apply to work of this section.

B. Division-26 Basic Electrical Materials and Methods section apply to work specified in this section.

1.2 DESCRIPTION OF WORK

A. Extent of electrical identification work is indicated by drawings and schedules.

B. Types of electrical identification work specified in this section include the following:

1. Electrical power, control, and communication conductors.
2. Operational instructions and warnings.
3. Equipment/system identification signs.

1.3 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of electrical identification products of types required, whose products have been in satisfactory use in similar service for not less than 3 years.

B. NEC Compliance: Comply with NEC as applicable to installation of identifying labels and markers for wiring and equipment.

C. UL Compliance: Comply with applicable requirements of UL Std 969, "Marking and Labeling Systems", pertaining to electrical identification systems.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering electrical identification products which may be incorporated in the work include, but are not limited to, the following:

1. Brady, W.H. Co.

2.2 ELECTRICAL IDENTIFICATION MATERIALS

A. General: Except as otherwise indicated, provide manufacturer's standard products of categories and types required for each application. Where more than single type is specified for an application, selection is Installer's option, but provide single selection for each application.

2.3 ENGRAVED PLASTIC-LAMINATE SIGNS

A. General: Provide engraving stock melamine plastic laminate, complying with FS L-P-387, in sizes and thicknesses indicated, engraved with engraver's standard letter style of sizes and wording indicated, white face and black core plies (letter color) except as otherwise indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate.

1. Thickness: 1/8", except as otherwise indicated.
2. Fasteners: Self-tapping stainless steel screws or permanent rivets. Contact-type permanent adhesive will not be acceptable.

2.4 LETTERING AND GRAPHICS

A. General: Coordinate names, abbreviations and other designations used in electrical identification work, with corresponding designations shown, specified or scheduled. Provide numbers, lettering, and wording as indicated or, if not otherwise indicated, as recommended by manufacturer or as required for proper identification and operation/maintenance of electrical systems and equipment.

PART 3 - EXECUTION

3.1 APPLICATION AND INSTALLATION

A. General Installation Requirements:

1. Install electrical identification products as indicated, in accordance with manufacturer's written instructions and requirements of NEC.
2. Coordination: Where identification is to be applied to surfaces which require finish, install identification after completion of painting.
3. Regulations: Comply with governing regulations and requests of governing authorities for identification of electrical work.

3.2 OPERATIONAL IDENTIFICATION AND WARNINGS

A. General: Wherever reasonably required to ensure safe and efficient operation and maintenance of electrical systems, and electrically connected mechanical systems and general systems and equipment, including prevention of misuse of electrical facilities by unauthorized personnel, install self-adhesive plastic signs or similar equivalent identification, instruction or warnings on switches, outlets and other controls, devices and doors of electrical enclosures. Where detailed instructions or explanations are needed, provide plasticized tags with clearly written messages adequate for intended purposes.

3.3 EQUIPMENT/SYSTEM IDENTIFICATION

A. General: Install engraved plastic-laminate sign on each major unit of electrical equipment in building; including central or master unit of each electrical system including communication/ control/signal systems, unless unit is specified with its own self-explanatory identification or signal system. Except as otherwise indicated, provide single line of text, 1/2" high lettering, on 1-1/2" high sign (2" high where 2 lines are required), black lettering in white field. Provide text matching terminology and numbering of the contract documents and shop drawings. Provide signs for each unit of the following categories of electrical work:

1. Switchboard (including all individual circuit breakers and main breaker). Existing labeling shall be removed and updated where changed or added.
2. Panelboards (including all individual circuit breakers and main breaker on distribution panels).
3. All electrical cabinets, disconnect switches and enclosures.
2. Access panel/doors to electrical facilities. Provide building disconnect signage as indicated on the drawings.
3. Transformers
4. Equipment disconnects and starters.
5. Timeclocks, contactors and lighting controls.
6. Other control stations, such as purge fans, etc.

B. Install signs at locations indicated or, where not otherwise indicated, at location for best convenience of viewing without interference with operation and maintenance of equipment. Secure to substrate with fasteners, except use adhesive where fasteners should not or cannot penetrate substrate.

END OF SECTION 26 05 53

SECTION 26 22 00 - DRY TYPE TRANSFORMERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. Division-26 Basic Electrical Materials and Methods sections apply to work specified in this section.

1.2 DESCRIPTION OF WORK:

A. Extent of dry type transformer work is indicated by drawings and schedules.

B. This section includes dry-type distribution transformers with primary and secondary voltages of 600V and less and capacity ratings through 500 kVA.

1.3 SUBMITTALS:

A. Product Data: Submit manufacturer's data on transformers including, but not limited to, voltages, number of phases, frequencies, temperature rating, sound levels, KVA ratings, K rating and short-circuit and continuous current ratings. Provide dimensions and weights of all transformers

1.4 OPERATION AND MAINTENANCE MANUALS

A. Provide complete operation and maintenance manuals for the transformers. The manuals shall contain complete operation and maintenance procedures and parts lists.

1.5 QUALITY ASSURANCE:

A. Manufacturer's Qualifications: Firms regularly engaged in the manufacture of transformers, of types, sizes and capacities required, and whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer's Qualifications: Firm with at least 5 years of successful installation experience on projects utilizing transformers similar to that required for this project. Installer shall be a liscensed electrician with experience installing at least ten transformers of equal size and scope.

1.6 CODES AND STANDARDS:

A. Electrical Code Compliance: Comply with applicable local code requirements of the authority having jurisdiction, and that portion of the NEC which pertains to installation and construction of dry type transformers.

B. UL Compliance: Comply with applicable requirements of UL pertaining to installation and construction of dry type transformers. Provide dry type transformers which are UL-listed and labeled.

C. NEMA Compliance: Comply with applicable portions of NEMA pertaining to dry type transformers.

1.7 DELIVERY, STORAGE, AND HANDLING:

A. Deliver dry type transformers and components properly packaged and mounted on pallets, or skids to facilitate handling of heavy items. Utilize factory-fabricated type containers or wrappings for dry type transformers which protect equipment from damage. Inspect equipment to ensure that no damage has occurred during shipment.

B. Store dry type transformers in original packaging and protect from weather and construction traffic. Wherever possible, store indoors; where necessary to store outdoors, store above grade and enclose with watertight wrapping.

C. Handle dry type transformers carefully to prevent physical damage to equipment and components. Remove packaging, including the opening of crates and containers, avoiding the use of excessive hammering and jarring which would damage the electrical equipment contained therein. Do not install damaged equipment; remove from site and replace damaged equipment with new.

1.8 SEQUENCING AND SCHEDULING:

A. Schedule delivery of dry type transformers which permits ready building ingress for large equipment components to their designated installation spaces. Coordinate delivery of equipment with the installation of other building components.

B. Provide the size and location of concrete equipment pads. Cast anchor bolt inserts into pad.

C. Coordinate with other electrical work including raceways, electrical boxes and fittings, and cabling/wiring work, as necessary to interface installation of switchboards with other work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Manufacturers: Subject to compliance with requirements, provide dry type transformers of one of the following manufacturers:

1. Square D Co.
2. Siemens, Inc.
3. Eaton/Cutler Hammer
4. General Electric

2.2 RATINGS INFORMATION

A. Transformer insulation shall be a UL recognized 150°C temperature class system. Neither the primary nor the secondary temperature shall exceed 150°C at any point in the coils while carrying their full rating of non-sinusoidal load. Neutrals shall be rated to carry 200% of the rated secondary current, unless specifically noted otherwise on the drawings. The maximum temperature hot spot temperatures shall not exceed the 30°C hot spot rating for the indicated K factors, defined as the sum of fundamental and harmonic per ANSI/IEEE C57.110-1986. Provide K factor of 13 where transformers are specifically noted to be K-rated on the drawings. Manufacturers rating K factors by average temperature rise alone shall not be acceptable.

B. Transformers do not require a special K rating except where specifically noted on the drawings. Standard transformers shall have the same construction as specified herein except they are not required to have a 200% neutral or K rating.

C. Transformers shall comply with all current Nema TP-1 efficiency rratings and requirements.

2.3 TRANSFORMER CONSTRUCTION

A. Transformer coils shall be of the continuous wound copper construction and shall be impregnated with nonhygroscopic, thermosetting varnish.

B. Transformers 15kVA and larger shall have a minimum of 6-2.5% full capacity primary taps for 480V primaries. Exact voltages and taps to be as designated on the plans or the transformer schedule.

C. All cores to be constructed with low hysteresis and eddy current losses. The core flux density shall be well below the saturation point to prevent core overheating caused by harmonic voltage distortion. Manufacturers shall submit verification of induction levels well below the usual level for standard transformers.

D. Transformers shall be common core construction. Transformers utilizing more than one core, or Scott-T connections, shall not be acceptable.

E. The transformer secondary neutral terminal shall be sized for 200% of the secondary phase current. (K rated transformers only)

F. The transformer enclosures shall be ventilated and be fabricated of heavy gauge, sheet steel construction. The entire enclosure shall be finished utilizing a continuous process consisting of degreasing, cleaning and phosphatizing, followed by electrostatic deposition of a polymer polyester powder coating and baking cycle to provide uniform coating of all edges and surfaces. The coating shall be UL recognized for outdoor use. The coating color shall be ANSI 49.

G. The maximum temperature of the top of the enclosure shall not exceed 50°C rise above 40°C ambient.

H. Transformers shall be supplied with a quality, full width electrostatic shield resulting in a maximum effective coupling capacitance between primary and secondary of 33 picofarads. With transformers connected under normal, loaded operating conditions, the attenuation of line noise and transients shall equal or exceed the following limits:

1. Common Mode: 0 to 1.5Hz - 120db; 1.5 to 10kHz - 90db; 10 to 100kHz - 65db; 100kHz to 40db.
2. Traverse Mode: 1.5 to 10kHz - 52db; 10 to 100kHz - 30db
3. Electrostatic shield required only where K rating transformers are noted.

I. Sound levels shall be warranted by the manufacturer not to exceed the following:

1. 15 to 50kVA - 45db; 51 to 150kVA - 50db; 151 to 300kVA - 55db; 301 to 500kVA - 60db.

2.4 ACCESSORIES

A. Provide wall mounting brackets for units where wall mounting is indicated.

B. Provide ceiling mounting brackets for units ceiling mounting is indicated.

2.5 APPLICABLE STANDARDS

A. All insulation materials are to be in accordance with NEMA ST20 standards for 220°C UL component recognized insulation system. Transformers are to be manufactured and tested in accordance with ANSI Standard C57.12.91 and NEMA TP-1.

B. Transformers of 500kVA or smaller shall be listed by Underwriters Laboratory.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine areas and conditions under which dry type transformers and components are to be installed, and notify Contractor in writing of conditions detrimental to proper completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

3.2 INSTALLATION OF DRY TYPE TRANSFORMERS:

A. Transformers shall be installed securely and level. All code required clearances shall be provided and access for cleaning and adjustment shall be provided.

B. Provide neoprene isolation pads between the transformer enclosure and the concrete pad.

C. Concrete equipment mounting pad shall be provided, 4" high.

D. Where transformers are hung, provide all required factory mounting hardware to wall or ceiling mount the transformer. The transformer shall be secured to structural members and shall not sway or move.

3.3 FIELD QUALITY CONTROL:

A. Prior to energization of circuitry, check all accessible connections to manufacturer's torque tightening specifications.

3.4 ADJUSTING AND CLEANING:

A. Adjust operating mechanisms for free mechanical movement.

B. Touch-up scratched or marred surfaces to match original finishes.

3.5 GROUNDING:

A. Provide equipment grounding connections for dry type transformers as indicated or required by the National Electrical Code. Transformer shall be grounded to building steel or nearest building grounding electrode conductor. Where building steel is not readily accessible, provide a ground rod and bond the ground rod back to the building grounding electrode system with minimum #3/0 AWG copper. Tighten connections to comply with tightening torques specified in UL Std 486A to assure permanent and effective grounds.

END OF SECTION 26 22 00

SECTION 26 24 16 - PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. Division-26 Basic Electrical Materials and Methods section apply to work specified in this section.

1.2 DESCRIPTION OF WORK

A. Extent of panelboard, load-center and enclosure work, including cabinets and cutout boxes is indicated by drawings and schedules.

B. Types of panelboards and enclosures in this section include the following:

1. Service-entrance panelboards
2. Power-distribution panelboards
3. Lighting and appliance panelboards

C. Refer to other Division-26 sections for cable/wire, connectors, and electrical raceway work required in conjunction with panelboards and enclosures; not work of this section. Refer to Section 262813 - Overcurrent Protective Devices for circuit breakers to be installed in panelboards.

1.3 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of panelboards and enclosures, of types, sizes, and ratings required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer's Qualifications: A firm with at least 3 years of successful installation experience on projects utilizing panelboards similar to that required for this project.

C. NEC Compliance: Comply with NEC as applicable to installation of panelboards, cabinets, and cutout boxes. Comply with NEC requirements pertaining to installation of wiring and equipment in hazardous locations.

D. UL Compliance: Comply with applicable requirements of Std No. 67 "Electric Panelboards:, and Stds No.'s 50, 869, 486A, 486B, and 1053 pertaining to panelboards, accessories and enclosures. Provide units which are UL-listed and labeled.

E. NEMA Compliance: Comply with NEMA Stds Pub/No. 250, "Enclosures for Electrical Equipment (1000 Volts Maximum), Pub/ No. PB 1, "Panelboards", and Pub/No. PB 1.1, "Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less".

F. Federal Specification Compliance: Comply with FS W-P-115, "Power Distribution Panel", pertaining to panelboards and accessories.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's data on panelboards. Data must include a complete panel layout indicating the circuit breakers and corresponding circuit numbers. Include ratings of each circuit breaker including short circuit capability. Indicate all options to be supplied with the panelboard. Indicate overall panelboard bus rating and main type and rating. Show complete dimensional information. Any deviation from dimensions shown on the drawings shall be specifically pointed out in the submittal. Indicate the panelboard short circuit capacity rating and specify if this is fully rated. Series ratings are not permitted. Clearly indicate the panel name for each submittal.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide panelboard products of one of the following (for each type and rating of panelboard and enclosure):

1. Square D Company
2. General Electric Company
3. Eaton
4. Seimens

B. All circuit breakers shall be the bolt-on type.

2.2 PANELBOARDS

A. General: Except as otherwise indicated, provide panelboards, enclosures and ancillary components, of types, sizes, and ratings indicated, which comply with manufacturer's standard materials; design and construction in accordance with published product information; equip with proper number of unit panelboard devices as required for complete installation. Where types, sizes, or ratings are not indicated, comply with NEC, UL, and established industry standards for those applications indicated.

B. Power Distribution Panelboards (600 amp and greater or as required for specified branch breakers): Provide dead-front safety type power distribution panelboards as indicated, with panelboard switching and protective devices in quantities, ratings, types, and with arrangement

shown; with anti-turn solderless pressure type main lug connectors approved for copper conductors. Select unit with feeder connecting at top of panel. Equip with copper bus bars with not less than 98% conductivity, and with full-sized neutral bus; provide suitable lugs on neutral bus for outgoing feeders requiring neutral connections. Provide bolt-on type molded-case main and branch circuit-breaker types for each circuit, with toggle handles that indicate when tripped. Where multiple-pole breakers are indicated, provide with common trip so overload on one pole will trip all poles simultaneously. Provide panelboards with bare uninsulated copper grounding bars suitable for bolting to enclosures. Select flush or surface mounted type enclosures, required on the drawings, fabricated by same manufacturer as panelboards, which mate properly with panelboards. Main distribution panels and ALL Service Entrance Panels shall be a power distribution type panel, such as Square D I-Line, GE Spectra Series, or equal. There shall be no limitation to only using 100 amp maximum branch breakers on these panels.

C. Lighting and Appliance Panelboards: Provide dead-front safety type lighting and appliance panelboards as indicated, with switching and protective devices in quantities, ratings, types, and arrangements shown; with anti-burn solderless pressure type lug connectors approved for copper conductors; construct unit for connecting feeders at top of panel; equip with copper bus bars, full-sized neutral bar, with bolt-in type heavy-duty, quick-make, quick-break, single-pole or multi-pole circuit-breakers, with toggle handles that indicate when tripped. Provide suitable lugs on neutral bus for each outgoing feeder required; provide bare copper uninsulated grounding bars suitable for bolting to enclosures. Select enclosures fabricated by same manufacturer as panelboards, which mate properly with panelboards. Loadcenters are not acceptable.

D. Panelboard Enclosures: Provide galvanized sheet steel cabinet type enclosures, in sizes and NEMA types as indicated, code-gage, minimum 16-gage thickness. Construct with multiple knockouts and wiring gutters. Provide fronts with wire gutters and without multiple knockouts. Provide fronts with adjustable trim clamps, doors with flush locks and keys, all panelboard enclosures keyed alike, with concealed piano door hinges. Equip with interior circuit-directory frame, and card with clear plastic covering. Provide baked gray enamel finish over a rust inhibitor coating. Design enclosures for flush recessed or surface mounting, as indicated on the drawings. Provide enclosures which are fabricated by same manufacturer as panelboards, which mate properly with panelboards to be enclosed.

E. Panelboard Accessories: Provide panelboard accessories and devices including, but not necessarily limited to, cartridge and plug time-delay type fuses, circuit-breakers, ground-fault protection units, etc., as recommended by panelboard manufacturer for ratings and applications indicated. All panelboards shall be provided with a separate copper ground bus bar.

F. Panelboard Ratings: All branch circuit panelboards shall be fully rated for the short circuit current indicated or the specific rating specified on the panel schedule, whichever is greater. Service entrance and distribution panelboards shall be fully rated for the short circuit current indicated or the specific rating specified on the panel schedule, whichever is greater. Series ratings will not be acceptable.

PART 3 - EXECUTION

3.1 INSPECTION

A. Installer must examine areas and conditions under which panelboards and enclosures are to be installed, and notify Contractor in writing of conditions detrimental to proper completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 INSTALLATION OF PANELBOARDS

A. General: Install panelboards and enclosures as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC standards and NECA's "Standard of Installation", and in compliance with recognized industry practices, to ensure that products comply with requirements.

B. Coordinate installation of panelboards and enclosures with cable and raceway installation work.

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 Stds 486A and B.

D. Anchor enclosures firmly and securely to walls and structural surfaces, ensuring that they are permanently and mechanically secure and plumb.

E. Provide properly wired electrical connections within enclosures.

F. Provide typewritten circuit directory card in panel door upon completion of installation work. All circuit breakers shall be labeled. All labeling shall be in accordance with the final room signage numbering. Use of panel schedules from the original drawings is not acceptable. The contractor shall provide separate and accurate panel schedules for each panel using the final room numbers from the Owner via the final approved signage submittal. Incorrect room numbers on panel schedules shall be changed. NO EXCEPTIONS.

G. Where panels are mounted flush in the wall, a minimum of three (3) spare 3/4" conduit shall be installed stubbed out a minimum of eight (8) inches above ceiling.

H. In addition to the three spare stub-up racewasys, provide one ¾” conduit (with pull cord) to the middle of each classroom, above the ceiling, from the nearest local electrical room. Conduit may be looped to up to three classrooms and them home run. Provide a label on the junction box “Future Use”. Stub the raceway into the electrical room and label with the classrooms served and provide a pull string.

3.3 GROUNDING

A. Provide equipment grounding connections for panelboards as indicated. Tighten connections to comply with tightening torques specified in UL Stds 486A and B to assure permanent and effective grounds.

3.4 FIELD QUALITY CONTROL

A. Prior to energization of circuitry, check all accessible connections to manufacturer's tightening torque specifications.

B. Prior to energization of panelboards, check with ground resistance tester phase-to-phase and phase-to-ground insulation resistance levels to ensure requirements are fulfilled.

C. Prior to energization, check panelboards for electrical continuity of circuits for short-circuits.

D. Subsequent to wire and cable hook-ups, energize panelboards and demonstrate functioning in accordance with requirements. Where necessary, correct malfunctioning units, and then retest to demonstrate compliance.

E. Prior to final acceptance completely fill out the circuit directories accurately depicting the equipment connected to each circuit. Circuit directories shall be typewritten.

END OF SECTION 26 24 16

SECTION 26 26 16 - CIRCUIT AND MOTOR DISCONNECTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-01 Specification sections, apply to work of this section.

B. Division-26 Basic Electrical Materials and Methods section, apply to work of this section.

1.2 DESCRIPTION OF WORK

A. Extent of circuit and motor disconnect switch work is indicated by drawings and schedules.

B. Types of circuit and motor disconnect switches in this section include the following:

1. Equipment disconnects.
2. Appliance disconnects.
3. Motor-circuit disconnects.

C. Wires/cables, raceways, and electrical boxes and fittings required in connection with circuit and motor disconnect work are specified in other Division-26 Basic Electrical Materials and Methods sections.

1.3 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of circuit and motor disconnect switches of types and capacities required whose products have been in satisfactory use in similar service for not less than 3 years.

B. Installer's Qualifications: Firm with at least 3 years of successful installation experience with projects utilizing circuit and motor disconnect work similar to that required for this project.

C. NEC Compliance: Comply with NEC requirements pertaining to construction and installation of electrical circuit and motor disconnect devices.

D. UL Compliance: Comply with requirements of UL 98, "Enclosed and Dead-Front Switches". Provide circuit and motor disconnect switches which have been UL-listed and labeled.

E. NEMA Compliance: Comply with applicable requirements of NEMA Stds Pub No. KS 1, "Enclosed Switches" and 250, "Enclosures for Electrical Equipment (1000 Volts Maximum)".

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's data on circuit and motor disconnect switches.

B. Wiring Diagrams: Submit power and control wiring diagrams for circuit and motor disconnects including connections to power and control panels, and feeders.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering circuit and motor disconnects which may be incorporated in the work include the following:

1. General Electric Co.
2. Square D Company
3. ITE/Seimens

2.2 FABRICATED SWITCHES

A. Heavy-Duty Safety Switches: Provide surface-mounted, heavy-duty type, sheet-steel enclosed safety switches, of types, sizes and electrical characteristics indicated; fusible or non-fusible type as indicated, amperes as indicated, 60 Hz, 3-blades, 4-poles, solid neutral; and incorporating quick-make, quick-break type switches; construct so that switch blades are visible in OFF position with door open. Equip with operating handle which is integral part of enclosure base and whose operating position is easily recognizable, and is padlockable in OFF position; construct current carrying parts of high-conductivity copper, with silver-tungsten type switch contacts, and positive pressure type reinforced fuse clips. Provide NEMA Type 3R enclosures, where applicable. Provide grounding kit. Provide 240 volt rated switches for 208Y/120 volt systems and 600 volt rated switches for 277Y/480 volt systems.

1. Fuses: Provide fuses for safety switches, sized as recommended by the manufacturer of the equipment to be protected, of classes, types, and ratings needed to fulfill electrical requirements for service indicated. Provide R-clips for all fuse holders.

PART 3 - EXECUTION

3.1 INSTALLATION OF CIRCUIT AND MOTOR DISCONNECT SWITCHES

A. Install circuit and motor disconnect switches as indicated, complying with manufacturer's written instructions, applicable requirements of NEC, NEMA, and NECA's "Standard of Installation", and in accordance with recognized industry practices.

B. Coordinate circuit and motor disconnect switch installation work with electrical raceway and cable work, as necessary for proper interface.

C. Install disconnect switches for use with motor-driven appliances, and motors and controllers within sight of controller position unless otherwise indicated.

D. Provide a nameplate indicating the equipment served and protected.

3.2 GROUNDING

A. Provide equipment grounding connections, sufficiently tight to assure a permanent and effective ground, for electrical disconnect switches where indicated.

3.3 FIELD QUALITY CONTROL

A. Subsequent to completion of installation of electrical disconnect switches, energize circuitry and demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at project site, then retest to demonstrate compliance; otherwise remove and replace with new units and retest.

B. Painting: repair all scratches to factory painted and primed finish with factory supplied touch-up paint.

END OF SECTION 26 26 16

SECTION 26 27 26 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-01 Specification sections, apply to work of this section.

B. This section is a Division-26 Basic Electrical Materials and Methods section, and is part of each Division-26 section making reference to wiring devices specified herein.

1.2 DESCRIPTION OF WORK

A. The extent of wiring device work is indicated by drawings and schedules. Wiring devices are defined as single discrete units of electrical distribution systems which are intended to carry but not utilize electric energy.

B. Types of electrical wiring devices in this section include the following:

1. Receptacles, including surge suppression type if applicable.
2. Ground-fault circuit interrupters

1.3 QUALITY ASSURANCE

A. Installer's Qualifications: Firm with at least 2 years of successful installation experience on projects utilizing wiring devices similar to those required for this project.

B. NEC Compliance: Comply with NEC as applicable to installation and wiring of electrical wiring devices.

C. UL Compliance: Comply with applicable requirements of UL 20, 486A, 498, and 943 pertaining to installation of wiring devices. Provide wiring devices which are UL-listed and labeled.

D. IEEE Compliance: Comply with applicable requirements of IEEE Std 241, "Recommended Practice for Electric Power Systems in Commercial Buildings", pertaining to electrical wiring systems.

E. NEMA Compliance: Comply with applicable portions of NEMA Stds Pub/No. WD 1, "General-Purpose Wiring Devices", WD 2, "Semiconductor Dimmers for Incandescent Lamps", and WD 5, "Specific,-Purpose Wiring Devices".

F. FS Compliance: Comply FS W-C-596 (Series) and FS W-S-896 (Series) pertaining to electrical power connectors and toggle switches.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's data on electrical wiring devices.

1. Receptacles, including surge suppression type if applicable.
2. Ground-fault circuit interrupters

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide wiring devices of one of the following (for each type and rating of wiring device):

1. Hubbell
2. Arrow-Hart Div.
3. Eagle Electric Co.
4. Leviton
5. Pass - Seymour

2.2 FABRICATED WIRING DEVICES

A. General: Provide factory-fabricated wiring devices, in types, colors, and electrical ratings for applications indicated and which comply with NEMA Stds Pub/No. WD 1. Provide white color devices and brushed satin finish stainless steel coverplates, except as otherwise indicated; all color selections to be verified by Contractor with Architect/Engineer prior to ordering.

B. Receptacles:

1. Heavy-Duty Duplex: Provide specification grade duplex receptacles, 2-pole, 3-wire, grounding, 20-amperes, 125-volts, with metal plaster ears, design for side and back wiring with spring loaded, screw activated pressure plate, with NEMA configuration 5-20R unless otherwise indicated. Hubbell or equal.
2. Ground-Fault Interrupters: Provide "feed-thru" type ground-fault circuit interrupters, with heavy-duty duplex receptacles, capable of protecting connecting downstream receptacles on single circuit, and of being installed in a 2-3/4" deep outlet box without adapter, grounding type UL-rated Class A, Group 1, rated 20 amperes, 120-volts, 60 Hz; with solid-state ground-fault sensing and indication; with 5 milliamperes ground-fault trip level; equip with NEMA configuration 5-20R. Device must have a positive trip identification and reset. Provide device to match the existing color of surrounding devices.

3. Special Receptacles: Special configuration receptacles shall be standard NEMA plug configuration as specified on the drawings or as required. Provide heavy duty, specification grade receptacles, with black nylon face and brushed satin stainless steel cover plate.

C. Switches:

1. Snap: Provide specification grade, general-duty flush single-pole, quiet type toggle switches, 20-amperes, 120-277 volts AC, with mounting yoke insulated from mechanism, equip with plaster ears, switch handle, and side-wired screw terminals.
2. 2-way: Provide specification grade, general-duty flush double-pole AC quiet switches, 20-amperes, 120-277 volts AC, with mounting yoke insulated from mechanism, equip with plaster ears, switch handles, side-wired screw terminals, with break-off tab features, which allows wiring with separate or common feed.
3. Three-way: Provide specification grade, general-duty flush 3-way AC quiet type switches, 20-amperes, 120-277 volts AC, with mounting yoke insulated from mechanism, equip with plaster ears, lock type switch handles, sidewired screw terminals, with break-off tab features, which allows wiring with separate or common feed.
4. Four-way: Provide specification grade, general-duty flush 4-way AC quiet switches, 20-amperes, 120-277 volts AC, with mounting yoke insulated from mechanism, equip with plaster ears, switch handles, side-wired screw terminals, with break-off tab features, which allows wiring with separate or common feed.
5. Touch Snap: Provide soft-touch snap switches, cap able of effortless-fingertip operation; single-pole AC quiet, with lighted rocker switch hangles; sidewired screw terminals for connecting copper-clad aluminum wire, 20-amperes, 120-277 volts rating. Equip with plaster ears.
6. Switches to be color to match existing switches with satin finish stainless steel coverplate.

2.3 WIRING DEVICE ACCESSORIES

A. Wallplates: Provide wallplates for single and combination wiring devices, of types, sizes, and with ganging and cutouts as required. Select plates which mate and match wiring devices to which attached. Construct with metal screws for securing plates to devices; screw heads colored to match finish of plates. Provide plates possessing the following additional construction features:

1. Material and Finish: 0.04" thick, type 302 satin finished stainless steel.

C. Outdoor receptacles that are in locations without protection from the weather shall be provide with a UL listed and approved “in-use” weatherproof cover, and shall be GFI protected. DO NOT use “in-use” type cover in damp locations.

PART 3 - EXECUTION

3.1 INSTALLATION OF WIRING DEVICES

A. Install wiring devices as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in accordance with recognized industry practices to fulfill project requirements.

B. Coordinate with other work, including painting, electrical boxes and wiring work, as necessary to interface installation of wiring devices with other work.

C. Install wiring devices only in electrical boxes which are clean; free from excess building materials, dirt, and debris.

D. Install galvanized steel wallplates on any exposed surface mounted devices.

E. Install wallplates after painting work is completed.

F. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for wiring devices. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Stds 486A and B. Use properly scaled torque indicating hand tool.

G. Contractor to provide ground fault protective type receptacles for any location within 2'-0" of sinks or other source of water. Feed through protection from one ground fault protected receptacle on a circuit is not acceptable.

H. Mounting height of boxes for devices as shown on legend, unless otherwise noted on the plan. Refer to architectural drawings to avoid interferences with millwork. Where two or more devices are shown at the same location, use gang box and one face plate. Verify all device locations with Owner prior to rough-in. Exact device locations may be adjusted by the Owner to avoid interferences or for general convenience at no additional cost to the Owner.

3.2 PROTECTION OF WALLPLATES AND RECEPTACLES

A. Upon installation of wallplates and receptacles, advise Contractor regarding proper and cautious use of convenience outlets. At time of Substantial Completion, replace those items which have been damaged, including those burned and scored by faulty plugs.

3.3 GROUNDING

A. Provide equipment grounding connections for wiring devices, unless otherwise indicated. Tighten connections to comply with tightening torques specified in UL Std 486 A to assure permanent and effective grounds.

3.4 TESTING

A. Prior to circuitry, test wiring for electrical continuity, for short-circuits and for grounding. Ensure proper polarity of connections is maintained. Prior to energization, test wiring devices to demonstrate compliance with requirements.

3.5 WARRANTY

A. All wiring devices shall have a minimum one year parts and labor warranty.

END OF SECTION 26 27 26

SECTION 26 28 13 - OVERCURRENT PROTECTIVE DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-01 Specification sections, apply to work of this section.

B. This section is a Division-26 Basic Electrical Materials and Methods section, and is part of each Division-26 section making reference to overcurrent protective devices specified herein.

1.2 DESCRIPTION OF WORK

A. Extent of overcurrent protective device work is indicated by drawings and schedules.

B. Types of overcurrent protective devices in this section include the following:

1. Circuit Breakers:
   a. Air, molded-case, for installation in panels.
   b. Air, molded-case, for individual, separately enclosed mounting.
   c. For installation in existing panels.

2. Fuses:
   a. Class RK1 and RK5, dual-element time-delay.

C. Refer to other Division-26 sections for cable/wire and connector work required in conjunction with overcurrent protective devices; not work of this section.

1.3 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of overcurrent protective devices, of types, sizes, and ratings required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer: Qualified with at least 5 years of successful installation experience on projects with electrical installation work similar to that required for project.

C. NEC Compliance: Comply with NEC requirements as applicable to construction and installation of overcurrent protective devices.

D. UL Compliance: Comply with applicable requirements of UL 489, "Molded-Case Circuit Breakers and Circuit-Breaker Enclosures", and UL 198D, "High-Interrupting-Capacity Class K Fuses". Provide overcurrent protective devices which have been UL-listed and labeled.

E. NEMA Compliance: Comply with applicable requirements of NEMA Std Pub Nos. AB 1, AB 2, and SG 3 pertaining to molded-case and low-voltage power type circuit breakers.

F. FS Compliance: Comply with Federal Specification W-C-375B/GEN pertaining to molded-case circuit breakers.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's data on overcurrent protective devices, including: amperes, voltages and current ratings, interrupting ratings, current limitations, internal inductive and non-inductive loads, time-current trip characteristics curves, and mounting requirements.

B. Maintenance Stock, Fuses: For types and ratings required, furnish additional fuses, amounting to one unit for every 5 installed units, but not less than one unit of each.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include the following:

1. Circuit Breakers:
   a. General Electric Co.
   b. Square D Co.
   c. ITE/Seimens

2. Fuses:
   a. Bussmann Div.; McGraw-Edison Co.
   b. Gould, Inc.
   c. Cefco

2.2 CIRCUIT BREAKERS

A. General: Except as otherwise indicated, provide circuit breakers and ancillary components, of types, sizes, ratings, and electrical characteristics indicated, which comply with manufacturer's standard design, materials, components, and construction in accordance with published product information, and as required for a complete installation.

B. Molded-Case Circuit Breakers: Provide factory assembled, molded-case circuit breakers of frame size indicated; rated 600 volts or 240 volts as required, 60 Hz, 3-poles with interrupting ratings as shown on drawings. Provide breakers with permanent thermal and instantaneous magnetic trips in each pole, and with fault-current limiting protection, ampere ratings as indicated. Construct with overcenter, trip-free, toggle-type operating mechanisms with quick-make, quick-break action and positive handle trip indication. Handle ties are not permitted.

Provide push-to-trip button on cover for mechanical tripping circuit breakers. Construct breakers for mounting and operating in any physical position and operating in an ambient temperature of 40oC. Provide breakers with mechanical screw type removable connector lugs, AL/CU rated. Circuit breakers shall have the short circuit interrupting rated indicated on the drawings or as required for the short circuit current available.

C. Molded-Case Circuit Breakers for Installation in Existing Panelboards or Switchboards: Shall meet the same specifications as in Part B above. Shall be manufactured by the same manufacturer as the panelboard or switchboard. When the existing panel or switchboard style is obsolete and the existing circuit breaker type is not available the contractor shall provide a circuit breaker of similar type as existing. The breaker shall be provided with all the required mounting hardware to mount the breaker in the existing space. The breaker shall meet or exceed the ratings of the existing breakers.

D. Provide all accesories indicated on the drawings, including accesories indicated on the panel schedules, such as shunt trips, ground fault protection, undervoltage trips, etc. Accessories shall be manufactured by the same manufacturer as the circuit breaker.

2.3 FUSES

A. General: Except as otherwise indicated, provide fuses of types, sizes, ratings, and average time/current and peak let-through current characteristics indicated, which comply with manufacturer's standard design, materials, and construction in accordance with published product information, and with industry standards and configurations.

B. Class RK5 Dual-Element Time-Delay Fuses: Provide UL Class RK-5 dual element time-delay fuses rated 600 V, 60 Hz, amperes as required by the manufacturer of the equipment being protected, with 200,000 RMS symmetrical interrupting current rating for protecting motors.

C. Class RK1 Dual-Element Time-Delay Fuses: Provide UL Class RK-1 dual element time-delay fuses rated 600 V, 60 Hz, amperes as required by the manufacturer of the equipment being protected, with 200,000 RMS symmetrical interrupting current rating for protecting service entrance or as otherwise noted.

2.4 EXISTING EQUIPMENT

A. Circuit breakers to be installed in existing equipment shall be manufactured by the existing equipment manufacturer and shall have short circuit interrupting ratings equal to or greater than the existing breakers. Provide all required factory supplied bus connection straps and bus connectors, plus factory supplied filler plates.

PART 3 - EXECUTION

3.1 INSTALLATION OF OVERCURRENT PROTECTIVE DEVICES

A. Install overcurrent protective devices as indicated, in accordance with manufacturer's written instructions and with recognized industry practices to ensure that protective devices comply with requirements. Comply with NEC and NEMA standards for installation of overcurrent protective devices.

B. Coordinate with other work, including electrical wiring work, as necessary to interface installation of overcurrent protective devices with other work.

C. Fasten circuit breakers without causing mechaincal stresses, twisting or misalignment being exerted by clamps, supports, or cabling.

D. Set field-adjustable circuit breakers for trip settings as indicated, subsequent to installation of units.

E. Install fuses, if any, in fused circuit breakers.

3.2 ADJUST AND CLEAN

A. Inspect circuit-breaker operating mechanisms for malfunctioning and, where necessary, adjust units for free mechanical movement.

3.3 FIELD QUALITY CONTROL

A. Prior to energization of overcurrent protective devices, test devices for continuity of circuitry and for short-circuits. Correct malfunctioning units, and then demonstrate compliance with requirements.

END OF SECTION 26 28 13

SECTION 26 43 13 - SURGE PROTECTION DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes transient voltage surge suppressors for low-voltage (600Volts and below) power equipment

B. Related Sections include the following:

1. Division 26 Section "Wiring Devices" transient voltage surge suppressors.
2. Division 26 Section "Panelboards"
3. Division 26 Section "Switchboards"

1.3 SUBMITTALS

A. Must have ten day prior approval to submit on project.

B. Request for submittals must be in writing and attached with independent documentation of the following items.

C. Drawings: Electrical and mechanical drawings shall be provided by the manufacturer which show unit dimensions, weights, mounting provisions, connection notes, wire size and wiring diagram.

1. SPD's with dimensions that exceed the available space to mount the device within the required maximum lead lengths will be rejected and not accepted. Verify maximum lead lengths can be met prior to bid.

D. Equipment Manual: The manufacturer shall furnish an installation manual with installation notes, start-up and operating instructions for the specified system. Installation instructions shall clearly state whether the system requires an external overcurrent device to maintain the system's UL 1449 listing. SPD requiring external overcurrent devices are not acceptable.

E. Verification that all SPD are UL 1449 listed and rated with a 20kA (In) nominal discharge rating for compliance to UL96A Lightning Protection Master Label and NFPA 780. Also provide UL 1449 VPR showing the following maximum VPR (clamping voltage) as follows:

1. 120Vsystem 600V (L-N)
2. 277Vsystem 1200V (L-N)

F. SPD manufacturer shall provide UL 3rd Edition documentation as part of submittal.

G. Manufacturer's Warranty Statement, showing a 10 year replacement warranty for modules or unit are damaged by transient voltages

1.4 STANDARDS

A. Underwriters Laboratories 1449 - (UL 1449 4th edition safety standard for surge protection devices)

B. NEC article 285. National Electrical Code 2011 SPD shall be labeled with a minimum 200kAIC rating.

C. NFPA 780 Standard for the installation of lightning protection systems

D. UL96A - Lightning Protection System Master Label

E. IEEE (Institute of Electrical and Electronic Engineering Inc.) C62.41.1 and C62.41.2, IEEE C62.45, IEEE C62.33 & C62.35 – latest editions.

F. All manufacturers must comply with above listed standards and any additions current revisions of industry standards. All products that do not comply with current industry standards will not be accepted.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain suppression devices and accessories through one source from a single manufacturer.

1.6 PROJECT CONDITIONS

A. Placing into Service: Do not energize or connect service entrance equipment, panel boards, control terminals, or data terminals to their sources until the surge protective devices are installed and connected.

B. Service Conditions: Rate surge protective devices for continuous operation under the following conditions, unless otherwise indicated:

1. Maximum Continuous Operating Voltage (MCOV): Not less than 115 percent
2. Operating Temperature: 30 to 120 deg F (0 to 50 deg C).
3. Humidity: 0 to 85 percent, non-condensing.
4. Altitude: Less than 20,000 feet (6000 m) above sea level.

1.7 COORDINATION

A. Coordinate location of field-mounted surge suppressors to allow adequate clearances for maintenance.

B. Coordinate surge protective devices with Division 26 Section "Panelboards" and “Switchboards”.

1.8 WARRANTY

A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Manufacturer shall provide a product warranty for a period of not less than ten (10) years from date of installation. Warranty shall cover unlimited replacement of SPD modules during the warranty period. Those firms responding to this specification shall provide proof that they have been regularly engaged in the design, manufacturing and testing of SPD for not less than five (5) years.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. PQ Protection

B. APT

2.2 SERVICE ENTRANCE SUPPRESSORS (TYPE SPD1)

Panel Amperage	≥3,000Amps	2500-1600Amps	1200-400Amps
Service Entrance	400kA/Modular	300kA/modular	200kA/modular

A. Provide service entrance rated, UL Type 1 SPD’s as shown and indicated on contract drawings.

B. Minimum surge current ratings per phase shown above, three phase, wye systems per phase rating shall equal L-N and L-G modes added together. No other methods are acceptable for per phase surge current rating calculations.

C. SPD’s shall be a multi-stage parallel connected device.

D. SPD’s UL 1449 3rd Edition VPR (clamping voltage) shall be a maximum rating of:

1. 120Vsystem 600V (L-N)
2. 277Vsystem 1200V (L-N)

E. SPD's shall mount external to the panel; internally mounted SPD's are not acceptable.

F. SPD voltages shall be verified by location on drawings, one-line diagrams and equipment schedules.

G. SPD shall be modular design with field replaceable modules per phase and per mode.

H. SPD shall have redundant status indicators on the front of the enclosure and shall monitor and indicate whether suppression capabilities have been compromised.

I. SPD shall contain protective components that utilize multiple thermally protected metal oxide varistors (MOV) per mode.

J. SPD's relying upon external and/or supplementary installed safety overcurrent protection do not meet the intent of this specification.

K. SPD's that are limited to being connected to breaker whether or not an integral disconnect switch is supplied do not meet the intent of this specification.

L. SPD's shall have an UL "In" rating (nominal discharge) of 20kA.

M. SPD shall have dry contacts for remote monitoring via the Campus security system (Ademco panels). Coordinate the required contact type with the existing security panels.

N. Service Entrance SPD's shall have audible alarms and surge counters.

O. SPD's shall have a metal, NEMA 4 rated enclosure.

P. SPD shall be designed and equipped with integral disconnecting means.

Q. Protection modes: The SPD shall provide Line to Neutral (L-N) (Wye), Line to Ground (L-G) (Wye or Delta), Line to Line (L-L) (Delta) and Neutral to Ground (N-G) (Wye) protection.

2.3 DISTRIBUTION, BRANCH PANEL AND/OR AUXILIARY PANELS (TYPE SPD2)

Panel Amperage	1200-800A	600A	400-100A
Distribution	200kA	200kA	200kA
Branch Panels		100kA	100kA

A. Provide UL Type 2 SPD's as shown and indicated on contract drawings. Any panel indicated to be 600 amp or larger, and any panel that is the service disconnect panel for the building shall be considered a "Distribution" type.

B. SPD's minimum surge current ratings per phase shown above, three phase, wye systems per phase rating shall equal L-N and L-G modes added together. No other methods are acceptable for per phase surge current rating calculations.

C. SPD's shall be a multi-stage parallel connected device.

D. SPD's shall mount external to the panel; internally mounted SPD's are not acceptable.

E. SPD voltages shall be verified by location on drawings, one-line diagrams and equipment schedules.

F. SPD shall be a compact, non-modular design

G. SPD shall have per phase status indicators on the front of the enclosure and shall monitor and indicate whether suppression capabilities have been compromised.

H. SPD shall contain protective components that utilize multiple thermally protected metal oxide varistors (MOV) per mode.

I. SPD's relying upon external and/or supplementary installed safety overcurrent protection do not meet the intent of this specification.

J. SPD's shall have an UL "In" rating (nominal discharge) of 20kA.

K. SPD shall have dry contacts for remote monitoring capabilities.

L. SPD's shall have a metal, NEMA 4 rated enclosure

M. Protection modes: The SPD shall provide Line to Neutral (L-N) (Wye), Line to Ground (L-G) (Wye or Delta), Line to Line (L-L) (Delta) and Neutral to Ground (N-G) (Wye) protection.

PART 3 - EXECUTION

3.1 INSTALLATION OF SURGE PROTECTIVE DEVICES

A. Review all installation information in manufacturer's installation manual prior to installing SPD's.

B. Verify all voltages before connecting to avoid injury and damage to equipment.

C. The SPD's shall be installed external to switchboard, distribution and panelboard.

D. Internally mounted SPD's will not be accepted.

E. The service entrance/switchboard/switchgear SPD's shall be installed with the shortest lead length possible and shall avoid any unnecessary or sharp bends. SPD's shall be connected to breakers with a 30 amp, 3 pole breaker for connection means.

F. The distribution, panelboard and auxiliary SPD's shall be installed with the shortest lead length possible from the panel it is protecting and shall avoid any unnecessary or sharp bends. SPD's shall be connected to breakers with a 30 amp, 3 pole breaker for connection means.

G. Ground resistance shall be 5 Ohms or less.

H. Refer to manufacturer's installation manual for further installation details.

3.2 FIELD QUALITY CONTROL

A INSTALLATION

1. After installing surge protective devices, but before electrical circuitry has been energized, test for compliance with manufacturers' installation instruction requirements and recommendations.

B MANUFACTURERS FIELD SERVICE

1. Engage a factory authorized service representative to inspect equipment installation. Report results in writing
2. Verify that electrical wiring installation complies with manufacturer's installation requirements.

END OF SECTION 26 43 13

SECTION 26 51 00 - INTERIOR BUILDING LUMINAIRES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. Division-26 Basic Electrical Materials and Methods section apply to work specified in this section.

1.2 DESCRIPTION OF WORK

A. Extent of interior lighting fixture work is indicated by drawings and schedules.

B. Types of interior lighting fixtures in this section include the following:

1. LED

C. Applications of interior lighting fixtures required for project including the following:

1. General lighting
2. Supplementary lighting
3. Task lighting
4. Emergency lighting

1.3 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of interior lighting fixtures of types and ratings required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer: Qualified with at least 3 years of successful installation experience on projects with interior lighting fixture work similar to that required for project.

C. NEC Compliance: Comply with NEC as applicable to installation and construction of interior building lighting fixtures.

D. NEMA Compliance: Comply with applicable requirements of NEMA Std Pub Nos. LE 1 and LE 2 pertaining to lighting equipment.

E. ANSI/IES Compliance: Comply with ANSI 132.1 pertaining to interior lighting fixtures.

F. ANSI/UL Compliance: Comply with ANSI/UL standards pertaining to interior lighting fixtures for hazardous locations.

G. UL Compliance: Provide interior lighting fixtures which have been UL-listed and labeled.

H. CBM Labels: Provide fluorescent-lamp ballasts which comply with Certified Ballast Manufacturers Association standards and carry the CBM label.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's data on interior building lighting fixtures, lamps and ballasts. Catalog numbers on the fixture schedule are intended to describe the general fixture requirements. The fixture description, catalog number and actual use and location of the fixture shall be utilized as the full luminaire specification requirements. Provide required accessories and options as necessary to meet the full specification and drawing requirements.

1. Submit complete catalog and technical data on lamps and drivers.

B. Shop Drawings: Submit fixture shop drawings in booklet form with separate sheet for each fixture, assembled in luminaire "type" alphabetical order, with proposed fixture and accessories clearly indicated on each sheet.

C. Point-by-point foot-candle calculations shall be submitted for the following areas, as a minimum:

1. A typical classroom.
2. Gymnasium.
3. Dining/Multi-purpose
4. Collaboration Corridor
5. Additional complete point-by-point foot-candle calculations shall be submitted for other fixtures or areas when requested by the engineer.

D. Luminaires will not be accepted without complete lamp and ballast submittals. Fixtures will not be accepted without acceptable lamps and ballasts.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturers/Catalog Numbers: Subject to compliance with requirements, provide fixtures manufactured by manufacturers as indicated on the fixture schedule. Catalog numbers given on the fixture schedule are intended to provide the general description of the required fixture and its quality. Additional accessories, mounting hardware, options, etc., not specifically described by the catalog number but required for a properly operating and installed fixture or as described by additional notation on the drawings or in the specifications, shall be provided.

1. Substitutions will not be considered without a full submittal package, complete with point-by-point calculations. Any substitutions that are considered must be prior approved by written addendum.

2.2 INTERIOR LIGHTING FIXTURES

A. General: Provide lighting fixtures, of sizes, types, and ratings indicated; complete with, but not necessarily limited to, housings, lamps, lamp holders, reflectors, ballasts, starters and wiring.

B. LED: LED luminaires shall be rated/tested to LM-79 standards

Provide energy saving LED-lamp drivers, compatible with the LED lamps and luminaire; Type 1, Class P; sound-rated A, and with internal thermal protection. All LED lamp type and associated driver for each individual type luminaire shall be of the same manufacturer and type. Drivers shall also meet the following requirements:

1. Operate LED lamps with no detectable flicker and provide for dimming where specified. Driver shall be compatible with the dimmers provided and installed. Provide written documentation of compatibility.
2. Driver manufacturer shall have been producing LED drivers in the U.S. for more than three years with a low failure rate.
3. Drivers shall be approved and listed by UL.
4. Drivers shall comply with all applicable state and federal efficiency standards.
5. Drivers shall comply with FCC and NEMA limits governing electromagnetic and radio frequency interference and shall not interfere with operation of other normal electrical equipment.
6. Drivers shall meet all applicable ANSI and IEEE standards regarding harmonic distortion and surge protection, but in no case shall have total harmonic distortion exceeding 10%.
7. Drivers shall not be affected by lamp failure and shall yield normal published expected lamp life.
9. Drivers shall operate at an input frequency of 60 HZ and an input voltage of 108 to 132 volts.
12. Driver assembly shall carry a minimum three year warranty, including labor allowance.

C. Fusing: All LED drivers shall be fused or be provided with automatic electronic thermal overload protection. Divers shall be capable of being disconnected at the luminaire for service and replacement.

2.3 LED LAMPS

A. Lamps: Provide LED lamps that comply with LM-80 standards**. LED lamps shall be rated for a minimum of 50,000 hours life. Lamps shall be provided with a minimum 3 year warranty.**

PART 3 - EXECUTION

3.1 INSTALLATION OF INTERIOR LIGHTING FIXTURES

A. Install interior lighting fixtures at locations and heights as indicated, in accordance with fixture manufacturer's written instructions, applicable requirements of NEC, NECA's "Standard of Installation", NEMA standards, and with recognized industry practices to ensure that lighting fixtures fulfill requirements.

B. Coordinate with other electrical work as appropriate to properly interface installation of interior lighting fixtures with other work.

C. Fasten fixtures securely to building structural support; and ensure that pendant fixtures are plumb and level. Provide all required mounting hardware and steel channel to supplement structural support where necessary. Fixtures shall not be supported from ductwork, piping, conduits, ceiling grid or any other non-structural building member. Fixtures may be supported from the ceiling grid only if the grid is properly supported from the building structure at a minimum of two corners at every fixture plus other supplemental support where deemed necessary. In addition, fixtures supported from a properly supported grid shall have grid hold-down clips installed. Hold-down clips shall be specifically manufactured for this purpose and shall be supplied with the fixtures.

D. Coordinate fixture installation with mechanical duct work, diffusers, return grilles, communication systems devices, etc., to avoid any interferences.

E. Gym fixtures shall securely mounted with a lighting fixture factory supplied stem mount. Provide supplemental structural steel (uni-strut, kindorf, etc.) to secure the gym lights to the building structure.

F. Pendant mounted direct/indirect fixtures shall be supported directly to the building structure, or via supplemental structural steel (uni-strut, kindorf). Any and all exposed supplemental steel or pendants, boxes, raceway, etc., shall be painted to match the surrounding area, or painted the color as directed by the architect.

3.2 ADJUST AND CLEAN

A. Clean interior lighting fixtures of dirt and debris upon completion of installation

B. Protect installed fixtures from damage during remainder of construction period.

3.3 FIELD QUALITY CONTROL

A. Upon completion of installation of interior lighting fixtures, and after building circuitry has been energized, apply electrical energy to demonstrate capability and compliance with

requirements. where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting.

B. At the time of Substantial Completion, replace lamps in interior lighting fixtures which are observed to be noticeably dimmed after Contractor's use and testing, as judged by Architect/Engineer.

C. Refer to Division-1 sections for the replacement/restoration of lamps in interior lighting fixtures, where used for temporary lighting prior to time of Substantial Completion.

D. Any and all exposed mounting hardware and supplemental steel mounting hardware (uni-strut, kindorf, etc.) shall be painted to match the surrounding areas or painted the color as directed by the architect. Exposed mounting hardware shall be prior approved by the architect before installation.

3.4 GROUNDING

A. Provide tight equipment grounding connections for each interior lighting fixture installation.

3.5 COMMISSIONING

A. Commissioning of the project will be required in accordance with the Florida Energy Code. Refer to the commissioning specification, section 23 0800 for more requirements, and other applicable specification sections. Provide all required materials, testing and labor to complete the commissioning procedures.

END OF SECTION 26 51 00

SECTION 26 55 61-STAGE LIGHTING

PART 1 – GENERAL

1.1 GENERAL

A. RELATED DOCUMENTS

1. Drawings and general provisions of Contract, including General and Supplementary Conditions, Special Conditions and Division-1 Specification sections, apply to work specified in this section.

1.2 RELATED WORK AND REQUIREMENTS

A. Section 26 00 00

1.3 SCOPE

A. This section requires the fabrication, furnishing, delivery, installation and testing of the lighting system as indicated on the drawings and specified herein.

B. The contractor shall provide all materials, equipment, labor, tools, scaffolds, and incidentals necessary to perform the scope of work.

C. It is the intention of these specifications that the contractor provides a professional quality, complete and properly operating system in every respect and detail.

D. The installation contractor shall examine the plans in detail to familiarize him with the scope of the work. Special attention shall be paid to reviewing all project electrical drawings, floor plans, conduit risers, and the like for locations and quantities of boxes and enclosures.

E. The contractor shall assume full responsibility for a complete operating installation, in the required location, in accordance with the contract documents.

F. Coordinate fully with the Division 26 Contractor.

1.4 WORK INCLUDED

A. Without restricting volume or generality of above "Scope," work to be performed under this section shall include, but not be limited to, the furnishing and installation of the following up grades:

1. Auditorium Theatre

   a. Take down all conventional ERS stage lighting fixtures and replace all worn and broken parts, bench focus and store for reinstallation.

   b. Take down all conventional par stage lighting fixtures and replace all worn and broken parts, bench focus and store for reinstallation.

   c. Take down all 10"fresnels and turn over to the owner.

   d. Take down all conventional stage lighting strip lights and turn over to the owner.

   e. Take down all conventional cyc lighting fixtures and turn over to the owner.

   f. Furnish and install a lighting control network with an auxiliary lighting control rack, network switches, patch bay, uninterrupted power supply with network receptacles and portable nodes at all lighting positions to distribute DMX 512 control signal.

   g. Provide a new DMX-512 computer based stage lighting console.

   h. Upgrade the existing ETC production dimmer rack and control module to Sensor 3.

   i. Upgrade the existing dimmer modules to new ThruPower Modules.

   j. Upgrade the existing ETC house light dimmer rack and control module to current version.

   k. Upgrade existing house lighting dimmer modules and airflow modules with new relay modules.

   l. Furnish & install a non-dim panel with 20 two pole 20A, 208V circuits.

   m. Furnish plugging boxes for non-dim circuits at existing and new lighting positions.

   n. Furnish plugging boxes for parallel circuits run to new lighting positions.

   o. Furnish and install house torm lighting positions with surface mount lighting ladder one house left and one house right.

   p. Furnish and install one surface mount lighting batten over the control booth window.

   q. Furnish and install new stage lighting fixtures as shown on Stage Lighting Light plot and described here in.

   r. Reinstall existing stage lighting fixtures as shown on Stage Lighting Light plot and described here in.

   s. Furnish and install a dance side lighting boom and fixture package as shown on Stage Lighting Light plot and described here in.

B. The Contractor shall examine the plans in detail to familiarize himself with the scope of work.

C. The Contractor shall provide the required manufacturers' shop drawings.

D. The Contractor shall provide all the necessary specialty equipment for the complete lighting and dimming system installation as specified herein, and shown on the drawings.

E. The Contractor shall coordinate the system control wire conduit and device locations with the Division 26 Contractor.

F. The Contractor shall deliver to the job site, and coordinate the installation of, the specialty equipment with the Division 26 Contractor.

G. The Contractor shall provide, install and terminate all system control wires.

H. The Contractor shall provide and install all system control devices.

I. The Contractor shall uncrate, assemble, lamp, hang and aim all the stage lighting fixtures as shown on the drawings.

J. The Contractor shall provide for the system activation.

K. The Contractor shall provide the system manuals.

L. The Contractor shall provide videotaped training sessions.

M. The Contractor shall provide the system warranty.

N. It is the Contractor's responsibility to ensure that the system and all of the system components, fixtures, equipment, devices, wire, terminations, field assemblies (including custom assemblies), etc pass all required inspections by the local authority having jurisdiction.

O. Procurement of all required permits.

1.5 CONTRACTOR'S QUALIFICATIONS:

A. Only qualified contractors shall be used.

B. The work of this section will be contracted to a single firm, referred to as the contractor.

C. The contractor shall be a lighting system contractor who regularly engages in the furnishing, installation and servicing of systems of similar nature, size, scope and

complexity to that contemplated by this specification. The contractor shall have done so for a period of not less than five years preceding the bid date.

D. The contractor shall have maintained for the five years preceding the bid date, a suitably staffed and equipped service organization which has continuously offered maintenance and repair services for systems of the nature, size, scope and complexity to that contemplated by this specification.

E. The contractor shall have on staff a factory trained field service agent, capable of system testing, commissioning and troubleshooting systems of the nature, size, scope and complexity to that contemplated by this specification.

F. The contractor shall have on staff a qualified and competent lighting designer / engineer capable of designing systems of the nature, size, scope and complexity to that contemplated by this specification.

G. The contractor shall maintain for the duration of this contract all required business and professional licenses and insurance.

H. The contractor shall demonstrate to the satisfaction of the owner, through submittals presented in accordance with the project timetable, that the contractor meets all the above qualifications. The minimum contractor qualification submittal shall include the following:

1. Statement of company history. Include a breakdown by percentage of gross sales of all business activities the contractor is involved in for each of the last 5 years (e.g. system installation = 30%, expendable sales = 40%, equipment rentals = 20%, design and other professional services = 10%, etc).
2. Previous experience: Furnish a list of four installations of the type and size contemplated by these specifications, currently in use as originally installed, in which a theatre / system consultant was involved, completed in the last 5 years and the following information regarding each installations:
    a. Name and address of each installation facility.
    b. Facility owner and telephone number.
    c. Name, address, and phone number of a person regularly employed by the owner, who is familiar with the operation of the systems and who has no connection or business connections with the contractor except as the contractor shall fully disclose
    d. Name, address, and phone number of the theatre / system consultant, along with the names of all the consultant's personal directly involved.
    e. System shop drawing – These will be returned if the contractor provides a call tag or return postage.
    f. Owner's manual drawing – These will be returned if the contractor provides a call tag or return postage.

g. System as-built drawings drawing – These will be returned if the contractor provides a call tag or return postage.

h. List of contractors personal involved with each person's responsibility on the project.

i. Name, address and phone number of the general contractor, along with the names of all key GC personal directly involved.

j. Name address and phone number of the electrical contractor, along with the names of all key EC personal directly involved.

3. Statement of current company capabilities and ownership.
4. Key Personal: For each of the key personnel listed in the below; Include individual's name, title, and number of continuous years of service to contractor. Include a resume detailing industry experience, and role within organization (include only full-time/regular staff employees; not independent contractor, freelance, or temporary positions). List all industry certifications held, training courses attended, and continuing education credits, including dates of attendance.

   a. Project Manager

   b. Senior Technician

   c. Service Manage

5. Factory Trained Field Service Agent. Include individual's name and title. List all factory held certifications, training courses attended, and continuing education credits, including dates of attendance. Provide a list of recently commissioned systems, scope of project, and commissioning dates.
6. Lighting Designer / Engineer. Include individual's name and title. List current design credits with scope of project, and design completion dates.
7. Other Department Staff. Include size of staff and experience of each staff member.
8. Replacement and Spare Parts Inventory – Provide detailed list of primary replacement parts, components, and spares typically held in inventory.
9. Test Equipment and Physical Plant – Include an inventory of all test facility equipment owned and used regularly by the Service Department. Provide description of physical plant and space utilization.
10. Copies of all business and professional licenses and insurance certificates.
11. Without prejudice to other contractors desiring to be qualified, the following are considered qualified and do not need to submit contractor's qualifications:

    Miami Stagecraft
    2855 E. 11th Ave.
    Hialeah, FL 33013
    (305) 836-9356
    Contact: Steve Welsh

    Stage Equipment and Lighting
    12250 N.E. 13th Court

Miami, FL 33161
(305) 891-2010
Contact: Rick Rudolph

Candela Controls
711 Business Park Blvd., Suite 101
Winter Garden, FL 34787
(407) 654-2420
Contact: Bill Ellis

Murphy Lighting Systems
621 Brookhaven Drive
Orlando, FL 32803
(407) 895-7475
Contact: Chris Murphy

PART 2 - PRODUCTS

2.1 GENERAL

A. When this document lists several acceptable manufacturers for a particular item of equipment, more than one of which is to be provided, the Contractor shall furnish all of those similar items of equipment from one manufacturer.

B. All dimmer racks, dimmer modules, lighting controls and lighting consoles shall be from the same manufacturer

C. Any item of equipment or hardware that may not be specifically shown on the drawings or specified herein, but required for proper system operation or installation, shall be furnished and installed and be of the highest quality available.

D. All materials and equipment used in this project shall be new, unused and of the latest models and design. Refurbished materials and equipment are not permitted except where noted.

E. The performance of all equipment must meet the most recently published manufacture's data sheet.

F. UL Labels: All equipment, where applicable standards have been established, shall be listed by Underwriters' Laboratories, Inc., and shall bear UL label when delivered to the job.

G. If so required by the local authority having jurisdiction, anything not arriving at the job bearing a UL label shall be field inspected and labeled by a nationally recognized testing laboratory recognized and approved by the local authority having jurisdiction.

2.2 ACCEPTABLE MANUFACTURERS

A. The stage lighting and control manufacturer shall be one who has been continuously engaged in the manufacture of stage lighting control equipment, wiring devices, and electronic dimmers for ten years or more.

B. Except where otherwise noted in this specification, the following are the approved manufacturers for the listed respective products:

Electronic Theatre Controls, Inc.
3030 Laura Lane
Middleton, Wisconsin 53562
(800) 688-4116

LEX Products Corp.
401 Shippan Avenue
Stamford, CT 06902
(800) 643-4460

LynTec
8401 Melrose
Lenexa, KA 66214
(913) 529-2233

Middle Atlantic Products, Inc.
North Corporate Drive
Riverdale, NJ 07457
(973) 839-1011

Pathway Connectivity
Acuity Brands Lighting
#103- 143917th Ave SE
Calgary AB T2G1J9, Canada
403-243-8110

SSRC
11 Freedom Court
Greer, South Carolina 29650
(864) 848-9770

C. Alternatives: In no case will equipment or materials of lesser design or workmanship be acceptable. Only those materials and equipment listed in this specification will be considered unless prior approval is sought and received.

1. Substitutions: When a specific piece of equipment specified has been discontinued and/or replaced by a new model, substitution will be acceptable when:
    a. Submission of complete data on the new model or substitute has been approved by the owner prior to equipment acquisition.
    b. Substitute equipment or the replacement of rejected equipment shall be at the sole expense of the contractor.

2. Substitutes shall be considered only when they are submitted fourteen days prior to bid date, and are accompanied by sufficient catalog data, specifications, and technical information for evaluation.
    a. Summarize proposal with a list of equipment catalog or series numbers. Substitute bids shall include a system riser diagram detailing components and any deviation of functionality from the drawings and specifications herein.
    b. The bidder shall include the name, address, and phone number of at least two- (2) factory authorized Field Warranty centers within a 250-mile radius of the job site as a part of the submittal documents.
    c. On the lighting fixtures, the bidder submitting other equipment shall include performance data taken and reported in compliance with the "Recommended Practice for Reporting Photometric Performance of Incandescent Filament Lighting Units used in Theatre and Television Production," approved as the official standard by the U.S. Institute for Theatre Technology, the Illuminating Engineering Society, the Society of Motion Picture and Television Engineers, and the American Theatre Association. For purposes of establishing the validity of such submissions, the manufacturer shall furnish this data from an independent testing laboratory. Proposals that fail to meet this requirement shall not be considered.
    d. On the dimming system, the bidder submitting other equipment shall include pertinent performance data, charts and drawings showing in what respect the system will function in accordance with specification, and in what way it will deviate from the specification. This submittal shall include, but not be limited to the following:
        1) Rated ampacity, peak single cycle surge current rating, I^2t rating, and transient voltage rating of the output devices employed in the dimmers.
        2) Laboratory verification of minimum current rise time at a 90-degree conductive angle, with the dimmer operating at the maximum load.
        3) Description of the air-cooling and air filtration systems.
        4) Description of the packaging and ease of replacement for all spare parts required in this specification.

5) Original Manufacturer's catalog data sheets for all major components of the dimmer system.

e. On the control system, the bidder shall submit the name of the manufacturer, and list of ten (10) or more operating systems in the State of Florida of the type specified which meet the performance control functions designed, with contact names and telephone numbers for references. This information shall be mandatory as a basis for determining the bidder's intent in meeting the full requirements of this specification, and shall be submitted at least fourteen days in advance of bidding.

f. It is understood that any additions or revisions of wiring required by the use of substitute equipment, whether such wiring is part of this contract or of the prime electrical contract, shall be the responsibility of the bidder making the substitution.

g. If required by the Owner, the Consultant, or Architect, the bidder shall provide working samples of substitute equipment including lamps for any lighting fixtures, to be delivered to the premises designated, for examination by Architects, Consultants, and such representatives as the Owner may direct. Handling, shipping and delivery to, or removal from site, of any sample required shall be at the cost of the Contractor. The Contractor shall be responsible for the arrangement of the cost of the electrical supply required to properly test any lighting instruments or item of equipment. Proposals which fail to address specification requirements or review comments will be rejected.

h. Prior approval submittal review and approval shall not be considered to be shop drawing review. Prior approval in no way relieves the Contractor of responsibility to fully meet the requirements and intent of this specification.

i. Should the contractor propose and receive approval for the use of alternative or substitute equipment which requires additional or modified conduit, the contractor will be solely responsible for the installation of such conduit.

2.3 AUDITORIUM STAGE LIGHTING DIMMER BANKS

A. Inspect, clean, repair and upgrade the existing dimmer racks. Inspection and cleaning shall include but not be limited to;

1. Thorough cleaning of the racks and dimmer modules with compressed air.
2. Inspection of all rack/dimmer power connectors. Replace as necessary with new parts only.
3. Tightening of all high voltage and neutral connections. Repair as necessary.

B. Furnish the dimmer rack maintenance and upgrades and related equipment; see system one line drawing for quantities and device location drawing for placement.

1. Electronic Theatre Controls, Inc.

CAT. #	DESCRIPTION
SR3-48	Upgrade stage lighting dimmer rack to Sensor 3 dimmer rack configured for 96, 20amp circuits.
-	
DRd-12	Upgrade house lighting dimmer rack to current version. Unison dimmer rack configured for 24, 20amp circuits

2.4 AUITORIUM STAGE LIGHTING DIMMER MODULES

A. The Dimmers shall be of modular design for easy installation and removal. Each module to come equipped with two 2.4kw dimmers, magnetic circuit breakers and a sealed power device assembly. The sealed power device assembly must be field replicable without soldering.

B. Remove the existing stage lighting dimmer modules and turn over to the owner.

C. Replace the existing stage lighting modules dimmer modules with new modules, see below.

D. Remove the existing house lighting dimmer modules and airflow modules and turn over to the owner.

E. Replace the existing house lighting dimming and airflow modules with new relay modules, see below.

1. Electronic Theatre Controls, Inc.

CAT. #	DESCRIPTION
TR20SAF	Stage lighting thru power dimmer modules. Dual 20 amp status reporting dimmer modules for production dimming circuits
TR20SAF	One spare
R20	House lighting relay modules. Dual 20 amp dimmer modules for house lighting relay circuits
R20	One spare

2.5 AUDITORIUM STAGE LIGHTING CONTROL MODULES

A. The control electronics shall be of modular design. The unit must be “slide in” for easy installation and removal. The control electronics module must be field replaceable without disconnecting any control wiring

B. Remove the existing stage lighting control module and turn over to the owner.

C. Replace the existing stage lighting control module with a new Control module.

D. Remove the existing house lighting control module and turn over to the owner.

E. Replace the existing house lighting control module with a new Control module.

1. Electronic Theatre Controls, Inc.

CAT. #	DESCRIPTION
CEM3	Stage lighting dimmer rack control module. Sensor 96 channel control module.
CEM3	One spare with initial project configuration installed
P-ACP	Unison Paradigm Architectural Control Processor (ACP) for the control of house lighting
P-SPM	Unison Paradigm Station Power Module
P-ACP	One spare with initial project configuration installed
UPBO	Battery pack option to keep the processor energized in the event of power loss or interruption to the enclosure. Battery to provide power up to 90 minutes

2.6 AUDITORIUM STAGE LIGHTING MAIN LIGHTING CONSOLE

A. Furnish the quantity of main lighting control consoles and accessories from one of the following approved manufacturers:

1. Electronic Theatre Controls, Inc.

QTY.	CAT. #	DESCRIPTION
1	Ion 2,048	Ion lighting console with 4

		universes of DMX output, include off line editor software
2	-	19” LCD DVI Touch Screen Monitors
2	FADW 2 x 10	Universal fader wing
1	-	20’ Network cable (console)
1	-	20’ DMX cable
1	-	20’ Network cable (portable node)
1	i Pad	For Remote Focus Unit
1	$100 i-Pad software gift card	For i-Pad lighting software, install so owner is account holder
1	-	Ion dust cover.
2	-	19” monitor dust cover
1	-	Fader wing dust cover.
1	2 kVA UPS	Uninterrupted Power Source.
2	Littlite	Task lights
1	-	6’ extension cable
1	-	6 receptacle power strip

2.7 COMPUTER

A. Furnish a Dell Laptop computer (or equal) which meets all minimum requirements for console off line software package. Include console off line software package installed on the laptop computer.

2.8 AUDITORIUM STAGE LIGHTING CONTROL CONNECTION PLATES

A. The system will be accessible via interconnection plates for the lighting control console and Ethernet output receptacles located at the performance lighting positions. Furnish lighting plugging stations; see contract drawings for type, quantities and locations.

2.9 DMX CONTROLLED NON- DIM PANEL

A. Furnish the enclosure and related equipment from the following approved manufacturers:

1. Lyntec

QTY.	CAT. #	DESCRIPTION
	LCP 341-20-1U-LA36400 with 20 @ BMB-220 breakers	Non dim lighting panel for LED and Moving Lights circuits ND-1 thru ND-20

2. Lyntec is the basis for design, alternative manufacturers are LEX or an approved equal.

2.10 DMX DISTRIBUTION & ETHERNET WIRING

A. Furnish equipment as shown on system drawing.

B. Install a certified CAT 6 network.

1. All branches will be fully tested and documented using a Certified CAT 6 tester.
2. All Components (wire, connectors, inline couplers, patch bay, patch cords, etc.) shall be fully CAT 6 compliant.
3. Provide network certifier results of all network runs.

C. Install the following hardware (when quantities above those shown on the system drawing are called for, those extras shall be furnished as loose equipment);

1. DMX/RDM rack mount four port Gateway configured as input node
   a. ETC N34G-4M
   b. Pathport is the basis for design, acceptable manufacturers are ETC.

2. HUB-1 36 port minimum managed gigabit network switch with PoE. PoE power to be sufficient to support all devices that are connected.
   a. 3Com or similar

3. PBY-1 Network Patch bay. 48 port RJ45. Provide required number of modular outlets. Include labeling.
   a. Siemon HD5-series or similar

4. Wireless Access Point (WAP) with single point Setup.
   a. Cisco WAP 121 Wireless-N Access point or equal.

5. One (1) DMX Opto-Splitter for house lighting fixture control.
   a. Pathway DMX Repeater Pro or equal.

6. Uninterrupted Power Supply - rack mount
   a. APC Smart UPS RT2200 VA RM 120V uninterrupted power supply 120v input/120v output, extended runtime model with switched outlet groups to connect critical equipment to a switched outlet group configured to turn on immediately in the event of a power outage and to connect peripheral equipment to a group configured to shut down, after a short period, in the event of a power outage in order to conserve battery run time (or Equal)
   b. APC Smart UPS 120v external Battery pack (or equal).

7. Thirty (30) 3’ CAT 6 patch cords
    a. Black Box Network Services or similar.
8. Portable Nodes
    a. DMX portable nodes with c-clamp and safety cable to distribute DMX over Ethernet with any compatible input or output device. Supports CAN, RDM, and USITT DMX 512-A, compliant with 802.af for Power over Ethernet, flexible output patch to allow a 512 address universe to begin at any output address. Fabricated from 16 gauge cold roll steel finished in black, fine textured scratch resistant powder coat, two integrated DMX 5 pin out ports, back lit LCD display for identification. Front and rear power indicators and RJ45 receptacle for connection to the lighting network.
    b. Path Port two port gateway is the basis of design or equal
9. One wall mount equipment rack for Auxiliary Rack 3. Furnish swing open access wall mount auxiliary rack as indicated on drawing. Furnish rack back box to electrical contractor and coordinate instillation. Provide internal power as required. Fill all unused rack spaces with blank panels.
    a. AR-3: Middle Atlantic Products DWR-24-32 with FD-24 front door.
    b. Furnish and install the following equipment in the AR-3 rack see contract drawings for location and quantities:

QTY.	DESCRIPTION
	Panel lights with dimmer.
	Uninterrupted power supply(described above)
	Uninterrupted power supply battery pack(described above)
	Four port Gateway / input (described above)
	DMX splitter(described above)
	Network hub (described above)
	Network patch bay (described above)
	4u locking drawer

    c. Middle Atlantic is the basis for design; acceptable manufacturers are Hoffman, and Rittal.

2.11 STAGE LIGHTING PLUGGING BOXES

A. Surface Mount Outlet boxes are fabricated from 16-gauge steel with a fine-texture, scratch-resistant, powder-coat finish. Outlets are 3-pole grounding of flush mount 20A 2P&G female stage pin connectors for 120V production dimmer dimming circuits and 20A L6-20 grounded flush mount female connectors for 208V, 2 pole non-dim panel circuits. Circuits are individually indicated with ¾” white die cut adhesive labels. Boxes are equipped with grounding lugs. All faceplates to match outlet box enclosure dimensions with no sharp

edges exposed. Basis of design is ETC alternative manufacturers are SSRC, LEX or an approved equal.

B. Pipe Mount Outlet boxes are fabricated from 16-gauge steel with a fine-texture, scratch-resistant, powder-coat finish. Outlets are 3-pole grounding of flush mount 20A 2P&G female stage pin connectors for 120V production dimmer dimming circuits and 20A L6-20 grounded flush mount female connectors for 208V, 2 pole non-dim panel circuits.. Pipe mounting hardware is to be configured to hang boxes from pipe battens. Circuits are individually indicated with ¾" white die cut adhesive labels clearly visible from **both** sides of the plugging boxes. Boxes are equipped with grounding lugs. All faceplates to match outlet box enclosure dimensions with no sharp edges exposed. Basis of design is ETC alternative manufacturers are Strand Lighting Inc., SSRC, LEX or an approved equal.

C. Furnish the plugging boxes for performance lighting circuits and non-dim circuits; see distribution detail drawing for circuit designations and quantities and see device location drawing for locations.

2.12 JUNCTION BOXES

A. This assembly shall be fabricated of 16-gauge, cold-rolled steel with removable covers. Standard box size shall be minimum 12"W x 10"H x 4"D with four mounting holes. Terminal Strips shall be a barrier screw clamp type. Two terminals shall be provided for each circuit. Terminals shall be sized for the circuit amperage as required. Finish shall be fine-texture, scratch resistant, black powder-coat. Provide ground bussing as required for back box.

B. This assembly is furnished by the stage lighting contractor as part of the cable management system for the new non-dim circuits for the over stage electrics. SSRC GB-6 is the basis of design, acceptable manufacturers are Leviton and ETC.

C. See lighting device location and system one line drawings for placement and quantities, and distribution detail drawings for circuit designations.

2.13 AUDITORIUM STAGE LIGHTING FIXTURES

A. All new theatrical lighting fixtures are to include a C-clamp, a color frame, a safety cable w/spring clip, 36" 3-wire leads and 20A grounded stage pin male connector installed except where noted differently.

B. All LED fixtures are to include a C-clamp(s), a safety cable w/spring clip, a power cable, a 10' power thru jumper cable and a 10' DMX male 5 pin to female DMX 5 pin thru jumper cable.

C. All moving head fixtures are to include a mega pipe clamps, a safety cable w/spring clip, a power cable, a 10' power thru jumper cable and a 10' DMX male 5 pin to female DMX 5 pin thru jumper cable.

D. Furnish and install the following theatrical lighting fixtures in the auditorium: see light plot for quantities.

QTY.	CAT. #	DESCRIPTION
	Electronic Theatre Controls, Inc. Cat. # 414 Or equal	Fourteen degree, 750 watt 115 volt ellipsoidal reflector spotlights.
	Electronic Theatre Controls, Inc. Cat. # 410 Or equal	Ten degree, 750 watt 115 volt ellipsoidal reflector spotlights.
	Electronic Theatre Controls, Inc. Cat. # 426 Or equal	Twenty-six degree, 750 watt 115 volt ellipsoidal reflector spotlights.
	Electronic Theatre Controls, Inc. Cat. # 436 Or equal	Thirty-six degree, 750 watt 115 volt ellipsoidal reflector spotlights.
	ETC Luster 2 LED light engine w/ LED CYC lens adaptor. Or equal	LED cyclorama wash light 100-240VAC Power cables with 2P&G connectors installed. Provide with 10' power thru and DMX jumpers
	Chauvet Ovation E-910FC or equal	ERS style LED fixture RGBAL color mixing system. Power cables with 2P&G connectors installed. fixture with universal power supply 100-240 VAC,
	COLORado 2-Quad Zoom OR equal	Led Wash Light with power & DMX thru connections, die cast all metal housing, Access slots for secondary lenses and standard 7.5" par accessories. Provide L45 secondary lens. 100VAC to 240VAC 50/60 Hz universal power unit, Power in cables with 2P&G connectors installed. Zoom Angle 16 to 48 degrees, DMX 512 in & thru via 5pin & 3pin XLR connectors, 16 bit virtual dimming engine, noiseless fan free convection cooling,

		ETC
	Chauvet Ovation B-2805FC Or equal	LED RGBAL color mixing system strip Light with universal power supply 100-240 VAC, Beam spread of 42 deg vertical-38 deg horizontal for a smooth even field for overhead stage washes. power con in with L6-20 male plug and 10’ power con to power con thru connectors, DMX 512 input/output, on board LCD menu for easy set up and addressing, top or floor mounting
	Chauvet COLORado Batten 72 Tour or equal	LED RGBAW color mixing system strip Light with universal power supply 100-240 VAC, Beam spread of 42 deg vertical-38 deg horizontal for a smooth even field for cyc and stage washes. power con in with L6-20 male plug and 10’ power con to power con thru connectors, DMX 512 input/output, on board LCD menu for easy set up and addressing, floor mounting
	Chauvet Maverick MK2 Spot	440w LED Engine, 120-240V auto ranging power supply. Power in cables with L6-20 connectors installed. CYM +CTO color mixing system, 13-37 degrees zoom range, variable frost filter, 3 facet rotating prism, motorizes iris, strobe, two 6 position rotating gobo wheels, 7 position+ white color wheel
	Chauvet Maverick MK2 Wash	Twelve 40w LEDs, 120-240V auto ranging power supply. Power in cables

		with L6-20 connectors installed RGBW color mixing system, 7-49 degrees zoom range, pixel mapping, strobe

E. Take down all existing stage lighting fixtures.

1. All ERS fixtures are to be maintenanced. Maintenance includes replacing worn and broken parts, bench focusing and installation of new 750w lamps. Store fixtures to be re hung. Turn over all good existing lamps to owner.
2. All Source Four par fixtures are to be maintenanced. Maintenance includes replacing worn and broken parts and installation of new 750w lamps. Store fixtures to be re hung. Turn over all good existing lamps to owner.
3. All 10" fresnels are to be turned over to the owner.
4. All conventional cyc light fixtures are to be turned over to the owner.
5. All conventional strip lighting fixtures are to be turned over to the owner.

2.14 AUDITORIUM STAGE LIGHTING LAMPS

A. Approved manufacturers for stage lamps are General Electric, Sylvania, or Ushio.

B. Furnish and install the following stage lamps for the auditorium stage lighting fixtures in the necessary quantities plus 20% for spares:

1. HPL750/115X, for ETC ellipsoidal and Pars.
2. Turn over ALL spares Lamps to the Owner.

2.15 AUDITORIUM STAGE LIGHTING ACCESSORIES

A. Furnish the following stage lighting accessories for the auditorium.

B. Lex Stage cable is the basis of design or an approved equal.

C. Provide all type S 2P&G jumpers and twofers required to cable the light plot and furnish the following jumpers. All jumpers are to have color coded length labeling at both ends of the cable with each length to be a different color.

1. 25 @ 5'-0", 12 AWG, type S extension cables w/male and female 2P&G connectors installed.
2. 20 @ 10'-0", 12 AWG, type S extension cables w/male and female 2P&G connectors installed.
3. 6 @ 25' -0", 12 AWG, type S extension cables w/male and female 2P&G connectors installed.

4. 5 @ 50' -0", 12 AWG, type S extension cables w/male and female 2P&G connectors installed.
5. 15 @ 2-Fers, Lex Products # 3123J-SP, for interconnection of fixtures.

D. Provide all type S L6-20 jumpers and twofers required to cable the light plot and furnish the following jumpers. All jumpers are to have color coded length labeling at both ends of the cable with each length to be a different color.

1. 10 @ 5'-0", 12 AWG, type S extension cables w/male and female L6-20 connectors installed.
2. 10 @ 10'-0", 12 AWG, type S extension cables w/male and female L6-20 connectors installed.
3. 5 @ 25' -0", 12 AWG, type S extension cables w/male and female L6-20 connectors installed.
4. 5 @ 2-Fers, with L6-20 connectors installed for interconnection of fixtures.

E. Provide all 5 pin DMX jumpers required to cable the light plot and furnish the following jumpers. All jumpers are to have color coded length labeling at both ends of the cable.

1. 10 @ 5’ male DMX 5 pin to female DMX 5 pin cables.
2. 10 @ 10’ male DMX 5 pin to female DMX 5 pin cables.
3. 5 @ 25’ male DMX 5 pin to female DMX 5 pin cables.
4. 5 DMX terminators.
5. 3 male 5 pin to female 3 pin DMX turnarounds
6. 3 female 5 pin to male 3pin DMX turnarounds.

7. In additional to all gel shown on light plot furnish one hundred (100) additional sheets assorted color media as follows, confirm gel selections with owner:

   a. 3 sheets Roscolux 33
   b. 3 sheets Lee 202
   c. 4 sheets Roscolux 119
   d. 2 sheets Roscolux 54
   e. 4 sheets Lee 152
   f. 4 sheets Roscolux 68
   g. 2 sheets Roscolux 55
   h. 2 sheets Roscolux 52
   i. 2 sheets Roscolux 364
   j. 2 sheets Roscolux 114
   k. 5 sheets Roscolux 81
   l. 5 sheets GAM 685
   m. 5 sheets GAM 235
   n. 3 sheets Roscolux 321
   o. 3 sheets Roscolux 385
   p. 2 sheets Roscolux 39

8. Side booms

a. Six (6) 50 lb. Boom bases, threaded for 1 ½" pipe.
b. Six (6) 12' long, schedule 40 pipes, finished flat black and threaded both ends, with couplings installed to protect threads.
c. Six (6) tie off caps threaded for 1 ½" pipe, City Theatrical model 1310
d. Twenty Four (24) 18" single tee sidearm.

PART 3 - EXECUTION

3.1 STANDARDS COMPLIANCE

A. Comply with all local building codes.

B. In the absence of specific local codes, comply with the National Electrical Code (NFPA-70) as applicable to installation and construction of stage lighting and control equipment.

C. Where not in conflict with local building codes or the National Electrical Code comply with industry standard professional practices.

D. Installation practices shall be in accordance with OSHA Safety and Health Standards.

3.2 SHOP DRAWINGS

A. Submit within thirty (30) days of the bid acceptance, for review and approval by the Owner, Architect, and Consultant:

1. Complete shop drawings and data sheets for all items specified.
2. Complete shop drawings for all components, assemblies, sub-assemblies, cabinets, wiring devices and hardware required to implement the work.
3. Riser diagrams showing all quantities, types and sizes of inter-connection wires to be installed by others.
4. Schematics of all block assemblies and sub-assemblies, including pin out identification of all low voltage cable connectors.
5. Approval of shop drawings does not relieve the Contractor of the responsibility of providing equipment in accordance with these specifications. Any deviations from the specifications shall be "starred" and noted in 1/4" high letters. Only deviations, which upgrade the quality of the equipment, shall be considered.
6. In addition to drawings, the Contractor may elect to submit catalog cuts for certain standard equipment items. These shall contain full information on dimensions, construction, applications, etc. to permit proper evaluation. In addition, they shall be properly identified as to their intended use and any options or variations shall be clearly noted.
7. Samples may be requested by the Architect and shall be furnished for inspection at the Architect's office, at the Contractor's sole expense.

8. Prior to the commencement of fabrication and delivery, the Contractor shall submit for approval, to the Architect, an outline of a proposed commencement and completion schedule of project requirements.

3.3 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver stage lighting equipment and controls to job site securely wrapped in containers.

B. Coordinate delivery dates with the Division 26 contractor

C. All equipment shall be stored in a clean, dry space.

D. Discrepancies in quantities or missing equipment shall be noted, in writing, and brought to the attention of the manufacturer within five days of receipt.

E. Replacement of missing or damaged equipment shall be the responsibility of the Contractor.

F. Handle equipment and controls carefully to prevent breakage, denting and scoring finish.

G. Replace and return damaged units to equipment manufacturer immediately.

H. Store in original cartons and protect from dirt, physical damage, weather, and construction traffic.

3.4 INSTALLATION

A. The Contractor shall furnish, deliver, install and terminate all system control wires.

1. All cables shall be permanently labeled at every termination. The label shall not be hand written. Clear heat shrink shall cover the label.
2. Service loops of not less than 6" will be present at all terminations to equipment.
3. All pulls to be made by hand, care will be taken not to nick cable jackets, and any nicked or damaged cable will be replaced.
4. A pull string will be left in all conduits after wire is installed.
5. NO SPLICES WHATSOEVER IN CONDUIT!
6. Include spare cables with all field runs. Quantity to be 10% or 1 whichever is greater unless otherwise specified.
7. Where shielded cable is in use leave shield drain wire the same length as the circuit conductor(s), sleeve shield drain wire in green PVC tubing. Cap where the cable jacket was removed with heat shrink. Where the shield drain wire is to be lifted follow the above and fold back over cable jacket. Then cap end with heat shrink. Do not use a single piece of heat shrink for this use two smaller ones.
8. All soldering will be clean and neat and not exhibit evidence of a " cold" joint, were necessary heat sinks will be used. Use only rosin core "electronic type" solder.

9. Wire nuts will be not allowed.

B. The Contractor shall furnish and install all system control devices.

C. The Contractor shall hang and aim the stage fixture hanging plot.

1. Provide the Theatre Consultant fourteen (14) days notice prior to this work being scheduled.
2. The Theatre Consultant shall verify the aiming of the stage fixtures.
3. The installation of all work shall be neat.

D. All boxes, equipment, etc shall be plumb and square.

E. The installation shall conform to the plans and spec.

F. The contractor shall not commence the installation of equipment and devices, other than the pulling of cable, until all areas are clean, painted and finished to a point that they are completely dust, dirt, lint, fiber and airborne particle free. The air conditioning system must be operating to its design level and be able to keep all areas with control equipment stable.

3.5 INSTALLATION COORDINATION

A. The Contractor shall specifically coordinate the placement and sizes of conduit relating to this work and shall specifically review and approve the conduit rough-in in time to advise all parties of needed changes, omissions, etc.

B. The Contractor shall report this successful coordination in writing to the Architect.

C. If any conflicts or omissions occur as a result of the Contractor's unsuccessful coordination of the above mentioned work, it shall be the Contractor's responsibility to correct, furnish and install any additional material that may be required.

D. The contractor shall at all times coordinate his work with the other trades to ensure smooth progress of work and satisfactory final results.

E. The Contractor shall examine areas and conditions under which stage lighting and controls are to be installed and notify the Architect in writing of conditions detrimental to proper installation and operation.

3.6 INSPECTION AND TESTING:

A. During the installation of the equipment the contractor shall arrange for access as necessary for inspection of equipment by the owner's and/or architect's representatives.

B. Provide a safe means of accessing all system components for all visits.

C. Equipment Pretesting: All racks are to be built and wired in contractors shop and tested prior to delivery to site. All other equipment is to be tested prior to delivery and installation. A written test report will be submitted to the owner.

D. Final Inspection:

1. The final inspection will confirm that the systems, as installed, meet the requirements of this spec, the contract documents, and the approved contractor's shop drawing and submittals.
2. The contractor will inform the owner in writing of the system's completion. The contractor will then request final inspection by the consultant, and carry out the necessary coordination. This coordination includes:
    a. Giving at least fourteen days notice to the consultant prior to the final inspection.
    b. Arranging for the contractor's and consultants exclusive use of the space.
    c. Arranging for a HVAC technician to be available to turn the AC system on and off as required.
    d. Arranging for a sound technician to be available to control the sound system as required.
    e. The contractor's job foreman and one additional worker familiar with the job will be present during all check out, testing and inspection.
    f. Contractor will complete the following tasks prior to consultant's arrival:
    g. Unpack and assemble all portable equipment.
    h. Place all portable equipment in one location.
    i. If anything has been turned over to the owner have the signed Letters of Transmittal on site.
    j. Complete all required paperwork (pre-testing reports, letters indicating successful coordination of the installation, etc.).
    k. Provide all lighting network certification reports.
    l. Remove all security covers.
    m. Contractor will provide all necessary software, cables, and interfaces to facilitate the setting of computer controlled, remote controlled or digitally controlled equipment.
    n. Contractor will provide the following test equipment for use during inspection and acceptance testing:
    o. Some type of light meter
    p. Some type of DMX checking device
    q. Some type of Multi-meter.
    r. Contractor will provide safe means to access all system components during the entire commissioning process.
    s. Contractor shall provide personal and equipment to make any adjustments to the theatrical lighting system(s), as well as to correct problems, for the entire inspection and testing period.

E. The Theatre Consultant or his representative will conduct all final system tests in order to determine final acceptance.

F. In no event shall the theatrical lighting systems installation be submitted for final approval or acceptance until any and all elements of the facility that may have a bearing on the system performance, including but not limited to doors, windows, HVAC, carpeting, furniture, wall coverings, stage flooring, rigging systems, interior design elements, architectural lighting and lighting control systems have been completed and are operable. All elements that may affect stage lighting systems operation or performance shall be "on" and operating during adjustments. The stage lighting contractor will be responsible for coordinating the requirements of this paragraph with other work on the project.

G. Equipment Backorders. Should any component or equipment be on backorder at time of system inspection and testing the contractor shall provide comparable loaner equipment at contractor's expense. Said equipment shall remain on-site until backordered equipment is delivered and installed.

3.7 MANUFACTURER'S SERVICES

A. The Contractor shall provide for:

1. A manufacturer's field service engineer to perform initial system activation. Under no circumstances shall power be applied to any equipment prior to initial system activation.
2. The manufacturer's field service engineer shall inspect and confirm that all low voltage terminations are correct.
3. Such engineering services shall be furnished within twenty-one (21) days of a written request by The Contractor.

3.8 TRAINING AND INSTRUCTION

A. The Contractor shall furnish sixteen (16) hours of onsite instruction to Owner designated persons. This instruction shall happen on four occasions and shall be divided into the training level groups listed below. The general conditions require all training sessions to be videotaped. This contractor is to coordinate with this requirement and if required perform the taping.

B. There are three levels of training that are required that reflect the level of knowledge to access to the stage lighting system based on the need.

1. Basic Users – This level is for the maintenance and box office personnel and it is to train the user to turn on & off the house lights and stage lights in order to perform maintenance and repair and allow general access to the auditorium and stage in non-performance situations.

    a. The first occasion shall take place at the time of initial system activation and be performed by the manufacturer's field service engineer. The initial training

session shall be not less than 2 hours and it is recommended the number of trainees be limited to 4 persons.

2. Intermediate Users – This level is for the general stage crew and it is to train the user to order to operate the stage lighting systems in performance and rehearsal situations.
    a. The first occasion shall take place at the time of initial system activation and be performed by the manufacturer's field service engineer. The initial training session shall be not less than 3 hours with 1 hour to concentrate on general systems and 2 hours to concentrate on lighting console training. It is recommended the number of trainees be limited to 3 persons.

3. Administrator – This level is for the person(s) who are responsible for the setup and maintenance of the stage lighting systems and the future training of the Basic and Intermediate Users.
    a. The first occasion shall take place at the time of initial system activation and be performed by the manufacturer's field service engineer. The initial training session shall be not less than 4 hours with 2 hours to cover all aspects of operation and maintenance required by this system and 2 hours to concentrate on lighting console training. It is recommended the number of trainees be limited to 2 persons.

4. All other occasions shall be coordinated with the owner representative and Contractor with (21) days written notice. This instruction shall be an overall review of the system operation and detailed console operations. The finial occasion shall take place within the first six months following system activation.

C. Provide operational assistance for the first usage of the system. This is to be on the owner's time schedule but, not to exceed 8 hours.

3.9 MANUALS

A. Upon completion of the work, the Theater Equipment Contractor shall submit four detailed printed copies of Operations and Maintenance Manuals for each space, 2 for the Owner, and 1 for the Architect/Engineer of Record and one for Consultants. The Contractor shall also provide CD-ROM's with the Operations and Maintenance Manuals in PDF form with a hyper link table of contents, also any and all CAD drawings including as-built shop drawings, equipment descriptions, any required certificates or warranties, and parts lists or other electronically produced submittal items. The contractor shall also provide a USB flash drive for each space with all project documents including the initial configuration files for the control electronics modules for the stage lighting dimmers and house light dimmers, the stage lighting consoles, the stage lighting network switches, the portable network nodes and all multi parameter stage lighting fixtures. Submit in quantities and file formats as required by the Architect

B. Additionally, inside the primary dimmer or auxiliary control rack, provide a document pouch and one set of final as-built drawings. Before distribution of manuals submit one copy to consultant for approval. Each manual is to contain the following:

1. System one line drawings including all labeling and changes ("as builts ").
2. Owner's manual for each piece of equipment.
3. Schematic diagram for each piece of equipment.
4. Contractors service phone number in a conspicuous place.
5. All test reports.

3.10 WARRANTIES

A. Contractor will warrant the system to be free from defects in materials and workmanship for a period of one year from the date of acceptance, or first beneficial use, whichever comes first. Acts of god and owner abuse or neglect are not covered.

B. During the warranty period the contractor will respond to and correct any call for service within one day of the call.

C. Loaner equipment will be provided if necessary.

D. The manufacturer of the stage lighting and control equipment shall warranty the electrical distribution, dimming and control equipment to be free from defects of material or workmanship for a period of two years from the date of acceptance.

E. The manufacturer shall warranty all fixtures and accessories (except lamps) to be free from defects of material or workmanship for a period of one year from the date of acceptance. During the period of this warranty, equipment that proves to be defective shall be repaired or replaced at no charge (excluding freight). Unauthorized local repairs of equipment during the warranty period shall relieve the manufacturer of his responsibilities under this warranty.

F. Include the name, address, and phone number of at least two- (2) factory authorized Field Warranty centers within a 250-mile radius of the job site in the operation and maintenance manual.

3.11 FINAL ACCEPTANCE

A. The following conditions must be met before final acceptance will be granted:

B. Inventory of all equipment by the project Architects or his representative.

C. All inventoried portable equipment is in secure storage, accessible only by the Owner.

D. Approval of final tests and inspections by the project Architects, Theatre Consultant, and Owner.

E. Submittal to the Architect of three (3) signed copies of the warranty (ies).

F. Satisfactory completion of all punch list items.

G. At the date of system activation, the Contractor shall furnish and replace all lamps in stage lighting fixtures, which are observed to be noticeably dimmed, as judged by the Architect or his representative.

END OF SECTION 25 55 61

SECTION 26 55 61-STAGE LIGHTING

PART 1 – GENERAL

1.1 GENERAL

A. RELATED DOCUMENTS

1. Drawings and general provisions of Contract, including General and Supplementary Conditions, Special Conditions and Division-1 Specification sections, apply to work specified in this section.

1.2 RELATED WORK AND REQUIREMENTS

A. Section 26 00 00

1.3 SCOPE

A. This section requires the fabrication, furnishing, delivery, installation and testing of the lighting system as indicated on the drawings and specified herein.

B. The contractor shall provide all materials, equipment, labor, tools, scaffolds, and incidentals necessary to perform the scope of work.

C. It is the intention of these specifications that the contractor provides a professional quality, complete and properly operating system in every respect and detail.

D. The installation contractor shall examine the plans in detail to familiarize him with the scope of the work. Special attention shall be paid to reviewing all project electrical drawings, floor plans, conduit risers, and the like for locations and quantities of boxes and enclosures.

E. The contractor shall assume full responsibility for a complete operating installation, in the required location, in accordance with the contract documents.

F. Coordinate fully with the Division 26 Contractor.

1.4 WORK INCLUDED

A. Without restricting volume or generality of above "Scope," work to be performed under this section shall include, but not be limited to, the furnishing and installation of the following up grades:

1. Auditorium Theatre

   a. Take down all conventional ERS stage lighting fixtures and replace all worn and broken parts, bench focus and store for reinstallation.

   b. Take down all conventional par stage lighting fixtures and replace all worn and broken parts, bench focus and store for reinstallation.

   c. Take down all 10"fresnels and turn over to the owner.

   d. Take down all conventional stage lighting strip lights and turn over to the owner.

   e. Take down all conventional cyc lighting fixtures and turn over to the owner.

   f. Repair follow spots.

   g. Furnish and install a lighting control network with an auxiliary lighting control rack, network switches, patch bay, uninterrupted power supply with network receptacles and portable nodes at all lighting positions to distribute DMX 512 control signal.

   h. Provide a new DMX-512 computer based stage lighting console.

   i. Upgrade the existing ETC production dimmer rack and control module to Sensor 3.

   j. Upgrade the existing dimmer modules to new ThruPower Modules.

   k. Upgrade the existing ETC house light dimmer rack and control module to current version.

   l. Upgrade existing house lighting dimmer modules and airflow modules with new relay modules.

   m. Furnish & install a non-dim panel with 20 two pole 20A, 208V circuits.

   n. Furnish plugging boxes for non-dim circuits at existing and new lighting positions.

   o. Furnish plugging boxes for parallel circuits run to new lighting positions.

   p. Furnish and install house torm lighting positions with surface mount lighting ladder one house left and one house right.

   q. Furnish and install one surface mount lighting batten over the control booth window.

   r. Furnish and install new stage lighting fixtures as shown on Stage Lighting Light plot and described here in.

   s. Reinstall existing stage lighting fixtures as shown on Stage Lighting Light plot and described here in.

   t. Furnish and install a dance side lighting boom and fixture package as shown on Stage Lighting Light plot and described here in.

B. The Contractor shall examine the plans in detail to familiarize himself with the scope of work.

C. The Contractor shall provide the required manufacturers' shop drawings.

D. The Contractor shall provide all the necessary specialty equipment for the complete lighting and dimming system installation as specified herein, and shown on the drawings.

E. The Contractor shall coordinate the system control wire conduit and device locations with the Division 26 Contractor.

F. The Contractor shall deliver to the job site, and coordinate the installation of, the specialty equipment with the Division 26 Contractor.

G. The Contractor shall provide, install and terminate all system control wires.

H. The Contractor shall provide and install all system control devices.

I. The Contractor shall uncrate, assemble, lamp, hang and aim all the stage lighting fixtures as shown on the drawings.

J. The Contractor shall provide for the system activation.

K. The Contractor shall provide the system manuals.

L. The Contractor shall provide videotaped training sessions.

M. The Contractor shall provide the system warranty.

N. It is the Contractor's responsibility to ensure that the system and all of the system components, fixtures, equipment, devices, wire, terminations, field assemblies (including custom assemblies), etc pass all required inspections by the local authority having jurisdiction.

O. Procurement of all required permits.

1.5 CONTRACTOR'S QUALIFICATIONS:

A. Only qualified contractors shall be used.

B. The work of this section will be contracted to a single firm, referred to as the contractor.

C. The contractor shall be a lighting system contractor who regularly engages in the furnishing, installation and servicing of systems of similar nature, size, scope and complexity to that contemplated by this specification. The contractor shall have done so for a period of not less than five years preceding the bid date.

D. The contractor shall have maintained for the five years preceding the bid date, a suitably staffed and equipped service organization which has continuously offered maintenance and repair services for systems of the nature, size, scope and complexity to that contemplated by this specification.

E. The contractor shall have on staff a factory trained field service agent, capable of system testing, commissioning and troubleshooting systems of the nature, size, scope and complexity to that contemplated by this specification.

F. The contractor shall have on staff a qualified and competent lighting designer / engineer capable of designing systems of the nature, size, scope and complexity to that contemplated by this specification.

G. The contractor shall maintain for the duration of this contract all required business and professional licenses and insurance.

H. The contractor shall demonstrate to the satisfaction of the owner, through submittals presented in accordance with the project timetable, that the contractor meets all the above qualifications. The minimum contractor qualification submittal shall include the following:

1. Statement of company history. Include a breakdown by percentage of gross sales of all business activities the contractor is involved in for each of the last 5 years (e.g. system installation = 30%, expendable sales = 40%, equipment rentals = 20%, design and other professional services = 10%, etc).
2. Previous experience: Furnish a list of four installations of the type and size contemplated by these specifications, currently in use as originally installed, in which a theatre / system consultant was involved, completed in the last 5 years and the following information regarding each installations:
    a. Name and address of each installation facility.
    b. Facility owner and telephone number.
    c. Name, address, and phone number of a person regularly employed by the owner, who is familiar with the operation of the systems and who has no connection or business connections with the contractor except as the contractor shall fully disclose
    d. Name, address, and phone number of the theatre / system consultant, along with the names of all the consultant's personal directly involved.
    e. System shop drawing – These will be returned if the contractor provides a call tag or return postage.
    f. Owner's manual drawing – These will be returned if the contractor provides a call tag or return postage.
    g. System as-built drawings drawing – These will be returned if the contractor provides a call tag or return postage.
    h. List of contractors personal involved with each person's responsibility on the project.

i. Name, address and phone number of the general contractor, along with the names of all key GC personal directly involved.

j. Name address and phone number of the electrical contractor, along with the names of all key EC personal directly involved.

3. Statement of current company capabilities and ownership.
4. Key Personal: For each of the key personnel listed in the below; Include individual's name, title, and number of continuous years of service to contractor. Include a resume detailing industry experience, and role within organization (include only full-time/regular staff employees; not independent contractor, freelance, or temporary positions). List all industry certifications held, training courses attended, and continuing education credits, including dates of attendance.
   a. Project Manager
   b. Senior Technician
   c. Service Manage
5. Factory Trained Field Service Agent. Include individual's name and title. List all factory held certifications, training courses attended, and continuing education credits, including dates of attendance. Provide a list of recently commissioned systems, scope of project, and commissioning dates.
6. Lighting Designer / Engineer. Include individual's name and title. List current design credits with scope of project, and design completion dates.
7. Other Department Staff. Include size of staff and experience of each staff member.
8. Replacement and Spare Parts Inventory – Provide detailed list of primary replacement parts, components, and spares typically held in inventory.
9. Test Equipment and Physical Plant – Include an inventory of all test facility equipment owned and used regularly by the Service Department. Provide description of physical plant and space utilization.
10. Copies of all business and professional licenses and insurance certificates.
11. Without prejudice to other contractors desiring to be qualified, the following are considered qualified and do not need to submit contractor's qualifications:

Miami Stagecraft
2855 E. 11th Ave.
Hialeah, FL 33013
(305) 836-9356
Contact: Steve Welsh

Stage Equipment and Lighting
12250 N.E. 13th Court
Miami, FL 33161
(305) 891-2010
Contact: Rick Rudolph

Candela Controls

711 Business Park Blvd., Suite 101
Winter Garden, FL 34787
(407) 654-2420
Contact: Bill Ellis

Murphy Lighting Systems
621 Brookhaven Drive
Orlando, FL 32803
(407) 895-7475
Contact: Chris Murphy

PART 2 - PRODUCTS

2.1 GENERAL

A. When this document lists several acceptable manufacturers for a particular item of equipment, more than one of which is to be provided, the Contractor shall furnish all of those similar items of equipment from one manufacturer.

B. All ETC dimmer racks, dimmer modules, lighting controls and lighting consoles shall be from the same manufacturer

C. Any item of equipment or hardware that may not be specifically shown on the drawings or specified herein, but required for proper system operation or installation, shall be furnished and installed and be of the highest quality available.

D. All materials and equipment used in this project shall be new, unused and of the latest models and design. Refurbished materials and equipment are not permitted except where noted.

E. The performance of all equipment must meet the most recently published manufacture's data sheet.

F. UL Labels: All equipment, where applicable standards have been established, shall be listed by Underwriters' Laboratories, Inc., and shall bear UL label when delivered to the job.

G. If so required by the local authority having jurisdiction, anything not arriving at the job bearing a UL label shall be field inspected and labeled by a nationally recognized testing laboratory recognized and approved by the local authority having jurisdiction.

2.2 ACCEPTABLE MANUFACTURERS

A. The stage lighting and control manufacturer shall be one who has been continuously engaged in the manufacture of stage lighting control equipment, wiring devices, and electronic dimmers for ten years or more.

B. Except where otherwise noted in this specification, the following are the approved manufacturers for the listed respective products:

Electronic Theatre Controls, Inc.
3030 Laura Lane
Middleton, Wisconsin 53562
(800) 688-4116

LEX Products Corp.
401 Shippan Avenue
Stamford, CT 06902
(800) 643-4460

LynTec
8401 Melrose
Lenexa, KA 66214
(913) 529-2233

Middle Atlantic Products, Inc.
North Corporate Drive
Riverdale, NJ 07457
(973) 839-1011

Pathway Connectivity
Acuity Brands Lighting
#103- 143917th Ave SE
Calgary AB T2G1J9, Canada
403-243-8110

SSRC
11 Freedom Court
Greer, South Carolina 29650
(864) 848-9770

C. Alternatives: In no case will equipment or materials of lesser design or workmanship be acceptable. Only those materials and equipment listed in this specification will be considered unless prior approval is sought and received.

1. Substitutions: When a specific piece of equipment specified has been discontinued and/or replaced by a new model, substitution will be acceptable when:

a. Submission of complete data on the new model or substitute has been approved by the owner prior to equipment acquisition.

b. Substitute equipment or the replacement of rejected equipment shall be at the sole expense of the contractor.

2. Substitutes shall be considered only when they are submitted fourteen days prior to bid date, and are accompanied by sufficient catalog data, specifications, and technical information for evaluation.

   a. Summarize proposal with a list of equipment catalog or series numbers. Substitute bids shall include a system riser diagram detailing components and any deviation of functionality from the drawings and specifications herein.

   b. The bidder shall include the name, address, and phone number of at least two- (2) factory authorized Field Warranty centers within a 250-mile radius of the job site as a part of the submittal documents.

   c. On the lighting fixtures, the bidder submitting other equipment shall include performance data taken and reported in compliance with the "Recommended Practice for Reporting Photometric Performance of Incandescent Filament Lighting Units used in Theatre and Television Production," approved as the official standard by the U.S. Institute for Theatre Technology, the Illuminating Engineering Society, the Society of Motion Picture and Television Engineers, and the American Theatre Association. For purposes of establishing the validity of such submissions, the manufacturer shall furnish this data from an independent testing laboratory. Proposals that fail to meet this requirement shall not be considered.

   d. On the dimming system, the bidder submitting other equipment shall include pertinent performance data, charts and drawings showing in what respect the system will function in accordance with specification, and in what way it will deviate from the specification. This submittal shall include, but not be limited to the following:

      1) Rated ampacity, peak single cycle surge current rating, I^2t rating, and transient voltage rating of the output devices employed in the dimmers.
      2) Laboratory verification of minimum current rise time at a 90-degree conductive angle, with the dimmer operating at the maximum load.
      3) Description of the air-cooling and air filtration systems.
      4) Description of the packaging and ease of replacement for all spare parts required in this specification.
      5) Original Manufacturer's catalog data sheets for all major components of the dimmer system.

   e. On the control system, the bidder shall submit the name of the manufacturer, and list of ten (10) or more operating systems in the State of Florida of the type specified which meet the performance control functions designed, with contact names and telephone numbers for references. This information shall be mandatory as a basis for determining the bidder's intent in meeting the full requirements of this specification, and shall be submitted at least fourteen days in advance of bidding.

f. It is understood that any additions or revisions of wiring required by the use of substitute equipment, whether such wiring is part of this contract or of the prime electrical contract, shall be the responsibility of the bidder making the substitution.

g. If required by the Owner, the Consultant, or Architect, the bidder shall provide working samples of substitute equipment including lamps for any lighting fixtures, to be delivered to the premises designated, for examination by Architects, Consultants, and such representatives as the Owner may direct. Handling, shipping and delivery to, or removal from site, of any sample required shall be at the cost of the Contractor. The Contractor shall be responsible for the arrangement of the cost of the electrical supply required to properly test any lighting instruments or item of equipment. Proposals which fail to address specification requirements or review comments will be rejected.

h. Prior approval submittal review and approval shall not be considered to be shop drawing review. Prior approval in no way relieves the Contractor of responsibility to fully meet the requirements and intent of this specification.

i. Should the contractor propose and receive approval for the use of alternative or substitute equipment which requires additional or modified conduit, the contractor will be solely responsible for the installation of such conduit.

2.3 AUDITORIUM STAGE LIGHTING DIMMER BANKS

A. Inspect, clean, repair and upgrade the existing dimmer racks. Inspection and cleaning shall include but not be limited to;

1. Thorough cleaning of the racks and dimmer modules with compressed air.
2. Inspection of all rack/dimmer power connectors. Replace as necessary with new parts only.
3. Tightening of all high voltage and neutral connections. Repair as necessary.

B. Furnish the dimmer rack maintenance and upgrades and related equipment; see system one line drawing for quantities and device location drawing for placement.

1. Electronic Theatre Controls, Inc.

CAT. #	DESCRIPTION
SR3-48	Upgrade stage lighting dimmer rack to Sensor 3 dimmer rack configured for 96, 20amp circuits.
-	
DRd-12	Upgrade house lighting dimmer rack to current version. Unison dimmer rack configured for 24, 20amp circuits

2.4 AUITORIUM STAGE LIGHTING DIMMER MODULES

A. The Dimmers shall be of modular design for easy installation and removal. Each module to come equipped with two 2.4kw dimmers, magnetic circuit breakers and a sealed power device assembly. The sealed power device assembly must be field replicable without soldering.

B. Remove the existing stage lighting dimmer modules and turn over to the owner.

C. Replace the existing stage lighting modules dimmer modules with new modules, see below.

D. Remove the existing house lighting dimmer modules and airflow modules and turn over to the owner.

E. Replace the existing house lighting dimming and airflow modules with new relay modules, see below.

1. Electronic Theatre Controls, Inc.

CAT. #	DESCRIPTION
TR20SAF	Stage lighting thru power dimmer modules. Dual 20 amp status reporting dimmer modules for production dimming circuits
TR20SAF	One spare
R20	House lighting relay modules. Dual 20 amp dimmer modules for house lighting relay circuits
R20	One spare

2.5 AUDITORIUM STAGE LIGHTING CONTROL MODULES

A. The control electronics shall be of modular design. The unit must be “slide in” for easy installation and removal. The control electronics module must be field replaceable without disconnecting any control wiring

B. Remove the existing stage lighting control module and turn over to the owner.

C. Replace the existing stage lighting control module with a new Control module.

D. Remove the existing house lighting control module and turn over to the owner.

E. Replace the existing house lighting control module with a new Control module.

1. Electronic Theatre Controls, Inc.

CAT. #	DESCRIPTION
CEM3	Stage lighting dimmer rack control module. Sensor 96 channel control module.
CEM3	One spare with initial project configuration installed
P-ACP	Unison Paradigm Architectural Control Processor (ACP) for the control of house lighting
P-SPM	Unison Paradigm Station Power Module
P-ACP	One spare with initial project configuration installed
UPBO	Battery pack option to keep the processor energized in the event of power loss or interruption to the enclosure. Battery to provide power up to 90 minutes

2.6 AUDITORIUM STAGE LIGHTING MAIN LIGHTING CONSOLE

A. Furnish the quantity of main lighting control consoles and accessories from one of the following approved manufacturers:

1. Electronic Theatre Controls, Inc.

QTY.	CAT. #	DESCRIPTION
1	Ion 2,048	Ion lighting console with 4 universes of DMX output, include off line editor software
2	-	19” LCD DVI Touch Screen Monitors
2	FADW 2 x 10	Universal fader wing
1	-	20’ Network cable (console)
1	-	20’ DMX cable
1	-	20’ Network cable (portable node)
1	i Pad	For Remote Focus Unit
1	$100 i-Pad software gift card	For i-Pad lighting software, install so owner is account holder
1	-	Ion dust cover.

2	-	19” monitor dust cover
1	-	Fader wing dust cover.
1	2 kVA UPS	Uninterrupted Power Source.
2	Littlite	Task lights
1	-	6’ extension cable
1	-	6 receptacle power strip

2.7 COMPUTER

A. Furnish a Dell Laptop computer (or equal) which meets all minimum requirements for console off line software package. Include console off line software package installed on the laptop computer.

2.8 AUDITORIUM STAGE LIGHTING CONTROL CONNECTION PLATES

A. The system will be accessible via interconnection plates for the lighting control console and Ethernet output receptacles located at the performance lighting positions. Furnish lighting plugging stations; see contract drawings for type, quantities and locations.

2.9 DMX CONTROLLED NON- DIM PANEL

A. Furnish the enclosure and related equipment from the following approved manufacturers:

1. Lyntec

QTY.	CAT. #	DESCRIPTION
	LCP 341-20-1U-LA36400 with 20 @ BMB-220 breakers	Non dim lighting panel for LED and Moving Lights circuits ND-1 thru ND-20

2. Lyntec is the basis for design, alternative manufacturers are LEX or an approved equal.

2.10 DMX DISTRIBUTION & ETHERNET WIRING

A. Furnish equipment as shown on system drawing.

B. Install a certified CAT 6 network.

1. All branches will be fully tested and documented using a Certified CAT 6 tester.
2. All Components (wire, connectors, inline couplers, patch bay, patch cords, etc.) shall be fully CAT 6 compliant.
3. Provide network certifier results of all network runs.

C. Install the following hardware (when quantities above those shown on the system drawing are called for, those extras shall be furnished as loose equipment);

1. DMX/RDM rack mount four port Gateway configured as input node
   a. ETC N34G-4M
   b. Pathport is the basis for design, acceptable manufacturers are ETC.

2. HUB-1 36 port minimum managed gigabit network switch with PoE. PoE power to be sufficient to support all devices that are connected.
   a. 3Com or similar

3. PBY-1 Network Patch bay. 48 port RJ45. Provide required number of modular outlets. Include labeling.
   a. Siemon HD5-series or similar

4. Wireless Access Point (WAP) with single point Setup.
   a. Cisco WAP 121 Wireless-N Access point or equal.

5. One (1) DMX Opto-Splitter for house lighting fixture control.
   a. Pathway DMX Repeater Pro or equal.

6. Uninterrupted Power Supply - rack mount
   a. APC Smart UPS RT2200 VA RM 120V uninterrupted power supply 120v input/120v output, extended runtime model with switched outlet groups to connect critical equipment to a switched outlet group configured to turn on immediately in the event of a power outage and to connect peripheral equipment to a group configured to shut down, after a short period, in the event of a power outage in order to conserve battery run time (or Equal)
   b. APC Smart UPS 120v external Battery pack (or equal).

7. Thirty (30) 3’ CAT 6 patch cords
   a. Black Box Network Services or similar.

8. Portable Nodes
   a. DMX portable nodes with c-clamp and safety cable to distribute DMX over Ethernet with any compatible input or output device. Supports CAN, RDM, and USITT DMX 512-A, compliant with 802.af for Power over Ethernet, flexible output patch to allow a 512 address universe to begin at any output address. Fabricated from 16 gauge cold roll steel finished in black, fine textured scratch resistant powder coat, two integrated DMX 5 pin out ports, back lit LCD display for identification. Front and rear power indicators and RJ45 receptacle for connection to the lighting network.
   b. Path Port two port gateway is the basis of design or equal

9. One wall mount equipment rack for Auxiliary Rack 3. Furnish swing open access wall mount auxiliary rack as indicated on drawing. Furnish rack back box to electrical contractor and coordinate instillation. Provide internal power as required. Fill all unused rack spaces with blank panels.

   a. AR-3: Middle Atlantic Products DWR-24-32 with FD-24 front door.

   b. Furnish and install the following equipment in the AR-3 rack see contract drawings for location and quantities:

QTY.	DESCRIPTION
	Panel lights with dimmer.
	Uninterrupted power supply(described above)
	Uninterrupted power supply battery pack(described above)
	Four port Gateway / input (described above)
	DMX splitter(described above)
	Network hub (described above)
	Network patch bay (described above)
	4u locking drawer

   c. Middle Atlantic is the basis for design; acceptable manufacturers are Hoffman, and Rittal.

2.11 STAGE LIGHTING PLUGGING BOXES

A. Surface Mount Outlet boxes are fabricated from 16-gauge steel with a fine-texture, scratch-resistant, powder-coat finish. Outlets are 3-pole grounding of flush mount 20A 2P&G female stage pin connectors for 120V production dimmer dimming circuits and 20A L6-20 grounded flush mount female connectors for 208V, 2 pole non-dim panel circuits. Circuits are individually indicated with ¾" white die cut adhesive labels. Boxes are equipped with grounding lugs. All faceplates to match outlet box enclosure dimensions with no sharp edges exposed. Basis of design is ETC alternative manufacturers are SSRC, LEX or an approved equal.

B. Pipe Mount Outlet boxes are fabricated from 16-gauge steel with a fine-texture, scratch-resistant, powder-coat finish. Outlets are 3-pole grounding of flush mount 20A 2P&G female stage pin connectors for 120V production dimmer dimming circuits and 20A L6-20 grounded flush mount female connectors for 208V, 2 pole non-dim panel circuits. Pipe mounting hardware is to be configured to hang boxes from pipe battens. Circuits are individually indicated with ¾" white die cut adhesive labels clearly visible from **both** sides of the plugging boxes. Boxes are equipped with grounding lugs. All faceplates to match outlet box enclosure dimensions with no sharp edges exposed. Basis of design is ETC alternative manufacturers are Strand Lighting Inc., SSRC, LEX or an approved equal.

C. Furnish the plugging boxes for performance lighting circuits and non-dim circuits; see distribution detail drawing for circuit designations and quantities and see device location drawing for locations.

2.12 JUNCTION BOXES

A. This assembly shall be fabricated of 16-gauge, cold-rolled steel with removable covers. Standard box size shall be minimum 12"W x 10"H x 4"D with four mounting holes. Terminal Strips shall be a barrier screw clamp type. Two terminals shall be provided for each circuit. Terminals shall be sized for the circuit amperage as required. Finish shall be fine-texture, scratch resistant, black powder-coat. Provide ground bussing as required for back box.

B. This assembly is furnished by the stage lighting contractor as part of the cable management system for the new non-dim circuits for the over stage electrics. SSRC GB-6 is the basis of design, acceptable manufacturers are Leviton and ETC.

C. See lighting device location and system one line drawings for placement and quantities, and distribution detail drawings for circuit designations.

2.13 AUDITORIUM STAGE LIGHTING FIXTURES

A. All new theatrical lighting fixtures are to include a C-clamp, a color frame, a safety cable w/spring clip, 36” 3-wire leads and 20A grounded stage pin male connector installed except where noted differently.

B. All LED fixtures are to include a C-clamp(s), a safety cable w/spring clip, a power cable, a 10’ power thru jumper cable and a 10’ DMX male 5 pin to female DMX 5 pin thru jumper cable.

C. All moving head fixtures are to include a mega pipe clamps, a safety cable w/spring clip, a power cable, a 10’ power thru jumper cable and a 10’ DMX male 5 pin to female DMX 5 pin thru jumper cable.

D. Furnish and install the following theatrical lighting fixtures in the auditorium: see light plot for quantities.

QTY.	CAT. #	DESCRIPTION
	Electronic Theatre Controls, Inc. Cat. # 410 Or equal	Ten degree, 750 watt 115 volt ellipsoidal reflector spotlights.
	Electronic Theatre Controls, Inc. Cat. # 414 Or equal	Fourteen degree, 750 watt 115 volt ellipsoidal reflector spotlights.
	Electronic Theatre Controls, Inc. Cat. # 426 Or equal	Twenty-six degree, 575 watt 115 volt ellipsoidal reflector spotlights.
	Electronic Theatre Controls, Inc. Cat. # 436 Or equal	Thirty-six degree, 575 watt 115 volt ellipsoidal

		reflector spotlights.
	ETC Luster 2 LED light engine w/ LED CYC lens adaptor. Or equal	LED cyclorama wash light 100-240VAC Power cables with 2P&G connectors installed. Provide with 10' power thru and DMX jumpers
	Chauvet Ovation E-910FC or equal	ERS style LED fixture RGBAL color mixing system. Power cables with 2P&G connectors installed. fixture with universal power supply 100-240 VAC,
	COLORado 2-Quad Zoom OR equal	Led Wash Light with power & DMX thru connections, die cast all metal housing, Access slots for secondary lenses and standard 7.5" par accessories. Provide L45 secondary lens. 100VAC to 240VAC 50/60 Hz universal power unit, Power in cables with 2P&G connectors installed. Zoom Angle 16 to 48 degrees, DMX 512 in & thru via 5pin & 3pin XLR connectors, 16 bit virtual dimming engine, noiseless fan free convection cooling, ETC
	Chauvet Ovation B-2805FC Or equal	LED RGBAL color mixing system strip Light with universal power supply 100-240 VAC, Beam spread of 42 deg vertical-38 deg horizontal for a smooth even field for overhead stage washes. power con in with L6-20 male plug and 10' power con to power con thru connectors, DMX 512 input/output, on board LCD menu for easy set up and

		addressing, top or floor mounting
	Chauvet COLORado Batten 72 Tour or equal	LED RGBAW color mixing system strip Light with universal power supply 100-240 VAC, Beam spread of 42 deg vertical-38 deg horizontal for a smooth even field for cyc and stage washes. power con in with L6-20 male plug and 10' power con to power con thru connectors, DMX 512 input/output, on board LCD menu for easy set up and addressing, floor mounting
	Chauvet Maverick MK2 Spot	440w LED Engine, 120-240V auto ranging power supply. Power in cables with L6-20 connectors installed. CYM +CTO color mixing system, 13-37 degrees zoom range, variable frost filter, 3 facet rotating prism, motorizes iris, strobe, two 6 position rotating gobo wheels, 7 position+ white color wheel
	Chauvet Maverick MK2 Wash	Twelve 40w LEDs, 120-240V auto ranging power supply. Power in cables with 2P&G connectors installed RGBW color mixing system, 7-49 degrees zoom range, pixel mapping, strobe

E. Take down all existing stage lighting fixtures.

1. All existing ERS fixtures are to be maintenanced. Maintenance includes replacing worn and broken parts, bench focusing and installation of new 575w lamps. Store fixtures to be re hung. Turn over all good existing lamps to owner.

2. All existing Source four par fixtures are to be maintenanced. Maintenance includes replacing worn and broken parts and installation of new 575w lamps. Store fixtures to be re hung. Turn over all good existing lamps to owner.
3. All 10” Fresnel fixtures are to be turned over to the owner
4. All conventional cyc light fixtures are to be turned over to the owner.
5. All conventional strip lighting fixtures are to be turned over to the owner.
6. Inspect and maintenance the follow spots. Maintenance includes replacing worn and broken parts this shall include replace broken locking collar on one follow spot and replacing bad wiring to follow spot lamp sockets.

2.14 AUDITORIUM STAGE LIGHTING LAMPS

A. Approved manufacturers for stage lamps are General Electric, Sylvania, or Ushio.

B. Furnish and install the following stage lamps for the auditorium stage lighting fixtures in the necessary quantities plus 20% for spares:

1. HPL750/115X, for ETC ellipsoidal fixtures as shown on light plot.
2. HPL575/115X, for ETC ellipsoidal and pars as shown on light plot.
3. Turn over ALL spares Lamps to the Owner.

2.15 AUDITORIUM STAGE LIGHTING ACCESSORIES

A. Furnish the following stage lighting accessories for the auditorium.

B. Lex Stage cable is the basis of design or an approved equal.

C. Provide all type S 2P&G jumpers and twofers required to cable the light plot and furnish the following jumpers. All jumpers are to have color coded length labeling at both ends of the cable with each length to be a different color.

1. 25 @ 5'-0", 12 AWG, type S extension cables w/male and female 2P&G connectors installed.
2. 20 @ 10'-0", 12 AWG, type S extension cables w/male and female 2P&G connectors installed.
3. 6 @ 25' -0", 12 AWG, type S extension cables w/male and female 2P&G connectors installed.
4. 5 @ 50' -0", 12 AWG, type S extension cables w/male and female 2P&G connectors installed.
5. 15 @ 2-Fers, Lex Products # 3123J-SP, for interconnection of fixtures.
6. 4 @ custom 2-Fers, male 2P&G connector to one female 2 P&G connector and one female 5-20(Edison) connector.

D. Provide all type S L6-20 jumpers and twofers required to cable the light plot and furnish the following jumpers. All jumpers are to have color coded length labeling at both ends of the cable with each length to be a different color.

1. 10 @ 5'-0", 12 AWG, type S extension cables w/male and female L6-20 connectors installed.
2. 10 @ 10'-0", 12 AWG, type S extension cables w/male and female L6-20 connectors installed.
3. 5 @ 25' -0", 12 AWG, type S extension cables w/male and female L6-20 connectors installed.
4. 5 @ 2-Fers, with L6-20 connectors installed for interconnection of fixtures.

E. Provide all 5 pin DMX jumpers required to cable the light plot and furnish the following jumpers. All jumpers are to have color coded length labeling at both ends of the cable.

1. 10 @ 5' male DMX 5 pin to female DMX 5 pin cables.
2. 10 @ 10' male DMX 5 pin to female DMX 5 pin cables.
3. 5 @ 25' male DMX 5 pin to female DMX 5 pin cables.
4. 5 DMX terminators.
5. 3 male 5 pin to female 3 pin DMX turnarounds
6. 3 female 5 pin to male 3pin DMX turnarounds.

7. In additional to all gel shown on light plot furnish one hundred (100) additional sheets assorted color media as follows, confirm gel selections with owner:

   a. 3 sheets Roscolux 33
   b. 3 sheets Lee 202
   c. 4 sheets Roscolux 119
   d. 2 sheets Roscolux 54
   e. 4 sheets Lee 152
   f. 4 sheets Roscolux 68
   g. 2 sheets Roscolux 55
   h. 2 sheets Roscolux 52
   i. 2 sheets Roscolux 364
   j. 2 sheets Roscolux 114
   k. 5 sheets Roscolux 81
   l. 5 sheets GAM 685
   m. 5 sheets GAM 235
   n. 3 sheets Roscolux 321
   o. 3 sheets Roscolux 385
   p. 2 sheets Roscolux 39

8. Side booms

   a. Six (6) 50 lb. Boom bases, threaded for 1 ½" pipe.
   b. Six (6) 12' long, schedule 40 pipes, finished flat black and threaded both ends, with couplings installed to protect threads.
   c. Six (6) tie off caps threaded for 1 ½" pipe, City Theatrical model 1310

d. Twenty Four (24) 18” single tee side arms.

PART 3 - EXECUTION

3.1 STANDARDS COMPLIANCE

A. Comply with all local building codes.

B. In the absence of specific local codes, comply with the National Electrical Code (NFPA-70) as applicable to installation and construction of stage lighting and control equipment.

C. Where not in conflict with local building codes or the National Electrical Code comply with industry standard professional practices.

D. Installation practices shall be in accordance with OSHA Safety and Health Standards.

3.2 SHOP DRAWINGS

A. Submit within thirty (30) days of the bid acceptance, for review and approval by the Owner, Architect, and Consultant:

1. Complete shop drawings and data sheets for all items specified.
2. Complete shop drawings for all components, assemblies, sub-assemblies, cabinets, wiring devices and hardware required to implement the work.
3. Riser diagrams showing all quantities, types and sizes of inter-connection wires to be installed by others.
4. Schematics of all block assemblies and sub-assemblies, including pin out identification of all low voltage cable connectors.
5. Approval of shop drawings does not relieve the Contractor of the responsibility of providing equipment in accordance with these specifications. Any deviations from the specifications shall be "starred" and noted in 1/4" high letters. Only deviations, which upgrade the quality of the equipment, shall be considered.
6. In addition to drawings, the Contractor may elect to submit catalog cuts for certain standard equipment items. These shall contain full information on dimensions, construction, applications, etc. to permit proper evaluation. In addition, they shall be properly identified as to their intended use and any options or variations shall be clearly noted.
7. Samples may be requested by the Architect and shall be furnished for inspection at the Architect's office, at the Contractor's sole expense.
8. Prior to the commencement of fabrication and delivery, the Contractor shall submit for approval, to the Architect, an outline of a proposed commencement and completion schedule of project requirements.

3.3 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver stage lighting equipment and controls to job site securely wrapped in containers.

B. Coordinate delivery dates with the Division 26 contractor

C. All equipment shall be stored in a clean, dry space.

D. Discrepancies in quantities or missing equipment shall be noted, in writing, and brought to the attention of the manufacturer within five days of receipt.

E. Replacement of missing or damaged equipment shall be the responsibility of the Contractor.

F. Handle equipment and controls carefully to prevent breakage, denting and scoring finish.

G. Replace and return damaged units to equipment manufacturer immediately.

H. Store in original cartons and protect from dirt, physical damage, weather, and construction traffic.

3.4 INSTALLATION

A. The Contractor shall furnish, deliver, install and terminate all system control wires.

1. All cables shall be permanently labeled at every termination. The label shall not be hand written. Clear heat shrink shall cover the label.
2. Service loops of not less than 6" will be present at all terminations to equipment.
3. All pulls to be made by hand, care will be taken not to nick cable jackets, and any nicked or damaged cable will be replaced.
4. A pull string will be left in all conduits after wire is installed.
5. NO SPLICES WHATSOEVER IN CONDUIT!
6. Include spare cables with all field runs. Quantity to be 10% or 1 whichever is greater unless otherwise specified.
7. Where shielded cable is in use leave shield drain wire the same length as the circuit conductor(s), sleeve shield drain wire in green PVC tubing. Cap where the cable jacket was removed with heat shrink. Where the shield drain wire is to be lifted follow the above and fold back over cable jacket. Then cap end with heat shrink. Do not use a single piece of heat shrink for this use two smaller ones.
8. All soldering will be clean and neat and not exhibit evidence of a " cold" joint, were necessary heat sinks will be used. Use only rosin core "electronic type" solder.
9. Wire nuts will be not allowed.

B. The Contractor shall furnish and install all system control devices.

C. The Contractor shall hang and aim the stage fixture hanging plot.

1. Provide the Theatre Consultant fourteen (14) days notice prior to this work being scheduled.
2. The Theatre Consultant shall verify the aiming of the stage fixtures.
3. The installation of all work shall be neat.

D. All boxes, equipment, etc shall be plumb and square.

E. The installation shall conform to the plans and spec.

F. The contractor shall not commence the installation of equipment and devices, other than the pulling of cable, until all areas are clean, painted and finished to a point that they are completely dust, dirt, lint, fiber and airborne particle free. The air conditioning system must be operating to its design level and be able to keep all areas with control equipment stable.

3.5 INSTALLATION COORDINATION

A. The Contractor shall specifically coordinate the placement and sizes of conduit relating to this work and shall specifically review and approve the conduit rough-in in time to advise all parties of needed changes, omissions, etc.

B. The Contractor shall report this successful coordination in writing to the Architect.

C. If any conflicts or omissions occur as a result of the Contractor's unsuccessful coordination of the above mentioned work, it shall be the Contractor's responsibility to correct, furnish and install any additional material that may be required.

D. The contractor shall at all times coordinate his work with the other trades to ensure smooth progress of work and satisfactory final results.

E. The Contractor shall examine areas and conditions under which stage lighting and controls are to be installed and notify the Architect in writing of conditions detrimental to proper installation and operation.

3.6 INSPECTION AND TESTING:

A. During the installation of the equipment the contractor shall arrange for access as necessary for inspection of equipment by the owner's and/or architect's representatives.

B. Provide a safe means of accessing all system components for all visits.

C. Equipment Pretesting: All racks are to be built and wired in contractors shop and tested prior to delivery to site. All other equipment is to be tested prior to delivery and installation. A written test report will be submitted to the owner.

D. Final Inspection:

1. The final inspection will confirm that the systems, as installed, meet the requirements of this spec, the contract documents, and the approved contractor's shop drawing and submittals.
2. The contractor will inform the owner in writing of the system's completion. The contractor will then request final inspection by the consultant, and carry out the necessary coordination. This coordination includes:

   a. Giving at least fourteen days notice to the consultant prior to the final inspection.
   b. Arranging for the contractor's and consultants exclusive use of the space.
   c. Arranging for a HVAC technician to be available to turn the AC system on and off as required.
   d. Arranging for a sound technician to be available to control the sound system as required.
   e. The contractor's job foreman and one additional worker familiar with the job will be present during all check out, testing and inspection.
   f. Contractor will complete the following tasks prior to consultant's arrival:
   g. Unpack and assemble all portable equipment.
   h. Place all portable equipment in one location.
   i. If anything has been turned over to the owner have the signed Letters of Transmittal on site.
   j. Complete all required paperwork (pre-testing reports, letters indicating successful coordination of the installation, etc.).
   k. Provide all lighting network certification reports.
   l. Remove all security covers.
   m. Contractor will provide all necessary software, cables, and interfaces to facilitate the setting of computer controlled, remote controlled or digitally controlled equipment.
   n. Contractor will provide the following test equipment for use during inspection and acceptance testing:
   o. Some type of light meter
   p. Some type of DMX checking device
   q. Some type of Multi-meter.
   r. Contractor will provide safe means to access all system components during the entire commissioning process.
   s. Contractor shall provide personal and equipment to make any adjustments to the theatrical lighting system(s), as well as to correct problems, for the entire inspection and testing period.

E. The Theatre Consultant or his representative will conduct all final system tests in order to determine final acceptance.

F. In no event shall the theatrical lighting systems installation be submitted for final approval or acceptance until any and all elements of the facility that may have a bearing on the system performance, including but not limited to doors, windows, HVAC, carpeting, furniture, wall coverings, stage flooring, rigging systems, interior design elements, architectural lighting and lighting control systems have been completed and are operable.

All elements that may affect stage lighting systems operation or performance shall be "on" and operating during adjustments. The stage lighting contractor will be responsible for coordinating the requirements of this paragraph with other work on the project.

G. Equipment Backorders. Should any component or equipment be on backorder at time of system inspection and testing the contractor shall provide comparable loaner equipment at contractor's expense. Said equipment shall remain on-site until backordered equipment is delivered and installed.

3.7 MANUFACTURER'S SERVICES

A. The Contractor shall provide for:

1. A manufacturer's field service engineer to perform initial system activation. Under no circumstances shall power be applied to any equipment prior to initial system activation.
2. The manufacturer's field service engineer shall inspect and confirm that all low voltage terminations are correct.
3. Such engineering services shall be furnished within twenty-one (21) days of a written request by The Contractor.

3.8 TRAINING AND INSTRUCTION

A. The Contractor shall furnish sixteen (16) hours of onsite instruction to Owner designated persons. This instruction shall happen on four occasions and shall be divided into the training level groups listed below. The general conditions require all training sessions to be videotaped. This contractor is to coordinate with this requirement and if required perform the taping.

B. There are three levels of training that are required that reflect the level of knowledge to access to the stage lighting system based on the need.

1. Basic Users – This level is for the maintenance and box office personnel and it is to train the user to turn on & off the house lights and stage lights in order to perform maintenance and repair and allow general access to the auditorium and stage in non-performance situations.

   a. The first occasion shall take place at the time of initial system activation and be performed by the manufacturer's field service engineer. The initial training session shall be not less than 2 hours and it is recommended the number of trainees be limited to 4 persons.

2. Intermediate Users – This level is for the general stage crew and it is to train the user to order to operate the stage lighting systems in performance and rehearsal situations.

   a. The first occasion shall take place at the time of initial system activation and be performed by the manufacturer's field service engineer. The initial training session

shall be not less than 3 hours with 1 hour to concentrate on general systems and 2 hours to concentrate on lighting console training. It is recommended the number of trainees be limited to 3 persons.

3. Administrator – This level is for the person(s) who are responsible for the setup and maintenance of the stage lighting systems and the future training of the Basic and Intermediate Users.

   a. The first occasion shall take place at the time of initial system activation and be performed by the manufacturer's field service engineer. The initial training session shall be not less than 4 hours with 2 hours to cover all aspects of operation and maintenance required by this system and 2 hours to concentrate on lighting console training. It is recommended the number of trainees be limited to 2 persons.

4. All other occasions shall be coordinated with the owner representative and Contractor with (21) days written notice. This instruction shall be an overall review of the system operation and detailed console operations. The finial occasion shall take place within the first six months following system activation.

C. Provide operational assistance for the first usage of the system. This is to be on the owner's time schedule but, not to exceed 8 hours.

3.9 MANUALS

A. Upon completion of the work, the Theater Equipment Contractor shall submit four detailed printed copies of Operations and Maintenance Manuals for each space, 2 for the Owner, and 1 for the Architect/Engineer of Record and one for Consultants. The Contractor shall also provide CD-ROM's with the Operations and Maintenance Manuals in PDF form with a hyper link table of contents, also any and all CAD drawings including as-built shop drawings, equipment descriptions, any required certificates or warranties, and parts lists or other electronically produced submittal items. The contractor shall also provide a USB flash drive for each space with all project documents including the initial configuration files for the control electronics modules for the stage lighting dimmers and house light dimmers, the stage lighting consoles, the stage lighting network switches, the portable network nodes and all multi parameter stage lighting fixtures. Submit in quantities and file formats as required by the Architect

B. Additionally, inside the primary dimmer or auxiliary control rack, provide a document pouch and one set of final as-built drawings. Before distribution of manuals submit one copy to consultant for approval. Each manual is to contain the following:

1. System one line drawings including all labeling and changes ("as builts ").
2. Owner's manual for each piece of equipment.
3. Schematic diagram for each piece of equipment.
4. Contractors service phone number in a conspicuous place.
5. All test reports.

3.10 WARRANTIES

A. Contractor will warrant the system to be free from defects in materials and workmanship for a period of one year from the date of acceptance, or first beneficial use, whichever comes first. Acts of god and owner abuse or neglect are not covered.

B. During the warranty period the contractor will respond to and correct any call for service within one day of the call.

C. Loaner equipment will be provided if necessary.

D. The manufacturer of the stage lighting and control equipment shall warranty the electrical distribution, dimming and control equipment to be free from defects of material or workmanship for a period of two years from the date of acceptance.

E. The manufacturer shall warranty all fixtures and accessories (except lamps) to be free from defects of material or workmanship for a period of one year from the date of acceptance. During the period of this warranty, equipment that proves to be defective shall be repaired or replaced at no charge (excluding freight). Unauthorized local repairs of equipment during the warranty period shall relieve the manufacturer of his responsibilities under this warranty.

F. Include the name, address, and phone number of at least two- (2) factory authorized Field Warranty centers within a 250-mile radius of the job site in the operation and maintenance manual.

3.11 FINAL ACCEPTANCE

A. The following conditions must be met before final acceptance will be granted:

B. Inventory of all equipment by the project Architects or his representative.

C. All inventoried portable equipment is in secure storage, accessible only by the Owner.

D. Approval of final tests and inspections by the project Architects, Theatre Consultant, and Owner.

E. Submittal to the Architect of three (3) signed copies of the warranty (ies).

F. Satisfactory completion of all punch list items.

G. At the date of system activation, the Contractor shall furnish and replace all lamps in stage lighting fixtures, which are observed to be noticeably dimmed, as judged by the Architect or his representative.

END OF SECTION 26 55 61

SECTION 26 55 61-STAGE LIGHTING

PART 1 – GENERAL

1.1 GENERAL

A. RELATED DOCUMENTS

1. Drawings and general provisions of Contract, including General and Supplementary Conditions, Special Conditions and Division-1 Specification sections, apply to work specified in this section.

1.2 RELATED WORK AND REQUIREMENTS

A. Section 26 00 00

1.3 SCOPE

A. This section requires the fabrication, furnishing, delivery, installation and testing of the lighting system as indicated on the drawings and specified herein.

B. The contractor shall provide all materials, equipment, labor, tools, scaffolds, and incidentals necessary to perform the scope of work.

C. It is the intention of these specifications that the contractor provides a professional quality, complete and properly operating system in every respect and detail.

D. The installation contractor shall examine the plans in detail to familiarize him with the scope of the work. Special attention shall be paid to reviewing all project electrical drawings, floor plans, conduit risers, and the like for locations and quantities of boxes and enclosures.

E. The contractor shall assume full responsibility for a complete operating installation, in the required location, in accordance with the contract documents.

F. Coordinate fully with the Division 26 Contractor.

1.4 WORK INCLUDED

A. Without restricting volume or generality of above "Scope," work to be performed under this section shall include, but not be limited to, the furnishing and installation of the following up grades:

1. Auditorium Theatre

   a. Take down all conventional ERS stage lighting fixtures and turn over to owner.

   b. Take down all conventional par 64 and fresnel stage lighting fixtures and turn over to owner.

   c. Take down all conventional strip light fixtures and turn over to the owner.

   d. Take down all conventional cyc fixtures and turn over to the owner.

   e. Upgrade lighting control network in the auxiliary lighting control rack, new network switches, new patch bay, new uninterrupted power supply. Furnish and install network receptacles and portable nodes at all lighting positions that currently do not have network receptacles.

   f. Provide a new DMX-512 computer based stage lighting console.

   g. Upgrade the existing Strand C-21 production dimmer rack and control module to current version.

   h. Upgrade the existing production dimmer rack dimmer modules to new Power through Modules.

   i. Upgrade the existing Strand A-21 house light dimmer rack and control module to current version.

   j. Upgrade existing house lighting dimmer modules and airflow modules with new relay modules.

   k. Furnish a DMX wireless transmitter system for control of wireless DMX LED house lights.

   l. Furnish & install a DMX controlled non-dim panel with 20 two pole 20A, 208V circuits.

   m. Furnish plugging boxes for non-dim circuits at existing and new lighting positions.

   n. Furnish plugging boxes for parallel circuits run to new lighting positions.

   o. Add two house torm lighting positions as shown in TL drawings. One house left and one house right.

   p. Add one surface mount lighting batten over the control booth window.

   q. Furnish and install new stage lighting fixtures as shown on the light plot.

   r. Furnish and install a dance side lighting booms and fixtures package as shown on TL drawings and detailed here in.

B. The Contractor shall examine the plans in detail to familiarize himself with the scope of work.

C. The Contractor shall provide the required manufacturers' shop drawings.

D. The Contractor shall provide all the necessary specialty equipment for the complete lighting and dimming system installation as specified herein, and shown on the drawings.

E. The Contractor shall coordinate the system control wire conduit and device locations with the Division 26 Contractor.

F. The Contractor shall deliver to the job site, and coordinate the installation of, the specialty equipment with the Division 26 Contractor.

G. The Contractor shall provide, install and terminate all system control wires.

H. The Contractor shall provide and install all system control devices.

I. The Contractor shall uncrate, assemble, lamp, hang and aim all the stage lighting fixtures as shown on the drawings.

J. The Contractor shall provide for the system activation.

K. The Contractor shall provide the system manuals.

L. The Contractor shall provide videotaped training sessions.

M. The Contractor shall provide the system warranty.

N. It is the Contractor's responsibility to ensure that the system and all of the system components, fixtures, equipment, devices, wire, terminations, field assemblies (including custom assemblies), pass all required inspections by the local authority having jurisdiction.

O. Procurement of all required permits.

1.5 CONTRACTOR'S QUALIFICATIONS:

A. Only qualified contractors shall be used.

B. The work of this section will be contracted to a single firm, referred to as the contractor.

C. The contractor shall be a lighting system contractor who regularly engages in the furnishing, installation and servicing of systems of similar nature, size, scope and complexity to that contemplated by this specification. The contractor shall have done so for a period of not less than five years preceding the bid date.

D. The contractor shall have maintained for the five years preceding the bid date, a suitably staffed and equipped service organization which has continuously offered maintenance and repair services for systems of the nature, size, scope and complexity to that contemplated by this specification.

E. The contractor shall have on staff a factory trained field service agent, capable of system testing, commissioning and troubleshooting systems of the nature, size, scope and complexity to that contemplated by this specification.

F. The contractor shall have on staff a qualified and competent lighting designer / engineer capable of designing systems of the nature, size, scope and complexity to that contemplated by this specification.

G. The contractor shall maintain for the duration of this contract all required business and professional licenses and insurance.

H. The contractor shall demonstrate to the satisfaction of the owner, through submittals presented in accordance with the project timetable, that the contractor meets all the above qualifications. The minimum contractor qualification submittal shall include the following:

1. Statement of company history. Include a breakdown by percentage of gross sales of all business activities the contractor is involved in for each of the last 5 years (e.g. system installation = 30%, expendable sales = 40%, equipment rentals = 20%, design and other professional services = 10%, etc).
2. Previous experience: Furnish a list of four installations of the type and size contemplated by these specifications, currently in use as originally installed, in which a theatre / system consultant was involved, completed in the last 5 years and the following information regarding each installations:
    a. Name and address of each installation facility.
    b. Facility owner and telephone number.
    c. Name, address, and phone number of a person regularly employed by the owner, who is familiar with the operation of the systems and who has no connection or business connections with the contractor except as the contractor shall fully disclose
    d. Name, address, and phone number of the theatre / system consultant, along with the names of all the consultant's personal directly involved.
    e. System shop drawing – These will be returned if the contractor provides a call tag or return postage.
    f. Owner's manual drawing – These will be returned if the contractor provides a call tag or return postage.
    g. System as-built drawings drawing – These will be returned if the contractor provides a call tag or return postage.

h. List of contractors personal involved with each person's responsibility on the project.

i. Name, address and phone number of the general contractor, along with the names of all key GC personal directly involved.

j. Name address and phone number of the electrical contractor, along with the names of all key EC personal directly involved.

3. Statement of current company capabilities and ownership.
4. Key Personal: For each of the key personnel listed in the below; Include individual's name, title, and number of continuous years of service to contractor. Include a resume detailing industry experience, and role within organization (include only full-time/regular staff employees; not independent contractor, freelance, or temporary positions). List all industry certifications held, training courses attended, and continuing education credits, including dates of attendance.

   a. Project Manager

   b. Senior Technician

   c. Service Manage

5. Factory Trained Field Service Agent. Include individual's name and title. List all factory held certifications, training courses attended, and continuing education credits, including dates of attendance. Provide a list of recently commissioned systems, scope of project, and commissioning dates.
6. Lighting Designer / Engineer. Include individual's name and title. List current design credits with scope of project, and design completion dates.
7. Other Department Staff. Include size of staff and experience of each staff member.
8. Replacement and Spare Parts Inventory – Provide detailed list of primary replacement parts, components, and spares typically held in inventory.
9. Test Equipment and Physical Plant – Include an inventory of all test facility equipment owned and used regularly by the Service Department. Provide description of physical plant and space utilization.
10. Copies of all business and professional licenses and insurance certificates.
11. Without prejudice to other contractors desiring to be qualified, the following are considered qualified and do not need to submit contractor's qualifications:

Miami Stagecraft
2855 E. 11th Ave.
Hialeah, FL 33013
(305) 836-9356
Contact: Steve Welsh

Stage Equipment and Lighting
12250 N.E. 13th Court
Miami, FL 33161
(305) 891-2010

Contact: Rick Rudolph

Candela Controls
711 Business Park Blvd., Suite 101
Winter Garden, FL 34787
(407) 654-2420
Contact: Bill Ellis

Murphy Lighting Systems
621 Brookhaven Drive
Orlando, FL 32803
(407) 895-7475
Contact: Chris Murphy

PART 2 - PRODUCTS

2.1 GENERAL

A. When this document lists several acceptable manufacturers for a particular item of equipment, more than one of which is to be provided, the Contractor shall furnish all of those similar items of equipment from one manufacturer.

B. Strand dimmer racks and dimmer modules are considered as equal with an ETC only front end controller.

C. Any item of equipment or hardware that may not be specifically shown on the drawings or specified herein, but required for proper system operation or installation, shall be furnished and installed and be of the highest quality available.

D. All materials and equipment used in this project shall be new, unused and of the latest models and design. Refurbished materials and equipment are not permitted except where noted.

E. The performance of all equipment must meet the most recently published manufacture's data sheet.

F. UL Labels: All equipment, where applicable standards have been established, shall be listed by Underwriters' Laboratories, Inc., and shall bear UL label when delivered to the job.

G. If so required by the local authority having jurisdiction, anything not arriving at the job bearing a UL label shall be field inspected and labeled by a nationally recognized testing laboratory recognized and approved by the local authority having jurisdiction.

2.2 ACCEPTABLE MANUFACTURERS

A. The stage lighting and control manufacturer shall be one who has been continuously engaged in the manufacture of stage lighting control equipment, wiring devices, and electronic dimmers for ten years or more.

B. Except where otherwise noted in this specification, the following are the approved manufacturers for the listed respective products:

Electronic Theatre Controls, Inc.
3030 Laura Lane
Middleton, Wisconsin 53562
(800) 688-4116

LEX Products Corp.
401 Shippan Avenue
Stamford, CT 06902
(800) 643-4460

LynTec
8401 Melrose
Lenexa, KA 66214
(913) 529-2233

Middle Atlantic Products, Inc.
North Corporate Drive
Riverdale, NJ 07457
(973) 839-1011

Pathway Connectivity
Acuity Brands Lighting
#103- 143917th Ave SE
Calgary AB T2G1J9, Canada
403-243-8110

SSRC
11 Freedom Court
Greer, South Carolina 29650
(864) 848-9770

C. Alternatives: In no case will equipment or materials of lesser design or workmanship be acceptable. Only those materials and equipment listed in this specification will be considered unless prior approval is sought and received.

1. Substitutions: When a specific piece of equipment specified has been discontinued and/or replaced by a new model, substitution will be acceptable when:

    a. Submission of complete data on the new model or substitute has been approved by the owner prior to equipment acquisition.

    b. Substitute equipment or the replacement of rejected equipment shall be at the sole expense of the contractor.

2. Substitutes shall be considered only when they are submitted fourteen days prior to bid date, and are accompanied by sufficient catalog data, specifications, and technical information for evaluation.

    a. Summarize proposal with a list of equipment catalog or series numbers. Substitute bids shall include a system riser diagram detailing components and any deviation of functionality from the drawings and specifications herein.

    b. The bidder shall include the name, address, and phone number of at least two- (2) factory authorized Field Warranty centers within a 250-mile radius of the job site as a part of the submittal documents.

    c. On the lighting fixtures, the bidder submitting other equipment shall include performance data taken and reported in compliance with the "Recommended Practice for Reporting Photometric Performance of Incandescent Filament Lighting Units used in Theatre and Television Production," approved as the official standard by the U.S. Institute for Theatre Technology, the Illuminating Engineering Society, the Society of Motion Picture and Television Engineers, and the American Theatre Association. For purposes of establishing the validity of such submissions, the manufacturer shall furnish this data from an independent testing laboratory. Proposals that fail to meet this requirement shall not be considered.

    d. On the dimming system, the bidder submitting other equipment shall include pertinent performance data, charts and drawings showing in what respect the system will function in accordance with specification, and in what way it will deviate from the specification. This submittal shall include, but not be limited to the following:

        1) Rated ampacity, peak single cycle surge current rating, I^2t rating, and transient voltage rating of the output devices employed in the dimmers.
        2) Laboratory verification of minimum current rise time at a 90-degree conductive angle, with the dimmer operating at the maximum load.
        3) Description of the air-cooling and air filtration systems.
        4) Description of the packaging and ease of replacement for all spare parts required in this specification.
        5) Original Manufacturer's catalog data sheets for all major components of the dimmer system.

    e. On the control system, the bidder shall submit the name of the manufacturer, and list of ten (10) or more operating systems in the State of Florida of the type specified which meet the performance control functions designed, with contact

names and telephone numbers for references. This information shall be mandatory as a basis for determining the bidder's intent in meeting the full requirements of this specification, and shall be submitted at least fourteen days in advance of bidding.

f. It is understood that any additions or revisions of wiring required by the use of substitute equipment, whether such wiring is part of this contract or of the prime electrical contract, shall be the responsibility of the bidder making the substitution.

g. If required by the Owner, the Consultant, or Architect, the bidder shall provide working samples of substitute equipment including lamps for any lighting fixtures, to be delivered to the premises designated, for examination by Architects, Consultants, and such representatives as the Owner may direct. Handling, shipping and delivery to, or removal from site, of any sample required shall be at the cost of the Contractor. The Contractor shall be responsible for the arrangement of the cost of the electrical supply required to properly test any lighting instruments or item of equipment. Proposals which fail to address specification requirements or review comments will be rejected.

h. Prior approval submittal review and approval shall not be considered to be shop drawing review. Prior approval in no way relieves the Contractor of responsibility to fully meet the requirements and intent of this specification.

i. Should the contractor propose and receive approval for the use of alternative or substitute equipment which requires additional or modified conduit, the contractor will be solely responsible for the installation of such conduit.

2.3 AUDITORIUM STAGE LIGHTING DIMMER BANKS

A. Inspect, clean, repair and upgrade the existing dimmer racks. Inspection and cleaning shall include but not be limited to;

1. Thorough cleaning of the racks and dimmer modules with compressed air.
2. Inspection of all rack/dimmer power connectors. Replace as necessary with new parts only.
3. Tightening of all high voltage and neutral connections. Repair as necessary.

B. Furnish the dimmer rack maintenance and upgrades and related equipment; see system one line drawing for quantities and device location drawing for placement.

1. Strand Lighting, Inc.

CAT. #	DESCRIPTION
xxxxx	Upgrade Stage lighting dimmer rack to current version. C-21dimmer rack configured for 96, 20amp circuits.

-	
A21-9 space	Upgrade House lighting dimmer rack to current version

2.4 AUITORIUM STAGE LIGHTING DIMMER MODULES

A. The Dimmers shall be of modular design for easy installation and removal. Each module to come equipped with two 2.4kw dimmers, magnetic circuit breakers and a sealed power device assembly. The sealed power device assembly must be field replicable without soldering.

B. Remove the existing stage lighting dimmer modules and turn over to the owner.

C. Replace the existing stage lighting modules dimmer modules with new modules, see below.

D. Remove the existing house lighting dimmer modules and airflow modules and turn over to the owner.

E. Replace the existing house lighting dimming and airflow modules with new relay modules, see below.

1. Strand Lighting Inc.

CAT. #	DESCRIPTION
76562PT	Stage lighting thru power dimmer modules. Dual 20 amp status reporting dimmer modules for production dimming circuits
76562	One spare
74179	House lighting relay modules dual 2400w modules for house light relay circuits.
74179	One spare

2.5 AUDITORIUM STAGE LIGHTING CONTROL MODULES

A. The control electronics shall be of modular design. The unit must be “slide in” for easy installation and removal. The control electronics module must be field replaceable without disconnecting any control wiring

B. Remove the existing stage lighting control module and turn over to the owner.

C. Replace the existing stage lighting control module with a new Control module.

D. Remove the existing house lighting control module and turn over to the owner.

E. Replace the existing house lighting control module with a new Control module.

1. Strand Lighting Inc.

CAT. #	DESCRIPTION
xxxxx	Upgrade 96 way C-21 control processor assembly with power supply and Ethernet switch to current version
xxxxxx	96 way, C-21 control processor module (spare) with initial project configuration installed
xxxxx	Architectural Control Processor for the control of house lighting
xxxxx	Station Power Module
xxxxx	Battery pack option to keep the processor energized in the event of power loss or interruption to the enclosure. Battery to provide power up to 90 minutes

2.6 AUDITORIUM STAGE LIGHTING MAIN LIGHTING CONSOLE

A. Furnish the quantity of main lighting control consoles and accessories from one of the following approved manufacturers:

1. Electronic Theatre Controls, Inc.

QTY.	CAT. #	DESCRIPTION
1	Ion 2,048	Ion lighting console with 4 universes of DMX output, include off line editor software
2	-	19” LCD DVI Touch Screen Monitors
2	FADW 2 x 10	Universal fader wing
1	-	20’ Network cable (console)
1	-	20’ DMX cable
1	-	20’ Network cable (portable node)
1	i Pad	For Remote Focus Unit
1	$100 i-Pad software gift card	For i-Pad lighting software, install so owner is account holder

1	-	Ion dust cover.
2	-	19” monitor dust cover
1	-	Fader wing dust cover.
1	2 kVA UPS	Uninterrupted Power Source.
2	Littlite	Task lights
1	-	6’ extension cable
1	-	6 receptacle power strip

2.7 COMPUTER

A. Furnish a Dell Laptop computer (or equal) which meets all minimum requirements for console off line software package. Include console off line software package installed on the laptop computer.

2.8 ARCHITECTURAL LIGHTING WIRELESS CONTROL SYSTEM

A. General

1. The instrument shall be an ArcSystem TX1 Transmitter as manufactured by ETC, Inc., or approved equal.

B. Physical

1. The product shall be constructed of a cold rolled steel outer enclosure, free of burrs and pits, finished in a fine texture, high temperature black powder coat paint.

2. The product:
   a. Shall allow direct connection of an external DMX512-A (ANSI E1.11-2008) input via an internal 3 position terminal block
   b. Shall have a DMX512-A (ANSI E1.11-2008) output via an internal 3 position terminal block allowing active pass-through of DMX for the control of third party equipment conforming to the same standard
   c. Shall have two independent dry contact connections providing the ability to remote trigger a pre-stored scene
   d. Shall include front panel LED status lights to indicate:
      1) Presence of power source
      2) Status of product (flashing heartbeat for OK)
      3) Presence of active DMX input
      4) Identification of product as a Master (assuming additional backup TX1 is present)

5) Indication that product output has been overridden by dry contact connection

e. Shall be designed to be wall mounted and provide knock-outs on the bottom face for connection of standard electrical containment

f. Shall allow direct connection of included antenna on the top surface

C. Electrical

1. The ArcSystem TX1 Transmitter shall have an integrated, on-board power supply with the following electrical properties
   1) 100-240VAC operating voltage range 50/60Hz
   2) Maximum 5W power consumption

2. The product shall include an internal 3 position terminal block to allow termination of electrical input.

3. The product shall include 1 x 3 position terminal block (2 x inputs and 1 x common/GND) providing two independent 12V 10mA dry contact terminals.

D. Wireless Protocol

1. The product shall act as a gateway for the ArcMesh wireless protocol and be configurable by separate ArcSystem commissioning software having the following properties:
   a. Proprietary and secure firmware stack operating in the unlicensed 2.4GHz Zigbee spectrum using the IEE802.15.4 standard
   b. Re-broadcast of wireless service from fixture to fixture
   c. Auto-forming, self-healing wireless mesh network

2. The product operating firmware shall provide the following configurable features:
   a. Radio network ID selection
   b. Radio channel selection
   c. DMX Broadcast ‘Time To Live’ selection
   d. Radio transmit power selection
   e. Personal Area Network sub-division selection options
   f. System wide forcing of all connected fixture to black-out via user assigned dedicated DMX address
   g. System wide forcing of all connected fixture to 100% on via user assigned dedicated DMX address
   h. Auto fail-safe option provides activation of pre-stored lighting scene on loss of wired DMX input.

i. Triggering of pre-stored scenes on activation of dry contact input

E. Automatic take-over in the event of loss of master transmitter when operating as a backup transmitter.

F. Furnish architectural wireless DMX transmitters, see contract drawings for quantities and locations.

2.9 AUDITORIUMDTHOEIF STAGE LIGHTING CONTROL CONNECTION PLATES

A. The system will be accessible via interconnection plates for the lighting control console and Ethernet output receptacles located at the performance lighting positions. Furnish lighting plugging stations; see contract drawings for type, quantities and locations.

2.10 DMX CONTROLLED NON- DIM PANEL

A. Furnish the enclosure and related equipment from the following approved manufacturers:

1. Lyntec

QTY.	CAT. #	DESCRIPTION
	LCP 341-20-1U-LA36400 with 20 @ BMB-220 breakers	Non dim lighting panel for LED and Moving Lights circuits ND-1 thru ND-20

2. Lyntec is the basis for design, alternative manufacturers are LEX or an approved equal.

2.11 DMX DISTRIBUTION & ETHERNET WIRING

A. Furnish equipment as shown on system drawing.

B. Maintenance and upgrade existing CAT 5 network, replace existing network hub and patch bay with new hub and patch bay. Turn over existing equipment to owner.

1. All branches will be fully tested and documented using a Certified CAT 5 tester.

2. All Components (wire, connectors, inline couplers, patch bay, patch cords, etc.) shall be fully CAT 5 compliant.

3. Provide network certifier results of all network runs.

C. Install the following hardware (when quantities above those shown on the system drawing are called for, those extras shall be furnished as loose equipment);

1. DMX/RDM rack mount four port Gateway configured as input node
    a. PathPort Rack Mount Quattro
    b. Pathport is the basis for design.
2. HUB-1 36 port minimum managed gigabit network switch with PoE. PoE power to be sufficient to support all devices that are connected.
    a. 3Com or similar
3. PBY-1 Network Patch bay. 48 port RJ45. Provide required number of modular outlets. Include labeling.
    a. Siemon HD5-series or similar
4. Wireless Access Point (WAP) with single point Setup.
    a. Cisco WAP 121 Wireless-N Access point or equal.
5. One (1) DMX Opto-Splitter for house lighting fixture control.
    a. Pathway DMX Repeater Pro or equal.
6. Uninterrupted Power Supply - rack mount
    a. APC Smart UPS RT2200 VA RM 120V uninterrupted power supply 120v input/120v output, extended runtime model with switched outlet groups to connect critical equipment to a switched outlet group configured to turn on immediately in the event of a power outage and to connect peripheral equipment to a group configured to shut down, after a short period, in the event of a power outage in order to conserve battery run time (or Equal)
    b. APC Smart UPS 120v external Battery pack (or equal).
7. Thirty (30) 3’ CAT 6 patch cords
    a. Black Box Network Services or similar.
8. Portable Nodes
    a. DMX portable nodes with c-clamp and safety cable to distribute DMX over Ethernet with any compatible input or output device. Supports CAN, RDM, and USITT DMX 512-A, compliant with 802.af for Power over Ethernet, flexible output patch to allow a 512 address universe to begin at any output address. Fabricated from 16 gauge cold roll steel finished in black, fine textured scratch resistant powder coat, two integrated DMX 5 pin out ports, back lit LCD display for identification. Front and rear power indicators and RJ45 receptacle for connection to the lighting network.
    b. PathPort two port gateway is the basis of design or equal

9. Existing 10u Auxiliary rack is to be reused. Maintenance rack and replace any worn or broken parts. Provide internal power as required. Fill all unused rack spaces with blank panels.

    a. Furnish and install the following equipment in the AR-1 rack see contract drawings for location and quantities:

QTY.	DESCRIPTION
	Uninterrupted power supply(described above)
	Uninterrupted power supply battery pack(described above)
	Four port Gateway / input (described above)
	DMX splitter(described above)
	Network hub (described above)
	Network patch bay (described above)

2.12 STAGE LIGHTING PLUGGING BOXES

A. Surface Mount Outlet boxes are fabricated from 16-gauge steel with a fine-texture, scratch-resistant, powder-coat finish. Outlets are 3-pole grounding of flush mount 20A 2P&G female stage pin connectors for 120V production dimmer dimming circuits and 20A L6-20 grounded flush mount female connectors for 208V, 2 pole non-dim panel circuits. Circuits are individually indicated with ¾" white die cut adhesive labels. Boxes are equipped with grounding lugs. All faceplates to match outlet box enclosure dimensions with no sharp edges exposed. Basis of design is ETC alternative manufacturers are SSRC, LEX or an approved equal.

B. Pipe Mount Outlet boxes are fabricated from 16-gauge steel with a fine-texture, scratch-resistant, powder-coat finish. Outlets are 3-pole grounding of flush mount 20A 2P&G female stage pin connectors for 120V production dimmer dimming circuits and 20A L6-20 grounded flush mount female connectors for 208V, 2 pole non-dim panel circuits. Pipe mounting hardware is to be configured to hang boxes from pipe battens. Circuits are individually indicated with ¾" white die cut adhesive labels clearly visible from **both** sides of the plugging boxes. Boxes are equipped with grounding lugs. All faceplates to match outlet box enclosure dimensions with no sharp edges exposed. Basis of design is ETC alternative manufacturers are Strand Lighting Inc., SSRC, LEX or an approved equal.

C. Furnish the plugging boxes for performance lighting circuits and non-dim circuits; see distribution detail drawing for circuit designations and quantities and see device location drawing for locations.

2.13 JUNCTION BOXES

A. This assembly shall be fabricated of 16-gauge, cold-rolled steel with removable covers. Standard box size shall be minimum 12"W x 10"H x 4"D with four mounting holes. Terminal Strips shall be a barrier screw clamp type. Two terminals shall be provided for each circuit. Terminals shall be sized for the circuit amperage as required. Finish shall be

fine-texture, scratch resistant, black powder-coat. Provide ground bussing as required for back box.

B. This assembly is furnished by the stage lighting contractor as part of the cable management system for the new non-dim circuits for the over stage electrics. SSRC GB-6 is the basis of design, acceptable manufacturers are Leviton and Strand.

C. See lighting device location and system one line drawings for placement and quantities, and distribution detail drawings for circuit designations.

2.14 AUDITORIUM STAGE LIGHTING FIXTURES

A. All new theatrical lighting fixtures are to include a C-clamp, a color frame, a safety cable w/spring clip, 36" 3-wire leads and 20A grounded stage pin male connector installed except where noted differently.

B. All LED fixtures are to include a C-clamp(s), a safety cable w/spring clip, a power cable, a 10' power thru jumper cable and a 10' DMX male 5 pin to female DMX 5 pin thru jumper cable.

C. All moving head fixtures are to include a mega pipe clamps, a safety cable w/spring clip, a power cable, and a 10' DMX male 5 pin to female DMX 5 pin thru jumper cable.

D. Furnish and install the following theatrical lighting fixtures in the auditorium: see light plot for quantities.

QTY.	CAT. #	DESCRIPTION
	Electronic Theatre Controls, Inc. Cat. # 410	Ten degree, 750 watt 115 volt ellipsoidal reflector spotlights.
	Electronic Theatre Controls, Inc. Cat. # 414	Fourteen degree, 750 watt 115 volt ellipsoidal reflector spotlights.
	Electronic Theatre Controls, Inc. Cat. # 419	Nineteen degree, 750 watt 115 volt ellipsoidal reflector spotlights.
	Electronic Theatre Controls, Inc. Cat. # 426	Twenty-six degree, 750 watt 115 volt ellipsoidal reflector spotlights.
	Electronic Theatre Controls, Inc. Cat. # 436	Thirty-six degree, 750 watt 115 volt ellipsoidal reflector spotlights.
	Electronic Theatre Controls, Inc. Cat. # PAR-EA	Source Four Par ,750 watt w/ lenses set

	ETC Luster 2 LED light engine w/ LED CYC lens adaptor. Or equal	LED cyclorama wash light 100-240VAC Power cables with 2P&G connectors installed. Provide with 10' power thru and DMX jumpers
	Chauvet Ovation E-910FC OR equal	ERS style LED fixture RGBAL color mixing system. Power cables with 2P&G connectors installed. fixture with universal power supply 100-240 VAC,
	COLORado 2-Quad Zoom OR equal	Led Wash Light with power & DMX thru connections, die cast all metal housing, Access slots for secondary lenses and standard 7.5" par accessories. Provide L45 secondary lens. 100VAC to 240VAC 50/60 Hz universal power unit, Power in cables with 2P&G connectors installed. Zoom Angle 16 to 48 degrees, DMX 512 in & thru via 5pin & 3pin XLR connectors, 16 bit virtual dimming engine, noiseless fan free convection cooling, ETC
	Chauvet Ovation B-2805FC OR equal	LED RGBAL color mixing system strip Light with universal power supply 100-240 VAC, Beam spread of 42 deg vertical-38 deg horizontal for a smooth even field for overhead stage washes. power con in with L6-20 male plug and 10' power con to power con thru connectors, DMX 512 input/output, on board LCD menu for easy set up and addressing, top or floor mounting

	Chauvet COLORado Batten 72 Tour or equal	LED RGBAW color mixing system strip Light with universal power supply 100-240 VAC, Beam spread of 42 deg vertical-38 deg horizontal for a smooth even field for cyc and stage washes. power con in with L6-20 male plug and 10' power con to power con thru connectors, DMX 512 input/output, on board LCD menu for easy set up and addressing, floor mounting
	Chauvet Maverick MK2 Spot	440w LED Engine, 120-240V auto ranging power supply. Power in cables with L6-20 connectors installed. CYM +CTO color mixing system, 13-37 degrees zoom range, variable frost filter, 3 facet rotating prism, motorizes iris, strobe, two 6 position rotating gobo wheels, 7 position+ white color wheel
	Chauvet Maverick MK2 Wash	Twelve 40w LEDs, 120-240V auto ranging power supply. Power in cables with L6-20 connectors installed RGBW color mixing system, 7-49 degrees zoom range, pixel mapping, strobe

E. Take down all existing stage lighting fixtures.

1. All existing ERS fixtures are to be turned over to the owner.
2. All existing par 64 fixtures are to be turned over to the owner.
3. All existing 10" Fresnel fixtures are to be turned over to the owner.
4. All existing conventional cyc light fixtures are to be turned over to the owner.
5. All existing conventional strip lighting fixtures are to be turned over to the owner.

2.15 AUDITORIUM STAGE LIGHTING LAMPS

A. Approved manufacturers for stage lamps are General Electric, Sylvania, or Ushio.

B. Furnish and install the following stage lamps for the auditorium stage lighting fixtures in the necessary quantities plus 20% for spares:

1. HPL750/115X, for ETC ellipsoidal and Pars.
2. Turn over ALL spares Lamps to the Owner.

2.16 AUDITORIUM STAGE LIGHTING ACCESSORIES

A. Furnish the following stage lighting accessories for the auditorium.

B. Lex Stage cable is the basis of design or an approved equal.

C. Provide all type S 2P&G jumpers and twofers required to cable the light plot and furnish the following jumpers. All jumpers are to have color coded length labeling at both ends of the cable with each length to be a different color.

1. 25 @ 5'-0", 12 AWG, type S extension cables w/male and female 2P&G connectors installed.
2. 20 @ 10'-0", 12 AWG, type S extension cables w/male and female 2P&G connectors installed.
3. 6 @ 25' -0", 12 AWG, type S extension cables w/male and female 2P&G connectors installed.
4. 5 @ 50' -0", 12 AWG, type S extension cables w/male and female 2P&G connectors installed.
5. 15 @ 2-Fers, Lex Products # 3123J-SP, for interconnection of fixtures.

D. Provide all type S L6-20 jumpers and twofers required to cable the light plot and furnish the following jumpers. All jumpers are to have color coded length labeling at both ends of the cable with each length to be a different color.

1. 10 @ 5'-0", 12 AWG, type S extension cables w/male and female L6-20 connectors installed.
2. 10 @ 10'-0", 12 AWG, type S extension cables w/male and female L6-20 connectors installed.
3. 5 @ 25' -0", 12 AWG, type S extension cables w/male and female L6-20 connectors installed.
4. 5 @ 2-Fers, with L6-20 connectors installed for interconnection of fixtures.

E. Provide all 5 pin DMX jumpers required to cable the light plot and furnish the following jumpers. All jumpers are to have color coded length labeling at both ends of the cable.

1. 10 @ 5’ male DMX 5 pin to female DMX 5 pin cables.
2. 10 @ 10’ male DMX 5 pin to female DMX 5 pin cables.
3. 5 @ 25’ male DMX 5 pin to female DMX 5 pin cables.

4. 5 DMX terminators.
5. 3 male 5 pin to female 3 pin DMX turnarounds
6. 3 female 5 pin to male 3pin DMX turnarounds.
7. 1 roll of heat shield
8. In additional to all gel shown on light plot furnish one hundred (100) additional sheets assorted color media as follows, confirm gel selections with owner:

   a. 3 sheets Roscolux 33
   b. 3 sheets Lee 202
   c. 4 sheets Roscolux 119
   d. 2 sheets Roscolux 54
   e. 4 sheets Lee 152
   f. 4 sheets Roscolux 68
   g. 2 sheets Roscolux 55
   h. 2 sheets Roscolux 52
   i. 2 sheets Roscolux 364
   j. 2 sheets Roscolux 114
   k. 5 sheets Roscolux 81
   l. 5 sheets GAM 685
   m. 5 sheets GAM 235
   n. 3 sheets Roscolux 321
   o. 3 sheets Roscolux 385
   p. 2 sheets Roscolux 39

9. Side booms

   a. Six (6) 50 lb. Boom bases, threaded for 1 ½" pipe.
   b. Six (6) 12' long, schedule 40 pipes, finished flat black and threaded both ends, with couplings installed to protect threads.
   c. Six (6) tie off caps threaded for 1 ½" pipe, City Theatrical model 1310
   d. Twenty Four (24) 18" single tee side arms.

PART 3 - EXECUTION

3.1 STANDARDS COMPLIANCE

A. Comply with all local building codes.

B. In the absence of specific local codes, comply with the National Electrical Code (NFPA-70) as applicable to installation and construction of stage lighting and control equipment.

C. Where not in conflict with local building codes or the National Electrical Code comply with industry standard professional practices.

D. Installation practices shall be in accordance with OSHA Safety and Health Standards.

3.2 SHOP DRAWINGS

A. Submit within thirty (30) days of the bid acceptance, for review and approval by the Owner, Architect, and Consultant:

1. Complete shop drawings and data sheets for all items specified.
2. Complete shop drawings for all components, assemblies, sub-assemblies, cabinets, wiring devices and hardware required to implement the work.
3. Riser diagrams showing all quantities, types and sizes of inter-connection wires to be installed by others.
4. Schematics of all block assemblies and sub-assemblies, including pin out identification of all low voltage cable connectors.
5. Approval of shop drawings does not relieve the Contractor of the responsibility of providing equipment in accordance with these specifications. Any deviations from the specifications shall be "starred" and noted in 1/4" high letters. Only deviations, which upgrade the quality of the equipment, shall be considered.
6. In addition to drawings, the Contractor may elect to submit catalog cuts for certain standard equipment items. These shall contain full information on dimensions, construction, applications, etc. to permit proper evaluation. In addition, they shall be properly identified as to their intended use and any options or variations shall be clearly noted.
7. Samples may be requested by the Architect and shall be furnished for inspection at the Architect's office, at the Contractor's sole expense.
8. Prior to the commencement of fabrication and delivery, the Contractor shall submit for approval, to the Architect, an outline of a proposed commencement and completion schedule of project requirements.

3.3 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver stage lighting equipment and controls to job site securely wrapped in containers.

B. Coordinate delivery dates with the Division 26 contractor

C. All equipment shall be stored in a clean, dry space.

D. Discrepancies in quantities or missing equipment shall be noted, in writing, and brought to the attention of the manufacturer within five days of receipt.

E. Replacement of missing or damaged equipment shall be the responsibility of the Contractor.

F. Handle equipment and controls carefully to prevent breakage, denting and scoring finish.

G. Replace and return damaged units to equipment manufacturer immediately.

H. Store in original cartons and protect from dirt, physical damage, weather, and construction traffic.

3.4 INSTALLATION

A. The Contractor shall furnish, deliver, install and terminate all system control wires.

1. All cables shall be permanently labeled at every termination. The label shall not be hand written. Clear heat shrink shall cover the label.
2. Service loops of not less than 6" will be present at all terminations to equipment.
3. All pulls to be made by hand, care will be taken not to nick cable jackets, and any nicked or damaged cable will be replaced.
4. A pull string will be left in all conduits after wire is installed.
5. NO SPLICES WHATSOEVER IN CONDUIT!
6. Include spare cables with all field runs. Quantity to be 10% or 1 whichever is greater unless otherwise specified.
7. Where shielded cable is in use leave shield drain wire the same length as the circuit conductor(s), sleeve shield drain wire in green PVC tubing. Cap where the cable jacket was removed with heat shrink. Where the shield drain wire is to be lifted follow the above and fold back over cable jacket. Then cap end with heat shrink. Do not use a single piece of heat shrink for this use two smaller ones.
8. All soldering will be clean and neat and not exhibit evidence of a " cold" joint, were necessary heat sinks will be used. Use only rosin core "electronic type" solder.
9. Wire nuts will be not allowed.

B. The Contractor shall furnish and install all system control devices.

C. The Contractor shall hang and aim the stage fixture hanging plot.

1. Provide the Theatre Consultant fourteen (14) days notice prior to this work being scheduled.
2. The Theatre Consultant shall verify the aiming of the stage fixtures.
3. The installation of all work shall be neat.

D. All boxes, equipment, etc shall be plumb and square.

E. The installation shall conform to the plans and spec.

F. The contractor shall not commence the installation of equipment and devices, other than the pulling of cable, until all areas are clean, painted and finished to a point that they are completely dust, dirt, lint, fiber and airborne particle free. The air conditioning system must be operating to its design level and be able to keep all areas with control equipment stable.

3.5 INSTALLATION COORDINATION

A. The Contractor shall specifically coordinate the placement and sizes of conduit relating to this work and shall specifically review and approve the conduit rough-in in time to advise all parties of needed changes, omissions, etc.

B. The Contractor shall report this successful coordination in writing to the Architect.

C. If any conflicts or omissions occur as a result of the Contractor's unsuccessful coordination of the above mentioned work, it shall be the Contractor's responsibility to correct, furnish and install any additional material that may be required.

D. The contractor shall at all times coordinate his work with the other trades to ensure smooth progress of work and satisfactory final results.

E. The Contractor shall examine areas and conditions under which stage lighting and controls are to be installed and notify the Architect in writing of conditions detrimental to proper installation and operation.

3.6 INSPECTION AND TESTING:

A. During the installation of the equipment the contractor shall arrange for access as necessary for inspection of equipment by the owner's and/or architect's representatives.

B. Provide a safe means of accessing all system components for all visits.

C. Equipment Pretesting: All racks are to be built and wired in contractors shop and tested prior to delivery to site. All other equipment is to be tested prior to delivery and installation. A written test report will be submitted to the owner.

D. Final Inspection:

1. The final inspection will confirm that the systems, as installed, meet the requirements of this spec, the contract documents, and the approved contractor's shop drawing and submittals.

2. The contractor will inform the owner in writing of the system's completion. The contractor will then request final inspection by the consultant, and carry out the necessary coordination. This coordination includes:

    a. Giving at least fourteen days notice to the consultant prior to the final inspection.
    b. Arranging for the contractor's and consultants exclusive use of the space.
    c. Arranging for a HVAC technician to be available to turn the AC system on and off as required.
    d. Arranging for a sound technician to be available to control the sound system as required.
    e. The contractor's job foreman and one additional worker familiar with the job will be present during all check out, testing and inspection.
    f. Contractor will complete the following tasks prior to consultant's arrival:

g. Unpack and assemble all portable equipment.
h. Place all portable equipment in one location.
i. If anything has been turned over to the owner have the signed Letters of Transmittal on site.
j. Complete all required paperwork (pre-testing reports, letters indicating successful coordination of the installation, etc.).
k. Provide all lighting network certification reports.
l. Remove all security covers.
m. Contractor will provide all necessary software, cables, and interfaces to facilitate the setting of computer controlled, remote controlled or digitally controlled equipment.
n. Contractor will provide the following test equipment for use during inspection and acceptance testing:
o. Some type of light meter
p. Some type of DMX checking device
q. Some type of Multi-meter.
r. Contractor will provide safe means to access all system components during the entire commissioning process.
s. Contractor shall provide personal and equipment to make any adjustments to the theatrical lighting system(s), as well as to correct problems, for the entire inspection and testing period.

E. The Theatre Consultant or his representative will conduct all final system tests in order to determine final acceptance.

F. In no event shall the theatrical lighting systems installation be submitted for final approval or acceptance until any and all elements of the facility that may have a bearing on the system performance, including but not limited to doors, windows, HVAC, carpeting, furniture, wall coverings, stage flooring, rigging systems, interior design elements, architectural lighting and lighting control systems have been completed and are operable. All elements that may affect stage lighting systems operation or performance shall be "on" and operating during adjustments. The stage lighting contractor will be responsible for coordinating the requirements of this paragraph with other work on the project.

G. Equipment Backorders. Should any component or equipment be on backorder at time of system inspection and testing the contractor shall provide comparable loaner equipment at contractor’s expense. Said equipment shall remain on-site until backordered equipment is delivered and installed.

3.7 MANUFACTURER’S SERVICES

A. The Contractor shall provide for:

1. A manufacturer’s field service engineer to perform initial system activation. Under no circumstances shall power be applied to any equipment prior to initial system activation.

2. The manufacturer's field service engineer shall inspect and confirm that all low voltage terminations are correct.
3. Such engineering services shall be furnished within twenty-one (21) days of a written request by The Contractor.

3.8 TRAINING AND INSTRUCTION

A. The Contractor shall furnish sixteen (16) hours of onsite instruction to Owner designated persons. This instruction shall happen on four occasions and shall be divided into the training level groups listed below. The general conditions require all training sessions to be videotaped. This contractor is to coordinate with this requirement and if required perform the taping.

B. There are three levels of training that are required that reflect the level of knowledge to access to the stage lighting system based on the need.

1. Basic Users – This level is for the maintenance and box office personnel and it is to train the user to turn on & off the house lights and stage lights in order to perform maintenance and repair and allow general access to the auditorium and stage in non-performance situations.
    a. The first occasion shall take place at the time of initial system activation and be performed by the manufacturer's field service engineer. The initial training session shall be not less than 2 hours and it is recommended the number of trainees be limited to 4 persons.

2. Intermediate Users – This level is for the general stage crew and it is to train the user to order to operate the stage lighting systems in performance and rehearsal situations.
    a. The first occasion shall take place at the time of initial system activation and be performed by the manufacturer's field service engineer. The initial training session shall be not less than 3 hours with 1 hour to concentrate on general systems and 2 hours to concentrate on lighting console training. It is recommended the number of trainees be limited to 3 persons.

3. Administrator – This level is for the person(s) who are responsible for the setup and maintenance of the stage lighting systems and the future training of the Basic and Intermediate Users.
    a. The first occasion shall take place at the time of initial system activation and be performed by the manufacturer's field service engineer. The initial training session shall be not less than 4 hours with 2 hours to cover all aspects of operation and maintenance required by this system and 2 hours to concentrate on lighting console training. It is recommended the number of trainees be limited to 2 persons.

4. All other occasions shall be coordinated with the owner representative and Contractor with (21) days written notice. This instruction shall be an overall review of the system operation and detailed console operations. The finial occasion shall take place within the first six months following system activation.

C. Provide operational assistance for the first usage of the system. This is to be on the owner's time schedule but, not to exceed 8 hours.

3.9 MANUALS

A. Upon completion of the work, the Theater Equipment Contractor shall submit four detailed printed copies of Operations and Maintenance Manuals for each space, 2 for the Owner, and 1 for the Architect/Engineer of Record and one for Consultants. The Contractor shall also provide CD-ROM's with the Operations and Maintenance Manuals in PDF form with a hyper link table of contents, also any and all CAD drawings including as-built shop drawings, equipment descriptions, any required certificates or warranties, and parts lists or other electronically produced submittal items. The contractor shall also provide a USB flash drive for each space with all project documents including the initial configuration files for the control electronics modules for the stage lighting dimmers and house light dimmers, the stage lighting consoles, the stage lighting network switches, the portable network nodes and all multi parameter stage lighting fixtures. Submit in quantities and file formats as required by the Architect

B. Additionally, inside the primary dimmer or auxiliary control rack, provide a document pouch and one set of final as-built drawings. Before distribution of manuals submit one copy to consultant for approval. Each manual is to contain the following:

1. System one line drawings including all labeling and changes ("as builts ").
2. Owner's manual for each piece of equipment.
3. Schematic diagram for each piece of equipment.
4. Contractors service phone number in a conspicuous place.
5. All test reports.

3.10 WARRANTIES

A. Contractor will warrant the system to be free from defects in materials and workmanship for a period of one year from the date of acceptance, or first beneficial use, whichever comes first. Acts of god and owner abuse or neglect are not covered.

B. During the warranty period the contractor will respond to and correct any call for service within one day of the call.

C. Loaner equipment will be provided if necessary.

D. The manufacturer of the stage lighting and control equipment shall warranty the electrical distribution, dimming and control equipment to be free from defects of material or workmanship for a period of two years from the date of acceptance.

E. The manufacturer shall warranty all fixtures and accessories (except lamps) to be free from defects of material or workmanship for a period of one year from the date of acceptance. During the period of this warranty, equipment that proves to be defective shall be repaired or replaced at no charge (excluding freight). Unauthorized local repairs of equipment during the warranty period shall relieve the manufacturer of his responsibilities under this warranty.

F. Include the name, address, and phone number of at least two- (2) factory authorized Field Warranty centers within a 250-mile radius of the job site in the operation and maintenance manual.

3.11 FINAL ACCEPTANCE

A. The following conditions must be met before final acceptance will be granted:

B. Inventory of all equipment by the project Architects or his representative.

C. All inventoried portable equipment is in secure storage, accessible only by the Owner.

D. Approval of final tests and inspections by the project Architects, Theatre Consultant, and Owner.

E. Submittal to the Architect of three (3) signed copies of the warranty (ies).

F. Satisfactory completion of all punch list items.

G. At the date of system activation, the Contractor shall furnish and replace all lamps in stage lighting fixtures, which are observed to be noticeably dimmed, as judged by the Architect or his representative.

END OF SECTION 26 55 61

SECTION 27 41 18 - SOUND & VIDEO SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Special Conditions and Division-1 Specification sections, apply to work specified in this section.

1.2 RELATED REQUIREMENTS

A. Basic Electrical Requirements

B. Raceways and Conduits

C. Wires and Cables

D. Outlet Boxes

E. Grounding

1.3 SCOPE OF WORK

A. This section requires the fabrication, furnishing, delivery, installation, testing of the sound and video systems and equalization of the sound system as indicated on the drawings and specified herein.

B. The sound contractor shall provide all materials, equipment, procedures, labor, tools, scaffolds, and incidentals necessary to the scope of work.

C. It is the intention of these specifications that the sound contractor provides a professional quality, complete and properly operating system in every respect and detail.

D. The installation contractor shall examine the plans in detail to familiarize him with the scope of the work.

E. The installation contractor shall assume full responsibility for a complete operating installation, in the required location, in accordance with the contract documents.

F. The contractor shall provide all necessary specialty equipment for the complete sound and video system installation as specified herein.

G. The contractor shall provide all necessary specialty equipment for the complete sound and video system as shown on the drawings.

H. Any errors, omissions, or ambiguities found in these documents do not relieve the Contractor of the responsibility of providing all items necessary for complete, safe, fully functional systems. Any errors, omissions, or ambiguities shall be brought to the attention of the Architect/Engineer of Record, Owner, and/or Theater Consultant for clarification.

I. Anything shown on the drawings or included in this specification shall be considered as part of both documents.

J. The drawings and specification when taken together communicate the design intent of the system. The contractor is responsible for all engineering, procedures, drawings, equipment, material, means and methods, and contract administration necessary to fully and completely provide and install the system contemplated by these documents.

K. No changes will be allowed for any issue that could have or should have been known at the time of bid. This includes but is not limited to discontinued products.

L. The contractor is solely responsible for meeting all codes and regulations and for the complete code compliance of the finished system.

M. The contractor shall employ the most current best standard practices for all aspects of work.

N. The contractor acknowledges that the consultants' opinion is final.

O. DSP programming, control system programming, system tuning and complete configuration of all components.

P. Mounting and attachments of all speakers, video projectors, projection screens and equipment.

Q. Coordinate and register all wireless microphone frequencies in the "White Space" database.

R. Coordinate fully with the electrical contractor.

S. This contractor is responsible to ensure that the system and all of the system components, fixtures, equipment, devices, wire, terminations, field assemblies (including custom assemblies) etc. pass all required inspections by the local authority having jurisdiction.

T. If so required by the local authority having jurisdiction, anything not arriving at the job bearing a compliance label from a nationally recognized testing lab shall be field inspected and labeled by such a testing lab. This extends to all field assemblies.

1.4 WORK INCLUDED IN THE AUDITORIUM

A. This is a partial renovation and system upgrade. Existing system components shall remain unless specified otherwise. The portions of the existing system that are to remain shall be interfaced wherever necessary with the renovated and upgraded system.

B. Renovations / and upgrades:

1. Upgrade the speaker system.
    a. Provide new line array speaker system, amplifiers and speaker processing
    b. Provide a portable front fill speaker system.
    c. The existing center speaker cluster shall be abandoned in place.
    d. The existing center speaker cluster amps and speaker processor shall be removed from the amp rack and turned over to the owner.

2. Provide a new digital mixing console and digital audio infrastructure.
3. Provide 12 channels of new wireless microphones.
    a. The existing wireless microphone equipment shall be removed from the playback rack and turned over to the owner.

4. Expand the stage monitor system
    a. Provide new self powered stage monitor speakers.
    b. Provide 8 audio tie line loops to feed the new monitor speakers.

5. Provide new playback source equipment
    a. The existing playback equipment shall be removed from the playback rack and turned over to the owner.

6. Provide a new front projection video projector.
7. Replace video screen with 16:9 front projection surface.
8. Provide a new video presentation system
    a. Computer receptacles backstage and in the control booth.
    b. Blu-Ray player in the control booth.
    c. Aux signal connection in the control booth,
    d. Touchscreen controller.

9. Provide a video show relay system
    a. A single remote controlled PTZ HD camera will be added.
    b. This camera will be distributed to TVs in the lobby, backstage and in backstage support areas
    c. Mount all TVs with tamper proof hardware.

10. Provide new wiring infrastructure
    a. Two new combination panels located backstage with lines running back to the control booth,

11. Provide a new portable equipment package.

C. All speaker cluster rigging.

1. Provide all required equipment and hardware to rig the new speakers.
2. The new clusters are to be hung from the existing building structure above the ceiling.

D. Control room Panduit wire duct: In the control booth, install below the counter a series of Panduit wire duct runs. These shall provide a cable path from and between the exsiting junction boxes, the existing playback rack, the existing sound rack, the new mixing console and the new under counter sound rack.

E. Power sequencing:

1. The existing sound system includes a power sequencing system. This system shall be extended and expanded to include all the new audio and video equipment.
2. This includes all internal rack power wiring.

F. Internal Rack Power Wiring:

1. Provide all power wiring, devices, hardware, receptacles, etc. as required to power wall equipment within each rack.
2. Provide a junction box located at the top of the rack for connection to circuiting by the electrical contractor.
3. Provide portable power cables for console, any portable racks, and all portable equipment.

G. Other requirements.

1. All RJ45 jacks and portable cables shall be color coded according to function.
2. All RJ45 portable cable shall be heavy duty service type – TMB ProPlex or equal.
3. All RJ45 jacks shall be Nuetrik EtherCON.
4. Supply all non standard back boxes shown on the electrical drawings.

1.5 WORK NOT INCLUDED

A. The following items of work, if required, are included in other sections and must be reviewed by the sound contractor for impact on this work:

1. Necessary conduit and raceway runs.
2. Stage flooring.
3. Theatrical stage lighting and electrical connections, electrical contractor supplied junction and back boxes, wiring to power sources, and wiring to all other electrically powered devices.
4. Front of house catwalks.

1.6 CONTRACTOR'S QUALIFICATIONS

A. Only qualified contractors shall be used.

B. The work of this section will be contracted to a single firm, referred to as the contractor.

C. The contractor shall be a systems contractor who regularly engages in the furnishing, installation and servicing of professional systems of similar nature, size, scope and complexity to that contemplated by this specification. The contractor shall have done so for a period of not less than five years preceding the bid date.

D. The contractor shall have maintained for the five years preceding the bid date, a suitably staffed and equipped service organization which has continuously offered maintenance and repair

services for systems of the nature, size, scope and complexity to that contemplated by this specification.

E. All liens must be satisfied for at least five years.

F. The contractor shall be licensed and insured.

G. The contractor shall be a factory authorized installation contractor (not "box sales") for all major system components (mixing console, speakers, amplifiers, signal processors, wireless systems, video projector, video matrix, cameras).

H. The contractor shall demonstrate to the satisfaction of the owner, through exhibits presented with his bid, that the sound contractor has a history to indicate the following:

1. Statement of company history. Include a breakdown by percentage of gross sales of all business activities the contractor is involved in for each of the last 5 years (e.g. system installation = 30%, box sales = 40%, equipment rentals = 20%, design and other professional services = 10%, etc).
2. Previous experience: Provide a list of four installations of the type and size contemplated by these specifications, currently in use as originally installed, in which a theatre / system consultant was involved, completed in the last 5 years and the following information regarding each installations:

    a. Name and address of each installation facility.
    b. Facility owner and telephone number.
    c. Name, address, and phone number of a person regularly employed by the owner, who is familiar with the operation of the systems and who has no connection or business connections with the contractor except as the contractor shall fully disclose
    d. Name, address, and phone number of the theatre / system consultant, along with the names of all the consultant's personal directly involved.
    e. System shop drawing - These will be returned if the contractor provides a call tag or return postage.
    f. Owner's manual drawing - These will be returned if the contractor provides a call tag or return postage.
    g. System as-built drawings drawing - These will be returned if the contractor provides a call tag or return postage.
    h. List of contractors personal involved with each persons responsibility on the project.
    i. Name, address and phone number of the general contractor, along with the names of all key GC personal directly involved.
    j. Name address and phone number of the electrical contractor, along with the names of all key EC personal directly involved.

3. Statement of current company capabilities and ownership.
4. Key Personnel: For each of the key personnel listed below; Include individual's name, title, and number of continuous years of service to contractor. Include a biography detailing industry experience, and role within organization (include only full-time/regular staff employees; not independent contractor, freelance, or temporary positions). List all

industry certifications held, training courses attended, and continuing education credits, including dates of attendance. List recently completed projects, scope of project, and completion dates.

a. Project Manager
b. Senior Technician
c. Service Manager

5. Other Department Staff – Include size of staff, and experience of each staff member.
6. Replacement and Spare Parts Inventory – Provide detailed list of primary replacement parts, components, and spares typically held in inventory.
7. Test Equipment and Physical Plant – Include an inventory of all test facility equipment owned and used regularly by the Service Department. Provide description of physical plant and space utilization.
8. Copies of all business and professional licenses and insurance certificates.

I. Without prejudice to other AV system sub-contractor desiring to be qualified, the following are considered qualified:

BCI Integrated Solutions
9419 Corporate Lake Dr.
Tampa, FL 33634
(813) 249-1020
Michael Fraioli

Peerson Audio, Inc.
1235 Park Lane South
Jupiter, Fl 33458.
(561) 741-8720
Clint Smith

Pro Sound
1375 N.E. 123rd Street
Miami, FL 33161
(305) 891-1000
Rick Scharmann

PART 2 - PRODUCTS

2.1 ALTERNATES

A. In no case will equipment or materials of lesser design or workmanship be acceptable. Only those materials and equipment listed in this specification will be considered unless prior approval is sought and received.

B. Substitutions: When a specific piece of equipment specified has been discontinued and/or replaced by a new model, substitution will be acceptable when:

1. Submission of complete data on the new model or substitute has been approved by the owner prior to equipment acquisition. Data shall include list pricing for specified and replacement equipment.
2. Substitute equipment or the replacement of rejected equipment shall be at the sole expense of the sound contractor.
3. After submittals have been approved there will be no cost to the owner for any required replacement equipment under any circumstances.

C. Should the contractor proposed and receive approval for the use of alternative wire and cable which requires additional conduit, the contractor will be solely responsible for the installation of such conduit.

2.2 GENERAL REQUIREMENTS

A. The major items of equipment shall be furnished in the quantity as on the drawings and the quantity as specified herein.

B. When documents list several acceptable manufacturers for a particular item of equipment, more than one of which is to be provided, the sound contractor shall supply all of those similar items of equipment from one manufacturer.

C. The sound contractor will provide necessary millwork, enclosures, baffles, grille cloth, wall plates, and any other item furnished under this contract not specifically noted otherwise herein or on the drawings in a manner and color as approved by the owner.

D. Any item of equipment or hardware that may not be specifically shown on the drawings or specified herein but required for proper sound system operation or installation shall be furnished and installed and be of the highest quality available.

E. The performance of all equipment must meet the most recently published manufacture's data sheet

F. All equipment, where applicable standards have been established, shall be listed by a nationally recognized testing labs and must bear a compliance label with delivered to the job.

G. If so required by the local authority having jurisdiction, anything not arriving at the job bearing a compliance label from a nationally recognized testing lab shall be field inspected and labeled by such a testing lab. This extends to all field assemblies.

H. Provide all power supplies / POE power injectors required.

I. Provide all software, drivers and related items.

1. Shure Wireless Work Bench
2. SymNet
3. Yamaha StageMix app
4. Yamaha QL Editor
5. Dante controller software

6. Amp control software
7. All others as required

J. Provide all equipment in the types and quantities shown on the contract drawings.

K. Provide the follow equipment in the quantities shown on the contract drawings:

1. MIX-1: 72 input capable front of house mixing console, 8 omni in, 8 omni out and 3 mini YGDAI card slots. Include 18" gooseneck lamps. Provide Yamaha Studio manager and Stagemix software.
   Yamaha CL5
   1 - console cover
   1 -Yamaha MY8-ADDA96 8 in, 8 out analog mini YGDAI card
   1- Yamaha MY8-AE96S 8 in, 8 out AES YGDAI card
   3- LA1L lamps

2. CAB-2: Console YGDAI breakout cable for AES digital card. DB25 connector to XLR wired with digital cable 10’ long with 3’ tails.
   Whirlwind or ProCo custom

3. RIO-1: 32 inout/ 16 output Dante enabled digital I/O
   1 – Yamaha Rio3224-D

4. RIO-2: 16 inout/ 8 output Dante enabled digital I/O
   1 – Yamaha Rio1608-D

5. RIO-3: 8 output Dante enabled digital I/O
   1 – Yamaha Ro8-D

6. CDR-1: Compact disk recorder / player. All inputs and outputs shall be balanced. Include a wired remote.
   Tascam CD-RW901MKII

7. SSR-1: Compact disk, USB, CF and SD/SDHC recorder/ player. All outputs shall be balanced. Include a wired remote.
   Tascam SS-CDR200

8. AAP-1: Apple TV w/ Siri remote, 64 GB.
   Apple TV, 64 GB

9. WIR-1: UHF Digital 4 channel Wireless microphone system with Dante audio over Ethernet. Include Shure Workbench control software.
   3@ Shure ULXD4Q receivers
   12@ Shure ULXD1 bodypack transmitters
   12@ Countryman E6 earset mics w/TA4F connectors
   (8-Tan, 4-Black)

10. WIR-2: Antennas Distribution System.
    Shure UA845

11. WIR-3: Active Wideband Antennas. Include (1) pair active antennas. Provide rigid mounts for the antennas, permanently installed in the correct orientation.
    Shure UA870WB

12. PRO-1: Programmable digital signal processor. 8 channel mic/line inputs on 2 analog input cards and 8 line outputs on 2 analog output cards all on Euroblock connections. Dante enabled.
    Symetrix SymNet Edge

13. AMP-1: 2000 watt per channel 4 channel amp into 4 ohms with onboard signal processing.
    QSC PLD4.5

14. AMP-2: 400 watt per channel stereo into 8 ohms with onboard signal processing.
    QSC GDX4

15. NET-1: 24 port 10/100/1000 Gigabit Ethernet switch for Dante' audio network.
    Summit X440-G2-24p-10GE4 switch
    Summit RPS-500p redundant power supply

16. NET-2: 24 port 10/100/1000 Gigabit Ethernet switch for sound network running remote monitoring software.
    Summit X440-G2-24p-10GE4 switch
    Summit RPS-500p redundant power supply

17. NET-3: Wireless 4 Port N gigabit network switch.
    Cisco RV180W

18. NET-4: Network Patchbay
    Belden CAT6+ patch panel, 24 port 1U preloaded

19. USB Hub
    HooToo HT-UH010 7-port hub

20. SPK-1: Main Left/Right full range line array speakers, 140 degree horizontal coverage. Include all necessary hardware rigging components, grids, bumpers, rigging tubes, hinge bars, quick release pins, shackles, etc., required for speaker suspension and aiming.
    QSC WL3082

21. SPK-2: Left/Right subwoofer speakers. Include all necessary hardware rigging components; rigging tubes, hinge bars, quick release pins, etc., required for speaker suspension.
    QSC WL212-sw

22. CAB-1: Custom Neutrik NL8 to NL4 breakout for portable front fill speakers, length dependent on site conditions.
    Whirlwind or ProCo custom

23. DWR-3: 3U rack drawer.

Middle Atlantic Products D3

24. LGT-3: Rack mount light module
    Littlite RL-10-D

25. RACK RS-2: Floor Mounted 24U 19" equipment rack. Roll out rotating. Provide locking front door, top and side panels. Provide rear rails. Provide integrated top fans.
    Middle Atlantic Products model WR-24-32.

26. RACK RS-3: Undercount top mount 8U 19" equipment rack.
    Middle Atlantic Products model EWR-8-22

27. RACK RV-1: Desktop 18U 19" equipment rack.
    Middle Atlantic Products model DTRK-1818

28. Portable Rack: 8space ATA style rack case, front and rear rails required.
    R&R Cases TRB series case

29. Video Projector:
    Christie Digital HD 14K-M 1080 HD
    Optional inputs cards as required
    Spare lamp
    Zoom lens sized for screen
    Zoom lens sized for rear cyc

30. Projection Screen: Hang from rigging system in the same place as the existing.
    Draper StageScreen Portable
    TecVision XT1100X surface
    16:9 aspect ratio
    248" diagional
    Black frame

31. CAM-1: High Def remote PTZ camera system
    Vaddio ClearVIEW HD-20SE QCCU System
    ClearVIEW HD-20SE PTZ camera
    Universal quick connect CCU for CAT-5 for HD-20SE
    Power supply
    EZIM CCU Slot Card
    Wall mount and mounting hardware
    Mounting and hardware, breakout cable, connectors

32. CCU-1: Camera Control Unit
    Vaddio Production VIEW Precision Camera Controller

33. MON-1: Rack mount camera preview monitor
    Marshall Electronics V-MD72-HDSDIx2

34. MON-2: 65" LCD HD TV, 1080P, 60Hz.with QAM tuner
    Sharp Aquos or equal. Include articulating arm type wall mount bracket

35. SPT-1: RF Splitter 1 in, 4 out
    Blonder Tongue digital ready bi directional

36. TAP-1: RF video tap. Single gang wall plate with internal tap-off. Tap-off value to be determined by final RF system engineering, with a measured value between +5 to +10 dBmV at tap-off output.
    Blonder Tongue Versa Tap Series V-3889

37. TERM-1: 75 ohm terminator. PROVIDE AS REQUIRED – NOT SHOWN ON ONE LINE DRAWING
    Blonder Tongue PBT (VersaTap style)

38. All specialty back boxes listed on the electrical drawings.
    CMBP = Whirlwind black powder coated surface mount 12x12x4 backbox with Whirlwind WFS wall frame or Wireworks Guardian Panel Mounts + custom panel
    SCL / SCR / SCC = Whirlwind black powder coated surface mount 8x8x4 backbox with Whirlwind WFS wall frame or Wireworks Guardian Panel Mounts + custom panel

L. Panels: All panels are made of 1/8" thick Aluminum plate, brushed anodized black and sealed. All controls and connectors will have engraved labels. The minimum allowable label size is 1/8"s. All labels will be back filled with white paint. All connectors are mounted with machine hardware. All panel layouts and labels must be submitted and approved prior to construction, the panels shown in the drawings are typical only.

M. Custom panels: See drawings for required components.

N. Connectors:

1. All XLR cable connectors are Neutrik “XX” series, black bodies, and silver contacts unless otherwise indicated.
2. All XLR chassis connectors are Neutrik “DLX” series, black bodies and silver contacts unless otherwise indicated.
3. 6 pin XLR connectors for intercom must be “Switchcraft compatible”
4. All RJ45 plugs and jacks are Neutrik EtherCON CAT6A
5. All plugs and jacks shall be color coded sealing covers / rings by function.
6. All speaker cable connectors are Neutrik SpeakON series “FC”.
7. All speaker chassis connectors are Neutrik SpeakON NL4MP-ST.
8. All RCA chassis connectors are Neutrik D-shaped housing, black chrome bodies, solder tabs with white / red isolation washers for stereo left right.
9. All BNC chassis conenctors are Neutrik NBB75DFIB-P (isolated, feed through, D-shape, black housing, protruding version). Provide color coded (by function) rubber sealing

O. System Wire: All wiring installed in a conduit which is located in the slab must be rated for wet locations.

1. 10 A.W.G. for speaker lines enclosed in conduit, racks, or speaker enclosures. Use for all speaker runs except 70 volt systems. 10 A.W.G. THWN.

2. 16 A.W.G. twisted pair for RMS control system and for 70 volt audio wire for use in conduit, racks, or speaker enclosures. West Penn Wire AQC 225
3. 22 A.W.G. shield twisted pair for all mic, line or D.C. control lines enclosed in conduit or racks. Belden 5500F1 or West Penn Wire AQC 291
4. 18 A.W.G. Shielded twisted pair with 18 A.W.G. drain wire for all intercom lines enclosed in conduit or racks. Belden 5300F1 or West Penn Wire AQC 293. An additional 12 A.W.G. THWN will be required if speaker stations are used. This additional wire shall be used in parallel with the drain wire of the shielded twisted pair cable.
5. 24 A.W.G. shield twisted pair for all AES/EBU digital audio lines enclosed in conduit or racks. West Penn DA2401.
6. Coax Antenna Lines. As called for by equipment manufacture.
7. UTP Category 5E network cable. Four twisted pair of 24 A.W.G. wire with an outer diameter suitable for termination by standard type RJ-45 connectors. Use for all Category 5 cable run within a conduit or raceway. Belden 7934A.
8. STP: Category 5E network cable. Shielded four twisted pair of 24 A.W.G. wire with an outer diameter suitable for termination by standard type RJ-45 connectors. Use for all Category 5 cable run within a conduit or raceway when STP cable is required. Belden 7937A.
9. Category 5 service cable. Use for all Category 5 cable NOT run within a conduit or raceway. TMB Associates ProPlex Ethernet cable.
10. RG6 coax for all video cable (including HD-SDI) West Penn Wire AQC806
11. RG 11 coax for wireless receiver antennas Liberty RG11-DB-CCTV
12. RG59 coax as required West Penn Wire AQC 815
13. Crestron cable as called for by manufacture. Wet location rated as necessary by installation location.

P. Internal Rack Power Wiring:

1. Provide all power wiring, devices, hardware, receptacles, etc. as required to power wall equipment within each rack.
2. Provide a junction box located at the top of the rack for connection to circuiting by the electrical contractor.
3. Provide portable power cables for console, any portable racks, and all portable equipment.

Q. Power Sequencing: The existing sound system includes a power sequencing system. This system shall be extended and expanded to include all the new audio and video equipment using the following equipment types are required.

1. SEQ-1: Power sequencer
   Lowell Manufacturing SCS-8R

2. SEQ-2: Switched 20 amp power outlet box
   Lowell Manufacturing RPC1-20A-MC

3. SEQ-3: Switched 30 amp power outlet box
   Lowell manufacturing RPC1-30A-MC

4. SEQ-4: Five duplex power strip; 4 duplex receptacles switched, one duplex receptacle un-switched.
   Lowell Manufacturing RCP-5-MC

R. Portable Equipment: Provide the following portable equipment that is not shown on the contract drawings:

1. Microphones. Provide a mic clip for each mic.
   4 @ Shure KSM-32
   2 @ AKG C414 XLS
   1 @ Countryman ISOMAX 4RF (M4HP5RF18EB) + AT8416 shockmount
   5 @ Countryman ISOMAX 2-H hanging mics
   4 @ Audio Technica 4040.
   4 @ Audio Technica 4041.
   1 @ Rode NT4 stereo mic
   3 @ Radial Engineering ProDI Direct Box.
   1 @ Radial Engineering USB-Pro stereo USB laptop DI.
   1 @ Radial Engineering ProD2 stereo direct box
   1 @ Shure VP-88
   4 @ Audix MicroBoom System, 50" boom assembly, cardioid mic element

2. Microphone Stands & Accessories.
   15 @ K&M KM210/91 black, mic stand w/boom
   5 @ K&M KM21140 black boom arm
   6 @ Atlas Sound MS12CE
   4 @ Atlas Sound MS20E
   4 @ Atlas Sound DMS7E
   4 @ K&M 21021 overhead boom stand

3. Mic Cables: Whirlwind MKQ series in black.
   10 @ 3 feet
   15 @ 10 feet
   15 @ 20 feet.
   15 @ 30 feet.
   6 @ 50 feet.
   3 @ 100 feet.

4. Speaker Cables.
   8 @ Whirlwind NL-4-50
   8 @ Whirlwind NL-4-25

5. Front Fill portable speakers with NL4. connectors
   4 @ QSC E10
   4 @ QSC E10 Yoke Mount
   4 @ QC M8 Eyebolt Kit-A
   4 @ USS TS-99BLStands
   2 @ 25' speaker cables
   2 @ 40' speaker cables

6. Patch Cables and Adapters
    - 8 @ Neutrik NL4MM.
    - 2 @ Switchcraft 389.
    - 2 @ Switchcraft 390
    - 2 @ Switchcraft 387A
    - 2 @ Switchcraft 386A
    - 2 @ Switchcraft 384A
    - 2 @ Switchcraft 383A
    - 4 @ RCA female to XLR male
    - 4 @ RCA female to XLR female
    - 4 @ ¼" TRS patchcable. 15' long

7. Video adapters & cables:
    - 4 @ HDMI (standard size) to mini HDMI 20' long
    - 1 @ Liberty AV Solutions DL-AR360
    - 1 @ Liberty AV Solutions DL-AR392
    - 1 @ Liberty AV Solutions DL-AR
    - 2 @ Extron 15HD GCF
    - 2 @ Extron 15HD GCM
    - 10 @ Extron BNCF-BNCF
    - 10 @ Extron BNCM-BNCF T
    - 4 @ Extron RCAF-BNCM
    - 1 @ ExtronVGA-A-M-M-MD/6
    - 1 @ Extron VGA-A-M-M-MD/35
    - 1 @ Extron VGA-A-M-F-MD/12
    - 2 @ Extron SYM BNCF/3
    - 2 @ Extron SYM BNCM/3
    - 2 @ Extron SYF BNCF/3
    - 2 @ Extron SYF BNCM/3
    - 4 @ Extron RG6-5 BNC/6
    - 12 @ Extron RG6 BNC/6
    - 2 @ Extron HDMI PRO/6
    - 2 @ Extron DISPLAYPORT-M-M/6
    - 2 @ Extron HDMI DVI-D/6
    - 2 @ Extron HDTV RCA/6
    - 2 @ Extron AV RCA/6
    - 2 @ Extron MHR-2-SVMF/20

8. Monitor and Portable Speakers.
    - 8 @ QSC K12 active monitors w/ stand sockets
    - 4 @ QSC K12 Yoke Mount Kit
    - 4 @ USS TS-99BLStands
    - 4 @ QSC M10 Kit-C
    - 8 @ Power cables 25' long.
    - 8 @ Signal cables 25' long

9. Apple I-Pad Air, 64 GB, running the following app software: ShurePlus Channels for wireless, Yamaha StageMix,, Symetrix SymNet,.
    - 1 @ Apple I-Pad Air 2, 64 GB

10. Headphones.
    1 @ Sony MDR-7506

PART 3 - EXECUTION

3.1 Submittals:

A. The sound contractor, within thirty days of the bid award and prior to beginning work, shall submit all of the following at the same time to the owner for approval:

B. Drawings: Complete shop drawings details and complete on all phases of installation including a minimum of:

1. Device location plan drawing(s)
2. System wiring diagram
    a. Make and model of all equipment
    b. All connection points on each piece of equipment
    c. All wire types
    d. All connector types
    e. All cable labels
    f. Show Dante ID and other setup info
    g. Show wireless frequency coordination
    h. Show IP address management
    i. Show RF levels on TV distribution system
    j. Show EDID information and management
3. Rack elevations
4. Details of all connection plates and custom panels
5. Rack and equipment labels
6. Mounting and rigging details for all equipment
7. Drawing showing the projector, the screen, the throw distance and all lens calculations in both plan and section

C. Mountings and Attachments: Prior to equipment installation, the sound contractor will submit to the owner detailed scale drawings of all proposed enclosures and speaker mounting or rigging weighing more than ten pounds. All mountings and attachments must be approved and stamped by an engineer licensed in Florida prior to submittal and the beginning of the installation.

D. Materials and Equipment: The sound contractor will submit to the owner a complete list of all materials and equipment to be furnished including catalog cuts for all equipment items. These must contain full information on dimensions, construction, applications, etc. to permit proper evaluation. In addition, they must be properly identified as to their intended use and any options or variations must be clearly marked. The contractor is to confirm equipment availability at time of submittal. It is assumed that all equipment submitted on is and will be available.

E. Test Equipment: The sound contractor will submit to the owner a list of test equipment to be used to test, equalize and demonstrate the final installation.

F. Schedule: Prior to the commencement of the installation work, the sound contractor shall submit for approval, to the owner, an outline of a proposed commencement and completion schedule and project requirements.

G. Variations: Any deviation from what is specified here and or shown on the system drawings must be "starred" and noted in ¼" high letters on the shop drawings and highlighted in the submittal data.

H. Approval of shop drawings and materials does not relieve the Contractor of any responsibilities.

3.2 COORDINATION WITH OTHER WORK:

A. The sound contractor shall specifically coordinate the placement and sizes of conduit relating to this work and shall specifically review and approve the conduit rough-in in time to advise all parties of needed changes, omissions, etc. The sound contractor shall report this successful coordination in writing to the owner's representative. Failing this, the following will be enforced:

1. The sound contractor shall provide and install any additional conduits required for the hookup, proper location and proper isolation of the various cable / signal types and equipment in the systems. The sound contractor must coordinate his conduit installation with those installed by the electrical contractor. All conduits shall be sized to their intended fill plus fifty percent.
2. The contractor shall at all times coordinate his work with the other trades to ensure smooth progress of work and satisfactory final results.

3.3 INSTALLATION:

A. Personnel: A single, competent, technically qualified foreman will oversee the entire job from start to finish. This foreman must:

1. Be present on the job site during all phases of installation and testing.
2. Be authorized to receive instructions from the Architects or their representatives.

B. Only experienced sound installers shall be employed on this job.

C. The contractor shall keep the job adequately staffed at all times.

D. All job documents pertaining to the installation of this system will be accessible to all workers throughout the installation process.

E. Installation practices shall be in accordance with OSHA Safety and Health Standards and all local codes.

F. The sound contractor shall not commence the installation of equipment and devices, other than the pulling of cable, until all areas are clean, painted and finished to a point that they are

completely dust, dirt, lint, fiber and airborne particle free. The air conditioning system must be operating to its design level and be able to keep all areas with sound equipment stable.

G. General Workmanship:

1. The installation of all work shall be neat.
2. All boxes, equipment, etc shall be plumb and square.
3. The installation shall conform to the plans and spec.
4. Equipment racks shall be assembled, wired and tested in the contractors shop prior to delivery to the job site.

H. Wiring:

1. If enclosed in conduit run only similar signal levels in a single conduit.
2. All pulls to be made be hand, care will be taken not to nick cable jackets, and any nicked or damaged cable will be replaced.
3. A pull string will be left in all conduits after wire is installed.
4. NO SPLICES WHATSOEVER IN CONDUIT!
5. If not enclosed in conduit neatly group cables into bundles and secure out of harms way.
6. Separate cable grouping by signal level. Mic and A.C. power shall be not less that 18" all other levels by not less than 6".
7. Include spare cables with all field runs. Quantity to be 10% or 1 which ever is greater unless otherwise specified.

I. Terminations:

1. All cables shall be permanently labeled at every termination.
2. Service loops of not less than 6" will be present at all terminations to equipment.
3. Where terminal blocks or barrier strips are used only uninsulated fork terminals with a brazed seam, sized according to wire and stud sizes, crimped with notch across from the seam will be approved.
4. Use barrier strips on equipment where provided.
5. Where shielded cable is in use leave shield drain wire the same length as the circuit conductor(s), sleeve shield drain wire in green pvc tubing. Cap where the cable jacket was removed with heat shrink. Where the shield drain wire is to be lifted follow the above and fold back over cable jacket. Then cap end with heatshrink. Do not use a single piece of heatshrink for this use two smaller ones.
6. All soldering will be clean and neat and not exhibit evidence of a " cold" joint, were necessary heat sinks will be used. Use only rosin core "electronic type " solder.
7. Wire nuts will be allowed only for field connections of 70 volt speaker lines and priority attenuation control lines, and then only when the proper size is used.

J. Polarity:

1. The " high " side will be connected to pin 2 on XLR connectors, to tip on 1/4" connectors and to the pin on phono connectors.
2. The " low " side will be connected to pin 3 on XLR connectors, to ring on 1/4" balanced connectors and to case on phono connectors.

3. Microphones will be wired so that an acoustic compression at the diaphragm produces a positive going signal on pin 2 with respect to pin 3.
4. Speakers will be wired so that when a positive going signal is applied to the + or red terminal an acoustic compression is produced.
5. The system will be wired to maintain absolute polarity though all system components to insure that a positive signal on pin 2 or tip produces a positive signal at the + or red speaker terminal.

K. Shield Grounding:

1. Do not tie pin 1 to case of XLR connectors anywhere.
2. Microphone shield drain wires will be grounded only at mixer inputs. Where microphone lines and mixer inputs run though a patchbay, connect shield drain wire to sleeve of patchbay connector and only to this point.
3. Line level lines will have shield drain wire lifted from ground at outputs and connected to ground at inputs.
4. The intent here is to not make ground loops, should any situation arise which would form a ground loop, please inform the owner for direction.

L. Mountings and Attachments:

1. Any and all structural, mounting, or rigging details are shown on the drawings for concept only.
2. The detail drawings and calculations of all proposed mounting or rigging of any equipment weighing more than ten pounds will be approved and stamped by a P.E. who is licensed in Florida.
3. Each cluster element is to be individually adjustable.
4. Provide for an adjustment range of +/- 10 degrees from the information shown in the contract documents.
5. In the absence of specific direction otherwise, standard rigging practices shall be followed.

M. Labels:

1. Cable Labels: All cables shall be labeled at all termination points. The label shall not be hand written. Clear heat shrink shall cover the label.
2. Equipment Labels. All equipment shall be labeled front and rear. Labels shall functionally describe the use of each piece of equipment. On equipment having multiple channels, each channel shall be labeled. Additionally the equipment label will call out equipment designation which will correspond with the designations shown on the approved contractor's one-line diagram. Labels shall be engraved lanacoid, white letters on black background, with a minimum letter size of 3/16". Approved patchbay labeling may vary from this.

N. Power Sequencing. The system shall turn on and off, in proper order, on circuit at a time, when the power switch is pressed. The power light shall be solid on when all circuits are on , and shall flash during sequencing.

O. The system may not be used prior to checkout.

3.4 INSPECTION AND TESTING:

A. During the installation of the equipment the sound contractor shall arrange for access as necessary for inspection of equipment by the owner's and/or architect's representatives.

B. Provide a safe means of accessing all system components for all visits.

C. Equipment Pretesting: All racks are to be built and wired in contractors shop and tested prior to delivery to site. All other equipment is to be tested prior to delivery and installation. A written test report will be submitted to the owner.

D. Final Inspection:

1. The final inspection will confirm that the systems, as installed, meets the requirements of this spec, the contract documents, and the approved contractor's shop drawing and submittals.
2. The contractor will inform the owner in writing of the system's completion. The contractor will then request final inspection by the consultant, and carry out the necessary coordination. This coordination includes:
    a. Giving at least fourteen days notice to the consultant prior to the final inspection.
    b. Arranging for the contractor's and consultant's exclusive use of the space.
    c. Arranging for a HVAC technician to be available to turn the AC system on and off as required.
    d. Arranging for a lighting technician to be available to control the stage lighting as required.
    e. The contractor's job foreman and one additional worker familiar with the job will be present during all check out, testing and tuning.

3. Contractor will complete the following tasks prior to consultant's arrival:
    a. Unpack and assemble all portable equipment.
    b. Place all portable equipment in one location.
    c. If anything has been turned over to the owner have the signed Letters of Transmittal on site.
    d. Complete all required paperwork (pre-testing reports, letters indicating successful coordination of the installation, etc.).
    e. Remove all security covers.

4. Contractor will provide all necessary software, cables, and interfaces to facilitate the setting of computer, remote controlled, or DSP based equipment.
5. Contractor will either: 1) relocate all system equalizers to a tech area in the house for the duration of system tuning or 2) for remotely controllable devices, locate the control position in a tech area in the house for the duration of system testing. In ether case a tech area in the house will be required with a minimum of a 4' x 6' folding table, intercom communications to the rack and console locations, and AC power.
6. Contractor will provide the following test equipment for use during tuning and acceptance testing:
    a. Sennheiser ZP-3 impedance bridge.
    b. Low distortion sine wave oscillator with variable sweep (start frequency, stop frequency, and sweep rate).

c. Distortion meter.
d. Oscilloscope dual channel, 100Mhz, .001v/div vertical amp.
e. Noise generator that will provide pink, white, or bandwidth limited pink noise.
f. 1/3 octave real time audio spectrum analyzer.
g. Precision sound level meter with filter set.
h. Polarity checker.
i. Precision true R.M.S. reading A.C. millivolt meter with dB scale.
j. Playback and recording media for testing all supplied source equipment.

7. Contractor will provide safe means to access all system components during the entire commissioning process.
8. Contractor shall provide personal and equipment to make adjustments to the speaker cluster(s), as well as to correct problems, for the entire inspection and testing period.

E. The Theatre Consultant or his representative will conduct all final system tests and equalization adjustments in order to determine final acceptance.

F. In no event shall the theatrical sound systems installation be submitted for final approval or acceptance until any and all elements of the facility that may have a bearing on the system performance, including but not limited to doors, windows, HVAC, carpeting, furniture, wall coverings, interior design elements, lighting and lighting control systems have been completed and are operable. All elements that may effect sound systems operation or performance shall be "on" and operating during adjustments. The sound contractor will be responsible for coordinating the requirements of this paragraph with other work on the project.

G. Should more than two trips be required to complete the systems testing, systems tuning, and clearing punch list items, the contractor will be charged for any additional visits. These charges will include:

1. A minimum of two people at a rate of $1250 per day per person.
2. Travel expense to and from the job site.
3. These charges will be paid to the consultant, in advance of the consultant's arrival on the job site.

3.5 MANUALS:

A. Prepare four identical copies of owner's manuals. The owner is to receive two, the consultant receives one and the contractor retains one. Before distribution of manuals submit one copy to consultant for approval. Each manual is to contain the following:

1. System one line drawing including all labeling and changes (" as builts ").
2. Owners manual for each piece of equipment.
3. Schematic diagram for each piece of equipment.
4. Contractors service phone number in a conspicuous place.
5. All test reports.

B. Provide all information as PDF files on CDs to be included with each manual.

C. Load all manual data as PDF files onto the iPad.

3.6 INSTRUCTION: The following is to be carried out within two months of system acceptance:

A. Provide a total of 12 hours of instruction, on a maximum of two occasions. This is to be time on site, travel time is not to be included within the allotted time.

B. Provide operational assistance for the first usage of the system. This is to be on the owners time schedule but, not to exceed 8 hours.

3.7 WARRANTY

A. Contractor will warrant the system to be free from defects in materials and workmanship for a period of one year from the date of acceptance, or first beneficial use, which ever comes first.

B. Acts of god and owner abuse, or neglect are not covered.

C. During the warranty period the contractor will respond to and correct any call for service within one day of the call. Loaner equipment will be provided if necessary.

END OF SECTION 27 41 18

SECTION 27 41 18 - SOUND & VIDEO SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Special Conditions and Division-1 Specification sections, apply to work specified in this section.

1.2 RELATED REQUIREMENTS

A. Basic Electrical Requirements

B. Raceways and Conduits

C. Wires and Cables

D. Outlet Boxes

E. Grounding

1.3 SCOPE OF WORK

A. This section requires the fabrication, furnishing, delivery, installation, testing of the sound and video systems and equalization of the sound system as indicated on the drawings and specified herein.

B. The sound contractor shall provide all materials, equipment, procedures, labor, tools, scaffolds, and incidentals necessary to the scope of work.

C. It is the intention of these specifications that the sound contractor provides a professional quality, complete and properly operating system in every respect and detail.

D. The installation contractor shall examine the plans in detail to familiarize him with the scope of the work.

E. The installation contractor shall assume full responsibility for a complete operating installation, in the required location, in accordance with the contract documents.

F. The contractor shall provide all necessary specialty equipment for the complete sound and video system installation as specified herein.

G. The contractor shall provide all necessary specialty equipment for the complete sound and video system as shown on the drawings.

H. Any errors, omissions, or ambiguities found in these documents do not relieve the Contractor of the responsibility of providing all items necessary for complete, safe, fully functional systems. Any errors, omissions, or ambiguities shall be brought to the attention of the Architect/Engineer of Record, Owner, and/or Theater Consultant for clarification.

I. Anything shown on the drawings or included in this specification shall be considered as part of both documents.

J. The drawings and specification when taken together communicate the design intent of the system. The contractor is responsible for all engineering, procedures, drawings, equipment, material, means and methods, and contract administration necessary to fully and completely provide and install the system contemplated by these documents.

K. No changes will be allowed for any issue that could have or should have been known at the time of bid. This includes but is not limited to discontinued products.

L. The contractor is solely responsible for meeting all codes and regulations and for the complete code compliance of the finished system.

M. The contractor shall employ the most current best standard practices for all aspects of work.

N. The contractor acknowledges that the consultants' opinion is final.

O. DSP programming, control system programming, system tuning and complete configuration of all components.

P. Mounting and attachments of all speakers, video projectors, projection screens and equipment.

Q. Coordinate and register all wireless microphone frequencies in the "White Space" database.

R. Coordinate fully with the electrical contractor.

S. This contractor is responsible to ensure that the system and all of the system components, fixtures, equipment, devices, wire, terminations, field assemblies (including custom assemblies) etc. pass all required inspections by the local authority having jurisdiction.

T. If so required by the local authority having jurisdiction, anything not arriving at the job bearing a compliance label from a nationally recognized testing lab shall be field inspected and labeled by such a testing lab. This extends to all field assemblies.

1.4 WORK INCLUDED IN THE AUDITORIUM

A. This is a partial renovation and system upgrade. Existing system components shall remain unless specified otherwise. The portions of the existing system that are to remain shall be interfaced wherever necessary with the renovated and upgraded system.

B. Renovations / and upgrades:

1. Upgrade the speaker system.
    a. Provide new line array speaker system, amplifiers and speaker processing
    b. Provide a portable front fill speaker system.
    c. The existing center speaker cluster shall be abandoned in place.
    d. The existing center speaker cluster amps and speaker processor shall be removed from the amp rack and turned over to the owner.

2. Provide a new digital mixing console and digital audio infrastructure.
3. Provide 12 channels of new wireless microphones.
    a. The existing wireless microphone equipment shall be removed from the playback rack and turned over to the owner.

4. Expand the stage monitor system
    a. Provide new self powered stage monitor speakers.
    b. Provide 8 audio tie line loops to feed the new monitor speakers.

5. Provide new playback source equipment
    a. The existing playback equipment shall be removed from the playback rack and turned over to the owner.

6. Provide a new front projection video projector.
7. Replace video screen with 16:9 front projection surface.
8. Provide a new video presentation system
    a. Computer receptacles backstage and in the control booth.
    b. Blu-Ray player in the control booth.
    c. Aux signal connection in the control booth,
    d. Touchscreen controller.

9. Provide a video show relay system
    a. A single remote controlled PTZ HD camera will be added.
    b. This camera will be distributed to TVs in the lobby, backstage and in backstage support areas
    c. Mount all TVs with tamper proof hardware.

10. Provide new wiring infrastructure
    a. Two new combination panels located backstage with lines running back to the control booth,

11. Provide a new portable equipment package.
12. Key West High School Intercom repairs: Make the following repairs to the intercom system at Key West High School:
    a. Replace men's dressing room wall speaker station.
    b. Rewire follow spot receptacle so that channels A/B are correct.
    c. Replace volume control and know in women's dressing room wall speaker station.

C. All speaker cluster rigging.

1. Provide all required equipment and hardware to rig the new speakers.
2. The new clusters are to be hung from the existing building structure above the ceiling.

D. Control room Panduit wire duct: In the control booth, install below the counter a series of Panduit wire duct runs. These shall provide a cable path from and between the exsiting junction boxes, the existing playback rack, the existing sound rack, the new mixing console and the new under counter sound rack.

E. Power sequencing:

1. The existing sound system includes a power sequencing system. This system shall be extended and expanded to include all the new audio and video equipment.
2. This includes all internal rack power wiring.

F. Internal Rack Power Wiring:

1. Provide all power wiring, devices, hardware, receptacles, etc. as required to power wall equipment within each rack.
2. Provide a junction box located at the top of the rack for connection to circuiting by the electrical contractor.
3. Provide portable power cables for console, any portable racks, and all portable equipment.

G. Other requirements.

1. All RJ45 jacks and portable cables shall be color coded according to function.
2. All RJ45 portable cable shall be heavy duty service type – TMB ProPlex or equal.
3. All RJ45 jacks shall be Nuetrik EtherCON.
4. Supply all non standard back boxes shown on the electrical drawings.

1.5 WORK NOT INCLUDED

A. The following items of work, if required, are included in other sections and must be reviewed by the sound contractor for impact on this work:

1. Necessary conduit and raceway runs.
2. Stage flooring.
3. Theatrical stage lighting and electrical connections, electrical contractor supplied junction and back boxes, wiring to power sources, and wiring to all other electrically powered devices.
4. Front of house catwalks.

1.6 CONTRACTOR'S QUALIFICATIONS

A. Only qualified contractors shall be used.

B. The work of this section will be contracted to a single firm, referred to as the contractor.

C. The contractor shall be a systems contractor who regularly engages in the furnishing, installation and servicing of professional systems of similar nature, size, scope and complexity

to that contemplated by this specification. The contractor shall have done so for a period of not less than five years preceding the bid date.

D. The contractor shall have maintained for the five years preceding the bid date, a suitably staffed and equipped service organization which has continuously offered maintenance and repair services for systems of the nature, size, scope and complexity to that contemplated by this specification.

E. All liens must be satisfied for at least five years.

F. The contractor shall be licensed and insured.

G. The contractor shall be a factory authorized installation contractor (not "box sales") for all major system components (mixing console, speakers, amplifiers, signal processors, wireless systems, video projector, video matrix, cameras).

H. The contractor shall demonstrate to the satisfaction of the owner, through exhibits presented with his bid, that the sound contractor has a history to indicate the following:

1. Statement of company history. Include a breakdown by percentage of gross sales of all business activities the contractor is involved in for each of the last 5 years (e.g. system installation = 30%, box sales = 40%, equipment rentals = 20%, design and other professional services = 10%, etc).
2. Previous experience: Provide a list of four installations of the type and size contemplated by these specifications, currently in use as originally installed, in which a theatre / system consultant was involved, completed in the last 5 years and the following information regarding each installations:

    a. Name and address of each installation facility.
    b. Facility owner and telephone number.
    c. Name, address, and phone number of a person regularly employed by the owner, who is familiar with the operation of the systems and who has no connection or business connections with the contractor except as the contractor shall fully disclose
    d. Name, address, and phone number of the theatre / system consultant, along with the names of all the consultant's personal directly involved.
    e. System shop drawing - These will be returned if the contractor provides a call tag or return postage.
    f. Owner's manual drawing - These will be returned if the contractor provides a call tag or return postage.
    g. System as-built drawings drawing - These will be returned if the contractor provides a call tag or return postage.
    h. List of contractors personal involved with each persons responsibility on the project.
    i. Name, address and phone number of the general contractor, along with the names of all key GC personal directly involved.
    j. Name address and phone number of the electrical contractor, along with the names of all key EC personal directly involved.

3. Statement of current company capabilities and ownership.
4. Key Personnel: For each of the key personnel listed below; Include individual's name, title, and number of continuous years of service to contractor. Include a biography detailing industry experience, and role within organization (include only full-time/regular staff employees; not independent contractor, freelance, or temporary positions). List all industry certifications held, training courses attended, and continuing education credits, including dates of attendance. List recently completed projects, scope of project, and completion dates.

    a. Project Manager
    b. Senior Technician
    c. Service Manager

5. Other Department Staff – Include size of staff, and experience of each staff member.
6. Replacement and Spare Parts Inventory – Provide detailed list of primary replacement parts, components, and spares typically held in inventory.
7. Test Equipment and Physical Plant – Include an inventory of all test facility equipment owned and used regularly by the Service Department. Provide description of physical plant and space utilization.
8. Copies of all business and professional licenses and insurance certificates.

I. Without prejudice to other AV system sub-contractor desiring to be qualified, the following are considered qualified:

BCI Integrated Solutions
9419 Corporate Lake Dr.
Tampa, FL 33634
(813) 249-1020
Michael Fraioli

Peerson Audio, Inc.
1235 Park Lane South
Jupiter, Fl 33458.
(561) 741-8720
Clint Smith

Pro Sound
1375 N.E. 123rd Street
Miami, FL 33161
(305) 891-1000
Rick Scharmann

PART 2 - PRODUCTS

2.1 ALTERNATES

A. In no case will equipment or materials of lesser design or workmanship be acceptable. Only those materials and equipment listed in this specification will be considered unless prior approval is sought and received.

B. Substitutions: When a specific piece of equipment specified has been discontinued and/or replaced by a new model, substitution will be acceptable when:

1. Submission of complete data on the new model or substitute has been approved by the owner prior to equipment acquisition. Data shall include list pricing for specified and replacement equipment.
2. Substitute equipment or the replacement of rejected equipment shall be at the sole expense of the sound contractor.
3. After submittals have been approved there will be no cost to the owner for any required replacement equipment under any circumstances.

C. Should the contractor proposed and receive approval for the use of alternative wire and cable which requires additional conduit, the contractor will be solely responsible for the installation of such conduit.

2.2 GENERAL REQUIREMENTS

A. The major items of equipment shall be furnished in the quantity as on the drawings and the quantity as specified herein.

B. When documents list several acceptable manufacturers for a particular item of equipment, more than one of which is to be provided, the sound contractor shall supply all of those similar items of equipment from one manufacturer.

C. The sound contractor will provide necessary millwork, enclosures, baffles, grille cloth, wall plates, and any other item furnished under this contract not specifically noted otherwise herein or on the drawings in a manner and color as approved by the owner.

D. Any item of equipment or hardware that may not be specifically shown on the drawings or specified herein but required for proper sound system operation or installation shall be furnished and installed and be of the highest quality available.

E. The performance of all equipment must meet the most recently published manufacture’s data sheet

F. All equipment, where applicable standards have been established, shall be listed by a nationally recognized testing labs and must bear a compliance label with delivered to the job.

G. If so required by the local authority having jurisdiction, anything not arriving at the job bearing a compliance label from a nationally recognized testing lab shall be field inspected and labeled by such a testing lab. This extends to all field assemblies.

H. Provide all power supplies / POE power injectors required.

I. Provide all software, drivers and related items.

1. Shure Wireless Work Bench
2. SymNet
3. Yamaha StageMix app
4. Yamaha QL Editor
5. Dante controller software
6. Amp control software
7. All others as required

J. Provide all equipment in the types and quantities shown on the contract drawings.

K. Provide the follow equipment in the quantities shown on the contract drawings:

1. MIX-1: 72 input capable front of house mixing console, 8 omni in, 8 omni out and 3 mini YGDAI card slots. Include 18" gooseneck lamps. Provide Yamaha Studio manager and Stagemix software.
   Yamaha CL5
   1 - console cover
   1 -Yamaha MY8-ADDA96 8 in, 8 out analog mini YGDAI card
   1- Yamaha MY8-AE96S 8 in, 8 out AES YGDAI card
   3- LA1L lamps

2. CAB-2: Console YGDAI breakout cable for AES digital card. DB25 connector to XLR wired with digital cable 10’ long with 3’ tails.
   Whirlwind or ProCo custom

3. RIO-1: 32 inout/ 16 output Dante enabled digital I/O
   1 – Yamaha Rio3224-D

4. RIO-2: 16 inout/ 8 output Dante enabled digital I/O
   1 – Yamaha Rio1608-D

5. RIO-3: 8 output Dante enabled digital I/O
   1 – Yamaha Ro8-D

6. CDR-1: Compact disk recorder / player. All inputs and outputs shall be balanced. Include a wired remote.
   Tascam CD-RW901MKII

7. SSR-1: Compact disk, USB, CF and SD/SDHC recorder/ player. All outputs shall be balanced. Include a wired remote.
   Tascam SS-CDR200

8. AAP-1: Apple TV w/ Siri remote, 64 GB.
   Apple TV, 64 GB

9. WIR-1: UHF Digital 4 channel Wireless microphone system with Dante audio over Ethernet. Include Shure Workbench control software.
   3@ Shure ULXD4Q receivers
   12@ Shure ULXD2/B58 handheld transmitters
   12@ Shure ULXD1 bodypack transmitters
   12@ Countryman E6 earset mics w/TA4F connectors
   (8-Tan, 4-Black)

10. WIR-2: Antennas Distribution System.
    Shure UA845

11. WIR-3: Active Wideband Antennas. Include (1) pair active antennas. Provide rigid mounts for the antennas, permanently installed in the correct orientation.
    Shure UA870WB

12. PRO-1: Programmable digital signal processor. 8 channel mic/line inputs on 2 analog input cards and 8 line outputs on 2 analog output cards all on Euroblock connections. Dante enabled.
    Symetrix SymNet Edge

13. AMP-1: 2000 watt per channel 4 channel amp into 4 ohms with onboard signal processing.
    QSC PLD4.5

14. AMP-2: 400 watt per channel stereo into 8 ohms with onboard signal processing.
    QSC GDX4

15. NET-1: 24 port 10/100/1000 Gigabit Ethernet switch for Dante' audio network.
    Summit X440-G2-24p-10GE4 switch
    Summit RPS-500p redundant power supply

16. NET-2: 24 port 10/100/1000 Gigabit Ethernet switch for sound network running remote monitoring software.
    Summit X440-G2-24p-10GE4 switch
    Summit RPS-500p redundant power supply

17. NET-3: Wireless 4 Port N gigabit network switch.
    Cisco RV180W

18. NET-4: Network Patchbay
    Belden CAT6+ patch panel, 24 port 1U preloaded

19. USB Hub
    HooToo HT-UH010 7-port hub

20. SPK-1: Main Left/Right full range line array speakers, 140 degree horizontal coverage. Include all necessary hardware rigging components, grids, bumpers, rigging tubes, hinge bars, quick release pins, shackles, etc., required for speaker suspension and aiming.
    QSC WL3082

21. SPK-2: Left/Right subwoofer speakers. Include all necessary hardware rigging components; rigging tubes, hinge bars, quick release pins, etc., required for speaker suspension.
    QSC WL212-sw

22. CAB-1: Custom Neutrik NL8 to NL4 breakout for portable front fill speakers, length dependent on site conditions.
    Whirlwind or ProCo custom

23. DWR-3: 3U rack drawer.
    Middle Atlantic Products D3

24. LGT-3: Rack mount light module
    Littlite RL-10-D

25. RACK RS-2: Floor Mounted 24U 19" equipment rack. Roll out rotating. Provide locking front door, top and side panels. Provide rear rails. Provide integrated top fans.
    Middle Atlantic Products model WR-24-32.

26. RACK RS-3: Undercount top mount 8U 19" equipment rack.
    Middle Atlantic Products model EWR-8-22

27. RACK RV-1: Desktop 18U 19" equipment rack.
    Middle Atlantic Products model DTRK-1818

28. Portable Rack: 8space ATA style rack case, front and rear rails required.
    R&R Cases TRB series case

29. Video Projector:
    Christie Digital HD 14K-M 1080 HD
    Optional inputs cards as required
    Spare lamp
    Zoom lens sized for screen

30. Projection Screen: Hang from rigging system in the same place as the existing.
    Draper StageScreen Portable
    TecVision XT1100X surface
    16:9 aspect ratio
    248" diagional
    Black frame

31. CAM-1: High Def remote PTZ camera system
    Vaddio ClearVIEW HD-20SE QCCU System
    ClearVIEW HD-20SE PTZ camera

Universal quick connect CCU for CAT-5 for HD-20SE
Power supply
EZIM CCU Slot Card
Wall mount and mounting hardware
Mounting and hardware, breakout cable, connectors

32. CCU-1: Camera Control Unit
    Vaddio Production VIEW Precision Camera Controller

33. MON-1: Rack mount camera preview monitor
    Marshall Electronics V-MD72-HDSDIx2

34. MON-2: 65" LCD HD TV, 1080P, 60Hz.with QAM tuner
    Sharp Aquos or equal. Include articulating arm type wall mount bracket

35. SPT-1: RF Splitter 1 in, 4 out
    Blonder Tongue digital ready bi directional

36. TAP-1: RF video tap. Single gang wall plate with internal tap-off. Tap-off value to be determined by final RF system engineering, with a measured value between +5 to +10 dBmV at tap-off output.
    Blonder Tongue Versa Tap Series V-3889

37. TERM-1: 75 ohm terminator. PROVIDE AS REQUIRED – NOT SHOWN ON ONE LINE DRAWING
    Blonder Tongue PBT (VersaTap style)

38. All specialty back boxes listed on the electrical drawings.
    CMBP = Whirlwind black powder coated surface mount 12x12x4 backbox with Whirlwind WFS wall frame or Wireworks Guardian Panel Mounts + custom panel
    SCL / SCR / SCC = Whirlwind black powder coated surface mount 8x8x4 backbox with Whirlwind WFS wall frame or Wireworks Guardian Panel Mounts + custom panel

L. Panels: All panels are made of 1/8" thick Aluminum plate, brushed anodized black and sealed. All controls and connectors will have engraved labels. The minimum allowable label size is 1/8"s. All labels will be back filled with white paint. All connectors are mounted with machine hardware. All panel layouts and labels must be submitted and approved prior to construction, the panels shown in the drawings are typical only.

M. Custom panels: See drawings for required components.

N. Connectors:

1. All XLR cable connectors are Neutrik "XX" series, black bodies, and silver contacts unless otherwise indicated.
2. All XLR chassis connectors are Neutrik "DLX" series, black bodies and silver contacts unless otherwise indicated.

3. 6 pin XLR connectors for intercom must be “Switchcraft compatible”
4. All RJ45 plugs and jacks are Neutrik EtherCON CAT6A
5. All plugs and jacks shall be color coded sealing covers / rings by function.
6. All speaker cable connectors are Neutrik SpeakON series “FC”.
7. All speaker chassis connectors are Neutrik SpeakON NL4MP-ST.
8. All RCA chassis connectors are Neutrik D-shaped housing, black chrome bodies, solder tabs with white / red isolation washers for stereo left right.
9. All BNC chassis conenctors are Neutrik NBB75DFIB-P (isolated, feed through, D-shape, black housing, protruding version). Provide color coded (by function) rubber sealing

O. System Wire: All wiring installed in a conduit which is located in the slab must be rated for wet locations.

1. 10 A.W.G. for speaker lines enclosed in conduit, racks, or speaker enclosures. Use for all speaker runs except 70 volt systems. 10 A.W.G. THWN.
2. 16 A.W.G. twisted pair for RMS control system and for 70 volt audio wire for use in conduit, racks, or speaker enclosures. West Penn Wire AQC 225
3. 22 A.W.G. shield twisted pair for all mic, line or D.C. control lines enclosed in conduit or racks. Belden 5500F1 or West Penn Wire AQC 291
4. 18 A.W.G. Shielded twisted pair with 18 A.W.G. drain wire for all intercom lines enclosed in conduit or racks. Belden 5300F1 or West Penn Wire AQC 293. An additional 12 A.W.G. THWN will be required if speaker stations are used. This additional wire shall be used in parallel with the drain wire of the shielded twisted pair cable.
5. 24 A.W.G. shield twisted pair for all AES/EBU digital audio lines enclosed in conduit or racks. West Penn DA2401.
6. Coax Antenna Lines. As called for by equipment manufacture.
7. UTP Category 5E network cable. Four twisted pair of 24 A.W.G. wire with an outer diameter suitable for termination by standard type RJ-45 connectors. Use for all Category 5 cable run within a conduit or raceway. Belden 7934A.
8. STP: Category 5E network cable. Shielded four twisted pair of 24 A.W.G. wire with an outer diameter suitable for termination by standard type RJ-45 connectors. Use for all Category 5 cable run within a conduit or raceway when STP cable is required. Belden 7937A.
9. Category 5 service cable. Use for all Category 5 cable NOT run within a conduit or raceway. TMB Associates ProPlex Ethernet cable.
10. RG6 coax for all video cable (including HD-SDI) West Penn Wire AQC806
11. RG 11 coax for wireless receiver antennas Liberty RG11-DB-CCTV
12. RG59 coax as required West Penn Wire AQC 815
13. Crestron cable as called for by manufacture. Wet location rated as necessary by installation location.

P. Internal Rack Power Wiring:

1. Provide all power wiring, devices, hardware, receptacles, etc. as required to power wall equipment within each rack.
2. Provide a junction box located at the top of the rack for connection to circuiting by the electrical contractor.

3. Provide portable power cables for console, any portable racks, and all portable equipment.

Q. Power Sequencing: The existing sound system includes a power sequencing system. This system shall be extended and expanded to include all the new audio and video equipment using the following equipment types are required.

1. SEQ-1: Power sequencer
   Lowell Manufacturing SCS-8R

2. SEQ-2: Switched 20 amp power outlet box
   Lowell Manufacturing RPC1-20A-MC

3. SEQ-3: Switched 30 amp power outlet box
   Lowell manufacturing RPC1-30A-MC

4. SEQ-4: Five duplex power strip; 4 duplex receptacles switched, one duplex receptacle un-switched.
   Lowell Manufacturing RCP-5-MC

R. Portable Equipment: Provide the following portable equipment that is not shown on the contract drawings:

1. Microphones. Provide a mic clip for each mic.
   4 @ Shure KSM-32
   2 @ AKG C414 XLS
   1 @ Countryman ISOMAX 4RF (M4HP5RF18EB) + AT8416 shockmount
   5 @ Countryman ISOMAX 2-H hanging mics
   4 @ Audio Technica 4040.
   4 @ Audio Technica 4041.
   1 @ Rode NT4 stereo mic
   3 @ Radial Engineering ProDI Direct Box.
   1 @ Radial Engineering USB-Pro stereo USB laptop DI.
   1 @ Radial Engineering ProD2 stereo direct box
   1 @ Shure VP-88
   4 @ Audix MicroBoom System, 50” boom assembly, cardioid mic element

2. Microphone Stands & Accessories.
   15 @ K&M KM210/91 black, mic stand w/boom
   5 @ K&M KM21140 black boom arm
   6 @ Atlas Sound MS12CE
   4 @ Atlas Sound MS20E
   4 @ Atlas Sound DMS7E
   4 @ K&M 21021 overhead boom stand

3. Mic Cables: Whirlwind MKQ series in black.
   10 @ 3 feet
   15 @ 10 feet
   15 @ 20 feet.

15 @ 30 feet.
6 @ 50 feet.
3 @ 100 feet.

4. Speaker Cables.
   8 @ Whirlwind NL-4-50
   8 @ Whirlwind NL-4-25

5. Front Fill portable speakers with NL4. connectors
   4 @ QSC E10
   4 @ QSC E10 Yoke Mount
   4 @ QC M8 Eyebolt Kit-A
   4 @ USS TS-99BLStands
   2 @ 25’ speaker cables
   2 @ 40’ speaker cables

6. Patch Cables and Adapters
   8 @ Neutrik NL4MM.
   2 @ Switchcraft 389.
   2 @ Switchcraft 390
   2 @ Switchcraft 387A
   2 @ Switchcraft 386A
   2 @ Switchcraft 384A
   2 @ Switchcraft 383A
   4 @ RCA female to XLR male
   4 @ RCA female to XLR female
   4 @ ¼” TRS patchcable. 15’ long

7. Video adapters & cables:
   4 @ HDMI (standard size) to mini HDMI 20’ long
   1 @ Liberty AV Solutions DL-AR360
   1 @ Liberty AV Solutions DL-AR392
   1 @ Liberty AV Solutions DL-AR
   2 @ Extron 15HD GCF
   2 @ Extron 15HD GCM
   10 @ Extron BNCF-BNCF
   10 @ Extron BNCM-BNCF T
   4 @ Extron RCAF-BNCM
   1 @ ExtronVGA-A-M-M-MD/6
   1 @ Extron VGA-A-M-M-MD/35
   1 @ Extron VGA-A-M-F-MD/12
   2 @ Extron SYM BNCF/3
   2 @ Extron SYM BNCM/3
   2 @ Extron SYF BNCF/3
   2 @ Extron SYF BNCM/3
   4 @ Extron RG6-5 BNC/6
   12 @ Extron RG6 BNC/6
   2 @ Extron HDMI PRO/6
   2 @ Extron DISPLAYPORT-M-M/6

2 @ Extron HDMI DVI-D/6
2 @ Extron HDTV RCA/6
2 @ Extron AV RCA/6
2 @ Extron MHR-2-SVMF/20

8. Monitor and Portable Speakers.
   8 @ QSC K12 active monitors w/ stand sockets
   4 @ QSC K12 Yoke Mount Kit
   4 @ USS TS-99BLStands
   4 @ QSC M10 Kit-C
   8 @ Power cables 25' long.
   8 @ Signal cables 25' long

9. Apple I-Pad Air, 64 GB, running the following app software: ShurePlus Channels for wireless, Yamaha StageMix,, Symetrix SymNet,.
   1 @ Apple I-Pad Air 2, 64 GB

10. Headphones.
    1 @ Sony MDR-7506

PART 3 - EXECUTION

3.1 Submittals:

A. The sound contractor, within thirty days of the bid award and prior to beginning work, shall submit all of the following at the same time to the owner for approval:

B. Drawings: Complete shop drawings details and complete on all phases of installation including a minimum of:

1. Device location plan drawing(s)
2. System wiring diagram
   a. Make and model of all equipment
   b. All connection points on each piece of equipment
   c. All wire types
   d. All connector types
   e. All cable labels
   f. Show Dante ID and other setup info
   g. Show wireless frequency coordination
   h. Show IP address management
   i. Show RF levels on TV distribution system
   j. Show EDID information and management
3. Rack elevations
4. Details of all connection plates and custom panels
5. Rack and equipment labels
6. Mounting and rigging details for all equipment

7. Drawing showing the projector, the screen, the throw distance and all lens calculations in both plan and section

C. Mountings and Attachments: Prior to equipment installation, the sound contractor will submit to the owner detailed scale drawings of all proposed enclosures and speaker mounting or rigging weighing more than ten pounds. All mountings and attachments must be approved and stamped by an engineer licensed in Florida prior to submittal and the beginning of the installation.

D. Materials and Equipment: The sound contractor will submit to the owner a complete list of all materials and equipment to be furnished including catalog cuts for all equipment items. These must contain full information on dimensions, construction, applications, etc. to permit proper evaluation. In addition, they must be properly identified as to their intended use and any options or variations must be clearly marked. The contractor is to confirm equipment availability at time of submittal. It is assumed that all equipment submitted on is and will be available.

E. Test Equipment: The sound contractor will submit to the owner a list of test equipment to be used to test, equalize and demonstrate the final installation.

F. Schedule: Prior to the commencement of the installation work, the sound contractor shall submit for approval, to the owner, an outline of a proposed commencement and completion schedule and project requirements.

G. Variations: Any deviation from what is specified here and or shown on the system drawings must be "starred" and noted in ¼" high letters on the shop drawings and highlighted in the submittal data.

H. Approval of shop drawings and materials does not relieve the Contractor of any responsibilities.

3.2 COORDINATION WITH OTHER WORK:

A. The sound contractor shall specifically coordinate the placement and sizes of conduit relating to this work and shall specifically review and approve the conduit rough-in in time to advise all parties of needed changes, omissions, etc. The sound contractor shall report this successful coordination in writing to the owner's representative. Failing this, the following will be enforced:

1. The sound contractor shall provide and install any additional conduits required for the hookup, proper location and proper isolation of the various cable / signal types and equipment in the systems. The sound contractor must coordinate his conduit installation with those installed by the electrical contractor. All conduits shall be sized to their intended fill plus fifty percent.
2. The contractor shall at all times coordinate his work with the other trades to ensure smooth progress of work and satisfactory final results.

3.3 INSTALLATION:

A. Personnel: A single, competent, technically qualified foreman will oversee the entire job from start to finish. This foreman must:

1. Be present on the job site during all phases of installation and testing.
2. Be authorized to receive instructions from the Architects or their representatives.

B. Only experienced sound installers shall be employed on this job.

C. The contractor shall keep the job adequately staffed at all times.

D. All job documents pertaining to the installation of this system will be accessible to all workers throughout the installation process.

E. Installation practices shall be in accordance with OSHA Safety and Health Standards and all local codes.

F. The sound contractor shall not commence the installation of equipment and devices, other than the pulling of cable, until all areas are clean, painted and finished to a point that they are completely dust, dirt, lint, fiber and airborne particle free. The air conditioning system must be operating to its design level and be able to keep all areas with sound equipment stable.

G. General Workmanship:

1. The installation of all work shall be neat.
2. All boxes, equipment, etc shall be plumb and square.
3. The installation shall conform to the plans and spec.
4. Equipment racks shall be assembled, wired and tested in the contractors shop prior to delivery to the job site.

H. Wiring:

1. If enclosed in conduit run only similar signal levels in a single conduit.
2. All pulls to be made be hand, care will be taken not to nick cable jackets, and any nicked or damaged cable will be replaced.
3. A pull string will be left in all conduits after wire is installed.
4. NO SPLICES WHATSOEVER IN CONDUIT!
5. If not enclosed in conduit neatly group cables into bundles and secure out of harms way.
6. Separate cable grouping by signal level. Mic and A.C. power shall be not less that 18" all other levels by not less than 6".
7. Include spare cables with all field runs. Quantity to be 10% or 1 which ever is greater unless otherwise specified.

I. Terminations:

1. All cables shall be permanently labeled at every termination.
2. Service loops of not less than 6" will be present at all terminations to equipment.

3. Where terminal blocks or barrier strips are used only uninsulated fork terminals with a brazed seam, sized according to wire and stud sizes, crimped with notch across from the seam will be approved.
4. Use barrier strips on equipment where provided.
5. Where shielded cable is in use leave shield drain wire the same length as the circuit conductor(s), sleeve shield drain wire in green pvc tubing. Cap where the cable jacket was removed with heat shrink. Where the shield drain wire is to be lifted follow the above and fold back over cable jacket. Then cap end with heatshrink. Do not use a single piece of heatshrink for this use two smaller ones.
6. All soldering will be clean and neat and not exhibit evidence of a " cold" joint, were necessary heat sinks will be used. Use only rosin core "electronic type " solder.
7. Wire nuts will be allowed only for field connections of 70 volt speaker lines and priority attenuation control lines, and then only when the proper size is used.

J. Polarity:

1. The " high " side will be connected to pin 2 on XLR connectors, to tip on 1/4" connectors and to the pin on phono connectors.
2. The " low " side will be connected to pin 3 on XLR connectors, to ring on 1/4" balanced connectors and to case on phono connectors.
3. Microphones will be wired so that an acoustic compression at the diaphragm produces a positive going signal on pin 2 with respect to pin 3.
4. Speakers will be wired so that when a positive going signal is applied to the + or red terminal an acoustic compression is produced.
5. The system will be wired to maintain absolute polarity though all system components to insure that a positive signal on pin 2 or tip produces a positive signal at the + or red speaker terminal.

K. Shield Grounding:

1. Do not tie pin 1 to case of XLR connectors anywhere.
2. Microphone shield drain wires will be grounded only at mixer inputs. Where microphone lines and mixer inputs run though a patchbay, connect shield drain wire to sleeve of patchbay connector and only to this point.
3. Line level lines will have shield drain wire lifted from ground at outputs and connected to ground at inputs.
4. The intent here is to not make ground loops, should any situation arise which would form a ground loop, please inform the owner for direction.

L. Mountings and Attachments:

1. Any and all structural, mounting, or rigging details are shown on the drawings for concept only.
2. The detail drawings and calculations of all proposed mounting or rigging of any equipment weighing more than ten pounds will be approved and stamped by a P.E. who is licensed in Florida.
3. Each cluster element is to be individually adjustable.
4. Provide for an adjustment range of +/- 10 degrees from the information shown in the contract documents.

5. In the absence of specific direction otherwise, standard rigging practices shall be followed.

M. Labels:

1. Cable Labels: All cables shall be labeled at all termination points. The label shall not be hand written. Clear heat shrink shall cover the label.
2. Equipment Labels. All equipment shall be labeled front and rear. Labels shall functionally describe the use of each piece of equipment. On equipment having multiple channels, each channel shall be labeled. Additionally the equipment label will call out equipment designation which will correspond with the designations shown on the approved contractor's one-line diagram. Labels shall be engraved lanacoid, white letters on black background, with a minimum letter size of 3/16". Approved patchbay labeling may vary from this.

N. Power Sequencing. The system shall turn on and off, in proper order, on circuit at a time, when the power switch is pressed. The power light shall be solid on when all circuits are on , and shall flash during sequencing.

O. The system may not be used prior to checkout.

3.4 INSPECTION AND TESTING:

A. During the installation of the equipment the sound contractor shall arrange for access as necessary for inspection of equipment by the owner's and/or architect's representatives.

B. Provide a safe means of accessing all system components for all visits.

C. Equipment Pretesting: All racks are to be built and wired in contractors shop and tested prior to delivery to site. All other equipment is to be tested prior to delivery and installation. A written test report will be submitted to the owner.

D. Final Inspection:

1. The final inspection will confirm that the systems, as installed, meets the requirements of this spec, the contract documents, and the approved contractor's shop drawing and submittals.
2. The contractor will inform the owner in writing of the system's completion. The contractor will then request final inspection by the consultant, and carry out the necessary coordination. This coordination includes:
    a. Giving at least fourteen days notice to the consultant prior to the final inspection.
    b. Arranging for the contractor's and consultant's exclusive use of the space.
    c. Arranging for a HVAC technician to be available to turn the AC system on and off as required.
    d. Arranging for a lighting technician to be available to control the stage lighting as required.
    e. The contractor's job foreman and one additional worker familiar with the job will be present during all check out, testing and tuning.

3. Contractor will complete the following tasks prior to consultant's arrival:
    a. Unpack and assemble all portable equipment.
    b. Place all portable equipment in one location.
    c. If anything has been turned over to the owner have the signed Letters of Transmittal on site.
    d. Complete all required paperwork (pre-testing reports, letters indicating successful coordination of the installation, etc.).
    e. Remove all security covers.

4. Contractor will provide all necessary software, cables, and interfaces to facilitate the setting of computer, remote controlled, or DSP based equipment.
5. Contractor will either: 1) relocate all system equalizers to a tech area in the house for the duration of system tuning or 2) for remotely controllable devices, locate the control position in a tech area in the house for the duration of system testing. In ether case a tech area in the house will be required with a minimum of a 4' x 6' folding table, intercom communications to the rack and console locations, and AC power.
6. Contractor will provide the following test equipment for use during tuning and acceptance testing:
    a. Sennheiser ZP-3 impedance bridge.
    b. Low distortion sine wave oscillator with variable sweep (start frequency, stop frequency, and sweep rate).
    c. Distortion meter.
    d. Oscilloscope dual channel, 100Mhz, .001v/div vertical amp.
    e. Noise generator that will provide pink, white, or bandwidth limited pink noise.
    f. 1/3 octave real time audio spectrum analyzer.
    g. Precision sound level meter with filter set.
    h. Polarity checker.
    i. Precision true R.M.S. reading A.C. millivolt meter with dB scale.
    j. Playback and recording media for testing all supplied source equipment.

7. Contractor will provide safe means to access all system components during the entire commissioning process.
8. Contractor shall provide personal and equipment to make adjustments to the speaker cluster(s), as well as to correct problems, for the entire inspection and testing period.

E. The Theatre Consultant or his representative will conduct all final system tests and equalization adjustments in order to determine final acceptance.

F. In no event shall the theatrical sound systems installation be submitted for final approval or acceptance until any and all elements of the facility that may have a bearing on the system performance, including but not limited to doors, windows, HVAC, carpeting, furniture, wall coverings, interior design elements, lighting and lighting control systems have been completed and are operable. All elements that may effect sound systems operation or performance shall be "on" and operating during adjustments. The sound contractor will be responsible for coordinating the requirements of this paragraph with other work on the project.

G. Should more than two trips be required to complete the systems testing, systems tuning, and clearing punch list items, the contractor will be charged for any additional visits. These charges will include:

1. A minimum of two people at a rate of $1250 per day per person.
2. Travel expense to and from the job site.
3. These charges will be paid to the consultant, in advance of the consultant's arrival on the job site.

3.5 MANUALS:

A. Prepare four identical copies of owner's manuals. The owner is to receive two, the consultant receives one and the contractor retains one. Before distribution of manuals submit one copy to consultant for approval. Each manual is to contain the following:

1. System one line drawing including all labeling and changes (" as builts ").
2. Owners manual for each piece of equipment.
3. Schematic diagram for each piece of equipment.
4. Contractors service phone number in a conspicuous place.
5. All test reports.

B. Provide all information as PDF files on CDs to be included with each manual.

C. Load all manual data as PDF files onto the iPad.

3.6 INSTRUCTION: The following is to be carried out within two months of system acceptance:

A. Provide a total of 12 hours of instruction, on a maximum of two occasions. This is to be time on site, travel time is not to be included within the allotted time.

B. Provide operational assistance for the first usage of the system. This is to be on the owners time schedule but, not to exceed 8 hours.

3.7 WARRANTY

A. Contractor will warrant the system to be free from defects in materials and workmanship for a period of one year from the date of acceptance, or first beneficial use, which ever comes first.

B. Acts of god and owner abuse, or neglect are not covered.

C. During the warranty period the contractor will respond to and correct any call for service within one day of the call. Loaner equipment will be provided if necessary.

END OF SECTION 27 41 18

SECTION 27 41 18 - SOUND & VIDEO SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Drawings and general provisions of Contract, including General and Supplementary Conditions, Special Conditions and Division-1 Specification sections, apply to work specified in this section.

1.2 RELATED REQUIREMENTS

A. Basic Electrical Requirements

B. Raceways and Conduits

C. Wires and Cables

D. Outlet Boxes

E. Grounding

1.3 SCOPE OF WORK

A. This section requires the fabrication, furnishing, delivery, installation, testing of the sound and video systems and equalization of the sound system as indicated on the drawings and specified herein.

B. The sound contractor shall provide all materials, equipment, procedures, labor, tools, scaffolds, and incidentals necessary to the scope of work.

C. It is the intention of these specifications that the sound contractor provides a professional quality, complete and properly operating system in every respect and detail.

D. The installation contractor shall examine the plans in detail to familiarize him with the scope of the work.

E. The installation contractor shall assume full responsibility for a complete operating installation, in the required location, in accordance with the contract documents.

F. The contractor shall provide all necessary specialty equipment for the complete sound and video system installation as specified herein.

G. The contractor shall provide all necessary specialty equipment for the complete sound and video system as shown on the drawings.

H. Any errors, omissions, or ambiguities found in these documents do not relieve the Contractor of the responsibility of providing all items necessary for complete, safe, fully functional systems. Any errors, omissions, or ambiguities shall be brought to the attention of the Architect/Engineer of Record, Owner, and/or Theater Consultant for clarification.

I. Anything shown on the drawings or included in this specification shall be considered as part of both documents.

J. The drawings and specification when taken together communicate the design intent of the system. The contractor is responsible for all engineering, procedures, drawings, equipment, material, means and methods, and contract administration necessary to fully and completely provide and install the system contemplated by these documents.

K. No changes will be allowed for any issue that could have or should have been known at the time of bid. This includes but is not limited to discontinued products.

L. The contractor is solely responsible for meeting all codes and regulations and for the complete code compliance of the finished system.

M. The contractor shall employ the most current best standard practices for all aspects of work.

N. The contractor acknowledges that the consultants' opinion is final.

O. DSP programming, control system programming, system tuning and complete configuration of all components.

P. Mounting and attachments of all speakers, video projectors, projection screens and equipment.

Q. Coordinate and register all wireless microphone frequencies in the "White Space" database.

R. Coordinate fully with the electrical contractor.

S. This contractor is responsible to ensure that the system and all of the system components, fixtures, equipment, devices, wire, terminations, field assemblies (including custom assemblies) etc. pass all required inspections by the local authority having jurisdiction.

T. If so required by the local authority having jurisdiction, anything not arriving at the job bearing a compliance label from a nationally recognized testing lab shall be field inspected and labeled by such a testing lab. This extends to all field assemblies.

1.4 WORK INCLUDED IN THE AUDITORIUM

A. This is a partial renovation and system upgrade. Existing system components shall remain unless specified otherwise. The portions of the existing system that are to remain shall be interfaced wherever necessary with the renovated and upgraded system.

B. Renovations / and upgrades:

1. Upgrade the speaker system.
    a. Provide new line array speaker system, amplifiers and speaker processing
    b. Provide a portable front fill speaker system.
    c. The existing center speaker cluster shall be abandoned in place.
    d. The existing center speaker cluster amps and speaker processor shall be removed from the amp rack and turned over to the owner.

2. Provide a new digital mixing console and digital audio infrastructure.
3. Provide 12 channels of new wireless microphones.
    a. The existing wireless microphone equipment shall be removed from the playback rack and turned over to the owner.

4. Expand the stage monitor system
    a. Provide new self powered stage monitor speakers.
    b. Provide 8 audio tie line loops to feed the new monitor speakers.

5. Provide new playback source equipment
    a. The existing playback equipment shall be removed from the playback rack and turned over to the owner.

6. Provide a new front projection video projector.
7. Replace video screen with 16:9 front projection surface.
8. Provide a new video presentation system
    a. Computer receptacles backstage and in the control booth.
    b. Blu-Ray player in the control booth.
    c. Aux signal connection in the control booth,
    d. Touchscreen controller.

9. Provide a video show relay system
    a. A single remote controlled PTZ HD camera will be added.
    b. This camera will be distributed to TVs in the lobby, backstage and in backstage support areas
    c. Mount all TVs with tamper proof hardware.

10. Provide new wiring infrastructure
    a. Two new combination panels located backstage with lines running back to the control booth,

11. Provide a new portable equipment package.

C. All speaker cluster rigging.

1. Provide all required equipment and hardware to rig the new speakers.
2. The new clusters are to be hung from the existing building structure above the ceiling.

D. Control room Panduit wire duct: In the control booth, install below the counter a series of Panduit wire duct runs. These shall provide a cable path from and between the exsiting junction boxes, the existing playback rack, the existing sound rack, the new mixing console and the new under counter sound rack.

E. Power sequencing:

1. The existing sound system includes a power sequencing system. This system shall be extended and expanded to include all the new audio and video equipment.
2. This includes all internal rack power wiring.

F. Internal Rack Power Wiring:

1. Provide all power wiring, devices, hardware, receptacles, etc. as required to power wall equipment within each rack.
2. Provide a junction box located at the top of the rack for connection to circuiting by the electrical contractor.
3. Provide portable power cables for console, any portable racks, and all portable equipment.

G. Other requirements.

1. All RJ45 jacks and portable cables shall be color coded according to function.
2. All RJ45 portable cable shall be heavy duty service type – TMB ProPlex or equal.
3. All RJ45 jacks shall be Nuetrik EtherCON.
4. Supply all non standard back boxes shown on the electrical drawings.

1.5 WORK NOT INCLUDED

A. The following items of work, if required, are included in other sections and must be reviewed by the sound contractor for impact on this work:

1. Necessary conduit and raceway runs.
2. Stage flooring.
3. Theatrical stage lighting and electrical connections, electrical contractor supplied junction and back boxes, wiring to power sources, and wiring to all other electrically powered devices.
4. Front of house catwalks.

1.6 CONTRACTOR'S QUALIFICATIONS

A. Only qualified contractors shall be used.

B. The work of this section will be contracted to a single firm, referred to as the contractor.

C. The contractor shall be a systems contractor who regularly engages in the furnishing, installation and servicing of professional systems of similar nature, size, scope and complexity to that contemplated by this specification. The contractor shall have done so for a period of not less than five years preceding the bid date.

D. The contractor shall have maintained for the five years preceding the bid date, a suitably staffed and equipped service organization which has continuously offered maintenance and repair

services for systems of the nature, size, scope and complexity to that contemplated by this specification.

E. All liens must be satisfied for at least five years.

F. The contractor shall be licensed and insured.

G. The contractor shall be a factory authorized installation contractor (not "box sales") for all major system components (mixing console, speakers, amplifiers, signal processors, wireless systems, video projector, video matrix, cameras).

H. The contractor shall demonstrate to the satisfaction of the owner, through exhibits presented with his bid, that the sound contractor has a history to indicate the following:

1. Statement of company history. Include a breakdown by percentage of gross sales of all business activities the contractor is involved in for each of the last 5 years (e.g. system installation = 30%, box sales = 40%, equipment rentals = 20%, design and other professional services = 10%, etc).
2. Previous experience: Provide a list of four installations of the type and size contemplated by these specifications, currently in use as originally installed, in which a theatre / system consultant was involved, completed in the last 5 years and the following information regarding each installations:

    a. Name and address of each installation facility.
    b. Facility owner and telephone number.
    c. Name, address, and phone number of a person regularly employed by the owner, who is familiar with the operation of the systems and who has no connection or business connections with the contractor except as the contractor shall fully disclose
    d. Name, address, and phone number of the theatre / system consultant, along with the names of all the consultant's personal directly involved.
    e. System shop drawing - These will be returned if the contractor provides a call tag or return postage.
    f. Owner's manual drawing - These will be returned if the contractor provides a call tag or return postage.
    g. System as-built drawings drawing - These will be returned if the contractor provides a call tag or return postage.
    h. List of contractors personal involved with each persons responsibility on the project.
    i. Name, address and phone number of the general contractor, along with the names of all key GC personal directly involved.
    j. Name address and phone number of the electrical contractor, along with the names of all key EC personal directly involved.

3. Statement of current company capabilities and ownership.
4. Key Personnel: For each of the key personnel listed below; Include individual's name, title, and number of continuous years of service to contractor. Include a biography detailing industry experience, and role within organization (include only full-time/regular staff employees; not independent contractor, freelance, or temporary positions). List all

industry certifications held, training courses attended, and continuing education credits, including dates of attendance. List recently completed projects, scope of project, and completion dates.

a. Project Manager
b. Senior Technician
c. Service Manager

5. Other Department Staff – Include size of staff, and experience of each staff member.
6. Replacement and Spare Parts Inventory – Provide detailed list of primary replacement parts, components, and spares typically held in inventory.
7. Test Equipment and Physical Plant – Include an inventory of all test facility equipment owned and used regularly by the Service Department. Provide description of physical plant and space utilization.
8. Copies of all business and professional licenses and insurance certificates.

I. Without prejudice to other AV system sub-contractor desiring to be qualified, the following are considered qualified:

BCI Integrated Solutions
9419 Corporate Lake Dr.
Tampa, FL 33634
(813) 249-1020
Michael Fraioli

Peerson Audio, Inc.
1235 Park Lane South
Jupiter, Fl 33458.
(561) 741-8720
Clint Smith

Pro Sound
1375 N.E. 123rd Street
Miami, FL 33161
(305) 891-1000
Rick Scharmann

PART 2 - PRODUCTS

2.1 ALTERNATES

A. In no case will equipment or materials of lesser design or workmanship be acceptable. Only those materials and equipment listed in this specification will be considered unless prior approval is sought and received.

B. Substitutions: When a specific piece of equipment specified has been discontinued and/or replaced by a new model, substitution will be acceptable when:

1. Submission of complete data on the new model or substitute has been approved by the owner prior to equipment acquisition. Data shall include list pricing for specified and replacement equipment.
2. Substitute equipment or the replacement of rejected equipment shall be at the sole expense of the sound contractor.
3. After submittals have been approved there will be no cost to the owner for any required replacement equipment under any circumstances.

C. Should the contractor proposed and receive approval for the use of alternative wire and cable which requires additional conduit, the contractor will be solely responsible for the installation of such conduit.

2.2 GENERAL REQUIREMENTS

A. The major items of equipment shall be furnished in the quantity as on the drawings and the quantity as specified herein.

B. When documents list several acceptable manufacturers for a particular item of equipment, more than one of which is to be provided, the sound contractor shall supply all of those similar items of equipment from one manufacturer.

C. The sound contractor will provide necessary millwork, enclosures, baffles, grille cloth, wall plates, and any other item furnished under this contract not specifically noted otherwise herein or on the drawings in a manner and color as approved by the owner.

D. Any item of equipment or hardware that may not be specifically shown on the drawings or specified herein but required for proper sound system operation or installation shall be furnished and installed and be of the highest quality available.

E. The performance of all equipment must meet the most recently published manufacture's data sheet

F. All equipment, where applicable standards have been established, shall be listed by a nationally recognized testing labs and must bear a compliance label with delivered to the job.

G. If so required by the local authority having jurisdiction, anything not arriving at the job bearing a compliance label from a nationally recognized testing lab shall be field inspected and labeled by such a testing lab. This extends to all field assemblies.

H. Provide all power supplies / POE power injectors required.

I. Provide all software, drivers and related items.

1. Shure Wireless Work Bench
2. SymNet
3. Yamaha StageMix app
4. Yamaha QL Editor
5. Dante controller software

6. Amp control software
7. All others as required

J. Provide all equipment in the types and quantities shown on the contract drawings.

K. Provide the follow equipment in the quantities shown on the contract drawings:

1. MIX-1: 72 input capable front of house mixing console, 8 omni in, 8 omni out and 3 mini YGDAI card slots. Include 18" gooseneck lamps. Provide Yamaha Studio manager and Stagemix software.
   Yamaha CL5
   1 - console cover
   1 -Yamaha MY8-ADDA96 8 in, 8 out analog mini YGDAI card
   1- Yamaha MY8-AE96S 8 in, 8 out AES YGDAI card
   3- LA1L lamps

2. CAB-2: Console YGDAI breakout cable for AES digital card. DB25 connector to XLR wired with digital cable 10’ long with 3’ tails.
   Whirlwind or ProCo custom

3. RIO-1: 32 inout/ 16 output Dante enabled digital I/O
   1 – Yamaha Rio3224-D

4. RIO-2: 16 inout/ 8 output Dante enabled digital I/O
   1 – Yamaha Rio1608-D

5. RIO-3: 8 output Dante enabled digital I/O
   1 – Yamaha Ro8-D

6. CDR-1: Compact disk recorder / player. All inputs and outputs shall be balanced. Include a wired remote.
   Tascam CD-RW901MKII

7. SSR-1: Compact disk, USB, CF and SD/SDHC recorder/ player. All outputs shall be balanced. Include a wired remote.
   Tascam SS-CDR200

8. AAP-1: Apple TV w/ Siri remote, 64 GB.
   Apple TV, 64 GB

9. WIR-1: UHF Digital 4 channel Wireless microphone system with Dante audio over Ethernet. Include Shure Workbench control software.
   3@ Shure ULXD4Q receivers
   12@ Shure ULXD2/B58 handheld transmitters
   12@ Shure ULXD1 bodypack transmitters
   12@ Countryman E6 earset mics w/TA4F connectors
   (8-Tan, 4-Black)

10. WIR-2: Antennas Distribution System.

Shure UA845

11. WIR-3: Active Wideband Antennas. Include (1) pair active antennas. Provide rigid mounts for the antennas, permanently installed in the correct orientation.
    Shure UA870WB

12. PRO-1: Programmable digital signal processor. 8 channel mic/line inputs on 2 analog input cards and 8 line outputs on 2 analog output cards all on Euroblock connections. Dante enabled.
    Symetrix SymNet Edge

13. PRO-2: Programmable digital signal processor. 12 channel mic/line inputs and 12 line outputs with additional analog output card, all on Euroblock connections. Dante enabled.
    Symetrix SymNet Radius 12X12 DSP

14. PRO-3: Programmable digital signal processor. 12 channel mic/line inputs and 12 line outputs with additional analog output card, all on Euroblock connections. Dante enabled.
    Symetrix SymNet Radius 12X12 DSP

15. AMP-1: 1000 watt per 4 channels into 4 ohms.
    Electro-Voice CPS 4.10

16. AMP-2: 1200 watt per channel stereo into 4 ohms.
    Electro-Voice CP4000S

17. AMP-3: 500 watt per channel, 4 channel amp into 4 ohms.
    Electro-Voice CPS 4.5

18. NET-1: 24 port 10/100/1000 Gigabit Ethernet switch for Dante' audio network.
    Summit X440-G2-24p-10GE4 switch
    Summit RPS-500p redundant power supply

19. NET-2: 24 port 10/100/1000 Gigabit Ethernet switch for sound network running remote monitoring software.
    Summit X440-G2-24p-10GE4 switch
    Summit RPS-500p redundant power supply

20. NET-3: Wireless 4 Port N gigabit network switch.
    Cisco RV180W

21. NET-4: Network Patchbay
    Belden CAT6+ patch panel, 24 port 1U preloaded

22. USB Hub
    HooToo HT-UH010 7-port hub

23. SPK-1: Main Left/Right full range line array speakers, 90 degree horizontal coverage. Include all necessary hardware rigging components, grids, bumpers, rigging tubes, hinge bars, quick release pins, shackles, etc., required for speaker suspension and aiming.

Electro-Voice XLCi907DVX-BLK

24. SPK-2: Left/Right subwoofer speakers. Include all necessary hardware rigging components, grids, bumpers, rigging tubes, hinge bars, quick release pins, shackles, etc., required for speaker suspension and aiming.
    Electro-Voice XLCi-215-FG

25. SPK-3: Left/Right delay speakers. Include all necessary hardware rigging components, grids, bumpers, rigging tubes, hinge bars, quick release pins, shackles, etc., required for speaker suspension and aiming.
    Electro-Voice EVF-1152S/96

26. CAB-1: Custom Neutrik NL8 to NL4 breakout for portable front fill speakers, length dependent on site conditions.
    Whirlwind or ProCo custom

27. DWR-3: 3U rack drawer.
    Middle Atlantic Products D3

28. LGT-3: Rack mount light module
    Littlite RL-10-D

29. RACK RS-2: Floor Mounted 24U 19" equipment rack. Roll out rotating. Provide locking front door, top and side panels. Provide rear rails. Provide integrated top fans.
    Middle Atlantic Products model WR-24-32.

30. RACK RS-3: Undercount top mount 8U 19" equipment rack.
    Middle Atlantic Products model EWR-8-22

31. Portable Rack: 8space ATA style rack case, front and rear rails required.
    R&R Cases TRB series case

32. Video Projector:
    Christie Digital HD 14K-M 1080 HD
    Optional inputs cards as required
    Spare lamp
    Zoom lens sized for screen

33. Projection Screen: Hang from rigging system in the same place as the existing.
    Draper StageScreen Portable
    TecVision XT1100X surface
    16:9 aspect ratio
    248" diagional
    Black frame

34. CAM-1: High Def remote PTZ camera system
    Vaddio ClearVIEW HD-20SE QCCU System
    ClearVIEW HD-20SE PTZ camera
    Universal quick connect CCU for CAT-5 for HD-20SE

Power supply
EZIM CCU Slot Card
Wall mount and mounting hardware
Mounting and hardware, breakout cable, connectors

35. CCU-1: Camera Control Unit
    Vaddio Production VIEW Precision Camera Controller

36. MON-1: Rack mount camera preview monitor
    Marshall Electronics V-MD72-HDSDIx2

37. MON-2: 65" LCD HD TV, 1080P, 60Hz.with QAM tuner
    Sharp Aquos or equal. Include articulating arm type wall mount bracket

38. SPT-1: RF Splitter 1 in, 4 out
    Blonder Tongue digital ready bi directional

39. TAP-1: RF video tap. Single gang wall plate with internal tap-off. Tap-off value to be determined by final RF system engineering, with a measured value between +5 to +10 dBmV at tap-off output.
    Blonder Tongue Versa Tap Series V-3889

40. TERM-1: 75 ohm terminator. PROVIDE AS REQUIRED – NOT SHOWN ON ONE LINE DRAWING
    Blonder Tongue PBT (VersaTap style)

41. All specialty back boxes listed on the electrical drawings.
    CMBP = Whirlwind black powder coated surface mount 12x12x4 backbox with Whirlwind WFS wall frame or Wireworks Guardian Panel Mounts + custom panel
    SCL / SCR / SCC = Whirlwind black powder coated surface mount 8x8x4 backbox with Whirlwind WFS wall frame or Wireworks Guardian Panel Mounts + custom panel

L. Panels: All panels are made of 1/8" thick Aluminum plate, brushed anodized black and sealed. All controls and connectors will have engraved labels. The minimum allowable label size is 1/8"s. All labels will be back filled with white paint. All connectors are mounted with machine hardware. All panel layouts and labels must be submitted and approved prior to construction, the panels shown in the drawings are typical only.

M. Custom panels: See drawings for required components.

N. Connectors:

1. All XLR cable connectors are Neutrik "XX" series, black bodies, and silver contacts unless otherwise indicated.
2. All XLR chassis connectors are Neutrik "DLX" series, black bodies and silver contacts unless otherwise indicated.
3. 6 pin XLR connectors for intercom must be "Switchcraft compatible"

4. All RJ45 plugs and jacks are Neutrik EtherCON CAT6A
5. All plugs and jacks shall be color coded sealing covers / rings by function.
6. All speaker cable connectors are Neutrik SpeakON series “FC”.
7. All speaker chassis connectors are Neutrik SpeakON NL4MP-ST.
8. All RCA chassis connectors are Neutrik D-shaped housing, black chrome bodies, solder tabs with white / red isolation washers for stereo left right.
9. All BNC chassis conenctors are Neutrik NBB75DFIB-P (isolated, feed through, D-shape, black housing, protruding version). Provide color coded (by function) rubber sealing

O. System Wire: All wiring installed in a conduit which is located in the slab must be rated for wet locations.

1. 10 A.W.G. for speaker lines enclosed in conduit, racks, or speaker enclosures. Use for all speaker runs except 70 volt systems. 10 A.W.G. THWN.
2. 16 A.W.G. twisted pair for RMS control system and for 70 volt audio wire for use in conduit, racks, or speaker enclosures. West Penn Wire AQC 225
3. 22 A.W.G. shield twisted pair for all mic, line or D.C. control lines enclosed in conduit or racks. Belden 5500F1 or West Penn Wire AQC 291
4. 18 A.W.G. Shielded twisted pair with 18 A.W.G. drain wire for all intercom lines enclosed in conduit or racks. Belden 5300F1 or West Penn Wire AQC 293. An additional 12 A.W.G. THWN will be required if speaker stations are used. This additional wire shall be used in parallel with the drain wire of the shielded twisted pair cable.
5. 24 A.W.G. shield twisted pair for all AES/EBU digital audio lines enclosed in conduit or racks. West Penn DA2401.
6. Coax Antenna Lines. As called for by equipment manufacture.
7. UTP Category 5E network cable. Four twisted pair of 24 A.W.G. wire with an outer diameter suitable for termination by standard type RJ-45 connectors. Use for all Category 5 cable run within a conduit or raceway. Belden 7934A.
8. STP: Category 5E network cable. Shielded four twisted pair of 24 A.W.G. wire with an outer diameter suitable for termination by standard type RJ-45 connectors. Use for all Category 5 cable run within a conduit or raceway when STP cable is required. Belden 7937A.
9. Category 5 service cable. Use for all Category 5 cable NOT run within a conduit or raceway. TMB Associates ProPlex Ethernet cable.
10. RG6 coax for all video cable (including HD-SDI) West Penn Wire AQC806
11. RG 11 coax for wireless receiver antennas Liberty RG11-DB-CCTV
12. RG59 coax as required West Penn Wire AQC 815
13. Crestron cable as called for by manufacture. Wet location rated as necessary by installation location.

P. Internal Rack Power Wiring:

1. Provide all power wiring, devices, hardware, receptacles, etc. as required to power wall equipment within each rack.
2. Provide a junction box located at the top of the rack for connection to circuiting by the electrical contractor.
3. Provide portable power cables for console, any portable racks, and all portable equipment.

Q. Power Sequencing: The existing sound system includes a power sequencing system. This system shall be extended and expanded to include all the new audio and video equipment using the following equipment types are required.

1. SEQ-1: Power sequencer
   Lowell Manufacturing SCS-8R

2. SEQ-2: Switched 20 amp power outlet box
   Lowell Manufacturing RPC1-20A-MC

3. SEQ-3: Switched 30 amp power outlet box
   Lowell manufacturing RPC1-30A-MC

4. SEQ-4: Five duplex power strip; 4 duplex receptacles switched, one duplex receptacle un-switched.
   Lowell Manufacturing RCP-5-MC

R. Portable Equipment: Provide the following portable equipment that is not shown on the contract drawings:

1. Microphones. Provide a mic clip for each mic.
   4 @ Shure KSM-32
   2 @ AKG C414 XLS
   1 @ Countryman ISOMAX 4RF (M4HP5RF18EB) + AT8416 shockmount
   5 @ Countryman ISOMAX 2-H hanging mics
   4 @ Audio Technica 4040.
   4 @ Audio Technica 4041.
   1 @ Rode NT4 stereo mic
   3 @ Radial Engineering ProDI Direct Box.
   1 @ Radial Engineering USB-Pro stereo USB laptop DI.
   1 @ Radial Engineering ProD2 stereo direct box
   1 @ Shure VP-88
   4 @ Audix MicroBoom System, 50” boom assembly, cardioid mic element

2. Microphone Stands & Accessories.
   15 @ K&M KM210/91 black, mic stand w/boom
   5 @ K&M KM21140 black boom arm
   6 @ Atlas Sound MS12CE
   4 @ Atlas Sound MS20E
   4 @ Atlas Sound DMS7E
   4 @ K&M 21021 overhead boom stand

3. Mic Cables: Whirlwind MKQ series in black.
   10 @ 3 feet
   15 @ 10 feet
   15 @ 20 feet.
   15 @ 30 feet.
   6 @ 50 feet.
   3 @ 100 feet.

4. Speaker Cables.
   8 @ Whirlwind NL-4-50
   8 @ Whirlwind NL-4-25

5. Front Fill speakers.
   4 @ Electro-Voice EVU-2082/95
   4 @ Yoke Mount
   4 @ USS TS-99BLStands
   2 @ 25’ speaker cables
   2 @ 40’ speaker cables

6. Patch Cables and Adapters
   8 @ Neutrik NL4MM.
   2 @ Switchcraft 389.
   2 @ Switchcraft 390
   2 @ Switchcraft 387A
   2 @ Switchcraft 386A
   2 @ Switchcraft 384A
   2 @ Switchcraft 383A
   4 @ RCA female to XLR male
   4 @ RCA female to XLR female
   4 @ ¼” TRS patchcable. 15’ long

7. Video adapters & cables:
   4 @ HDMI (standard size) to mini HDMI 20’ long
   1 @ Liberty AV Solutions DL-AR360
   1 @ Liberty AV Solutions DL-AR392
   1 @ Liberty AV Solutions DL-AR
   2 @ Extron 15HD GCF
   2 @ Extron 15HD GCM
   10 @ Extron BNCF-BNCF
   10 @ Extron BNCM-BNCF T
   4 @ Extron RCAF-BNCM
   1 @ ExtronVGA-A-M-M-MD/6
   1 @ Extron VGA-A-M-M-MD/35
   1 @ Extron VGA-A-M-F-MD/12
   2 @ Extron SYM BNCF/3
   2 @ Extron SYM BNCM/3
   2 @ Extron SYF BNCF/3
   2 @ Extron SYF BNCM/3
   4 @ Extron RG6-5 BNC/6
   12 @ Extron RG6 BNC/6
   2 @ Extron HDMI PRO/6
   2 @ Extron DISPLAYPORT-M-M/6
   2 @ Extron HDMI DVI-D/6
   2 @ Extron HDTV RCA/6
   2 @ Extron AV RCA/6
   2 @ Extron MHR-2-SVMF/20

8. Monitor and Portable Speakers.
   8 @ QSC K12 active monitors w/ stand sockets
   4 @ QSC K12 Yoke Mount Kit
   4 @ USS TS-99BLStands
   4 @ QSC M10 Kit-C
   8 @ Power cables 25’ long.
   8 @ Signal cables 25’ long

9. Apple I-Pad Air, 64 GB, running the following app software: ShurePlus Channels for wireless, Yamaha StageMix,, Symetrix SymNet,.
   1 @ Apple I-Pad Air 2, 64 GB

10. Headphones.
   1 @ Sony MDR-7506

PART 3 - EXECUTION

3.1 Submittals:

A. The sound contractor, within thirty days of the bid award and prior to beginning work, shall submit all of the following at the same time to the owner for approval:

B. Drawings: Complete shop drawings details and complete on all phases of installation including a minimum of:

1. Device location plan drawing(s)
2. System wiring diagram
   a. Make and model of all equipment
   b. All connection points on each piece of equipment
   c. All wire types
   d. All connector types
   e. All cable labels
   f. Show Dante ID and other setup info
   g. Show wireless frequency coordination
   h. Show IP address management
   i. Show RF levels on TV distribution system
   j. Show EDID information and management
3. Rack elevations
4. Details of all connection plates and custom panels
5. Rack and equipment labels
6. Mounting and rigging details for all equipment
7. Drawing showing the projector, the screen, the throw distance and all lens calculations in both plan and section

C. Mountings and Attachments: Prior to equipment installation, the sound contractor will submit to the owner detailed scale drawings of all proposed enclosures and speaker mounting or rigging

weighing more than ten pounds. All mountings and attachments must be approved and stamped by an engineer licensed in Florida prior to submittal and the beginning of the installation.

D. Materials and Equipment: The sound contractor will submit to the owner a complete list of all materials and equipment to be furnished including catalog cuts for all equipment items. These must contain full information on dimensions, construction, applications, etc. to permit proper evaluation. In addition, they must be properly identified as to their intended use and any options or variations must be clearly marked. The contractor is to confirm equipment availability at time of submittal. It is assumed that all equipment submitted on is and will be available.

E. Test Equipment: The sound contractor will submit to the owner a list of test equipment to be used to test, equalize and demonstrate the final installation.

F. Schedule: Prior to the commencement of the installation work, the sound contractor shall submit for approval, to the owner, an outline of a proposed commencement and completion schedule and project requirements.

G. Variations: Any deviation from what is specified here and or shown on the system drawings must be "starred" and noted in ¼" high letters on the shop drawings and highlighted in the submittal data.

H. Approval of shop drawings and materials does not relieve the Contractor of any responsibilities.

3.2 COORDINATION WITH OTHER WORK:

A. The sound contractor shall specifically coordinate the placement and sizes of conduit relating to this work and shall specifically review and approve the conduit rough-in in time to advise all parties of needed changes, omissions, etc. The sound contractor shall report this successful coordination in writing to the owner's representative. Failing this, the following will be enforced:

1. The sound contractor shall provide and install any additional conduits required for the hookup, proper location and proper isolation of the various cable / signal types and equipment in the systems. The sound contractor must coordinate his conduit installation with those installed by the electrical contractor. All conduits shall be sized to their intended fill plus fifty percent.
2. The contractor shall at all times coordinate his work with the other trades to ensure smooth progress of work and satisfactory final results.

3.3 INSTALLATION:

A. Personnel: A single, competent, technically qualified foreman will oversee the entire job from start to finish. This foreman must:

1. Be present on the job site during all phases of installation and testing.
2. Be authorized to receive instructions from the Architects or their representatives.

B. Only experienced sound installers shall be employed on this job.

C. The contractor shall keep the job adequately staffed at all times.

D. All job documents pertaining to the installation of this system will be accessible to all workers throughout the installation process.

E. Installation practices shall be in accordance with OSHA Safety and Health Standards and all local codes.

F. The sound contractor shall not commence the installation of equipment and devices, other than the pulling of cable, until all areas are clean, painted and finished to a point that they are completely dust, dirt, lint, fiber and airborne particle free. The air conditioning system must be operating to its design level and be able to keep all areas with sound equipment stable.

G. General Workmanship:

1. The installation of all work shall be neat.
2. All boxes, equipment, etc shall be plumb and square.
3. The installation shall conform to the plans and spec.
4. Equipment racks shall be assembled, wired and tested in the contractors shop prior to delivery to the job site.

H. Wiring:

1. If enclosed in conduit run only similar signal levels in a single conduit.
2. All pulls to be made be hand, care will be taken not to nick cable jackets, and any nicked or damaged cable will be replaced.
3. A pull string will be left in all conduits after wire is installed.
4. NO SPLICES WHATSOEVER IN CONDUIT!
5. If not enclosed in conduit neatly group cables into bundles and secure out of harms way.
6. Separate cable grouping by signal level. Mic and A.C. power shall be not less that 18" all other levels by not less than 6".
7. Include spare cables with all field runs. Quantity to be 10% or 1 which ever is greater unless otherwise specified.

I. Terminations:

1. All cables shall be permanently labeled at every termination.
2. Service loops of not less than 6" will be present at all terminations to equipment.
3. Where terminal blocks or barrier strips are used only uninsulated fork terminals with a brazed seam, sized according to wire and stud sizes, crimped with notch across from the seam will be approved.
4. Use barrier strips on equipment where provided.
5. Where shielded cable is in use leave shield drain wire the same length as the circuit conductor(s), sleeve shield drain wire in green pvc tubing. Cap where the cable jacket was removed with heat shrink. Where the shield drain wire is to be lifted follow the above and fold back over cable jacket. Then cap end with heatshrink. Do not use a single piece of heatshrink for this use two smaller ones.

6. All soldering will be clean and neat and not exhibit evidence of a " cold" joint, were necessary heat sinks will be used. Use only rosin core "electronic type " solder.
7. Wire nuts will be allowed only for field connections of 70 volt speaker lines and priority attenuation control lines, and then only when the proper size is used.

J. Polarity:

1. The " high " side will be connected to pin 2 on XLR connectors, to tip on 1/4" connectors and to the pin on phono connectors.
2. The " low " side will be connected to pin 3 on XLR connectors, to ring on 1/4" balanced connectors and to case on phono connectors.
3. Microphones will be wired so that an acoustic compression at the diaphragm produces a positive going signal on pin 2 with respect to pin 3.
4. Speakers will be wired so that when a positive going signal is applied to the + or red terminal an acoustic compression is produced.
5. The system will be wired to maintain absolute polarity though all system components to insure that a positive signal on pin 2 or tip produces a positive signal at the + or red speaker terminal.

K. Shield Grounding:

1. Do not tie pin 1 to case of XLR connectors anywhere.
2. Microphone shield drain wires will be grounded only at mixer inputs. Where microphone lines and mixer inputs run though a patchbay, connect shield drain wire to sleeve of patchbay connector and only to this point.
3. Line level lines will have shield drain wire lifted from ground at outputs and connected to ground at inputs.
4. The intent here is to not make ground loops, should any situation arise which would form a ground loop, please inform the owner for direction.

L. Mountings and Attachments:

1. Any and all structural, mounting, or rigging details are shown on the drawings for concept only.
2. The detail drawings and calculations of all proposed mounting or rigging of any equipment weighing more than ten pounds will be approved and stamped by a P.E. who is licensed in Florida.
3. Each cluster element is to be individually adjustable.
4. Provide for an adjustment range of +/- 10 degrees from the information shown in the contract documents.
5. In the absence of specific direction otherwise, standard rigging practices shall be followed.

M. Labels:

1. Cable Labels: All cables shall be labeled at all termination points. The label shall not be hand written. Clear heat shrink shall cover the label.
2. Equipment Labels. All equipment shall be labeled front and rear. Labels shall functionally describe the use of each piece of equipment. On equipment having multiple

channels, each channel shall be labeled. Additionally the equipment label will call out equipment designation which will correspond with the designations shown on the approved contractor's one-line diagram. Labels shall be engraved lanacoid, white letters on black background, with a minimum letter size of 3/16". Approved patchbay labeling may vary from this.

N. Power Sequencing. The system shall turn on and off, in proper order, on circuit at a time, when the power switch is pressed. The power light shall be solid on when all circuits are on , and shall flash during sequencing.

O. The system may not be used prior to checkout.

3.4 INSPECTION AND TESTING:

A. During the installation of the equipment the sound contractor shall arrange for access as necessary for inspection of equipment by the owner's and/or architect's representatives.

B. Provide a safe means of accessing all system components for all visits.

C. Equipment Pretesting: All racks are to be built and wired in contractors shop and tested prior to delivery to site. All other equipment is to be tested prior to delivery and installation. A written test report will be submitted to the owner.

D. Final Inspection:

1. The final inspection will confirm that the systems, as installed, meets the requirements of this spec, the contract documents, and the approved contractor's shop drawing and submittals.
2. The contractor will inform the owner in writing of the system's completion. The contractor will then request final inspection by the consultant, and carry out the necessary coordination. This coordination includes:
    a. Giving at least fourteen days notice to the consultant prior to the final inspection.
    b. Arranging for the contractor's and consultant's exclusive use of the space.
    c. Arranging for a HVAC technician to be available to turn the AC system on and off as required.
    d. Arranging for a lighting technician to be available to control the stage lighting as required.
    e. The contractor's job foreman and one additional worker familiar with the job will be present during all check out, testing and tuning.

3. Contractor will complete the following tasks prior to consultant's arrival:
    a. Unpack and assemble all portable equipment.
    b. Place all portable equipment in one location.
    c. If anything has been turned over to the owner have the signed Letters of Transmittal on site.
    d. Complete all required paperwork (pre-testing reports, letters indicating successful coordination of the installation, etc.).
    e. Remove all security covers.

4. Contractor will provide all necessary software, cables, and interfaces to facilitate the setting of computer, remote controlled, or DSP based equipment.
5. Contractor will either: 1) relocate all system equalizers to a tech area in the house for the duration of system tuning or 2) for remotely controllable devices, locate the control position in a tech area in the house for the duration of system testing. In ether case a tech area in the house will be required with a minimum of a 4' x 6' folding table, intercom communications to the rack and console locations, and AC power.
6. Contractor will provide the following test equipment for use during tuning and acceptance testing:
    a. Sennheiser ZP-3 impedance bridge.
    b. Low distortion sine wave oscillator with variable sweep (start frequency, stop frequency, and sweep rate).
    c. Distortion meter.
    d. Oscilloscope dual channel, 100Mhz, .001v/div vertical amp.
    e. Noise generator that will provide pink, white, or bandwidth limited pink noise.
    f. 1/3 octave real time audio spectrum analyzer.
    g. Precision sound level meter with filter set.
    h. Polarity checker.
    i. Precision true R.M.S. reading A.C. millivolt meter with dB scale.
    j. Playback and recording media for testing all supplied source equipment.

7. Contractor will provide safe means to access all system components during the entire commissioning process.
8. Contractor shall provide personal and equipment to make adjustments to the speaker cluster(s), as well as to correct problems, for the entire inspection and testing period.

E. The Theatre Consultant or his representative will conduct all final system tests and equalization adjustments in order to determine final acceptance.

F. In no event shall the theatrical sound systems installation be submitted for final approval or acceptance until any and all elements of the facility that may have a bearing on the system performance, including but not limited to doors, windows, HVAC, carpeting, furniture, wall coverings, interior design elements, lighting and lighting control systems have been completed and are operable. All elements that may effect sound systems operation or performance shall be "on" and operating during adjustments. The sound contractor will be responsible for coordinating the requirements of this paragraph with other work on the project.

G. Should more than two trips be required to complete the systems testing, systems tuning, and clearing punch list items, the contractor will be charged for any additional visits. These charges will include:

1. A minimum of two people at a rate of $1250 per day per person.
2. Travel expense to and from the job site.
3. These charges will be paid to the consultant, in advance of the consultant's arrival on the job site.

3.5 MANUALS:

A. Prepare four identical copies of owner's manuals. The owner is to receive two, the consultant receives one and the contractor retains one. Before distribution of manuals submit one copy to consultant for approval. Each manual is to contain the following:

1. System one line drawing including all labeling and changes (" as builts ").
2. Owners manual for each piece of equipment.
3. Schematic diagram for each piece of equipment.
4. Contractors service phone number in a conspicuous place.
5. All test reports.

B. Provide all information as PDF files on CDs to be included with each manual.

C. Load all manual data as PDF files onto the iPad.

3.6 INSTRUCTION: The following is to be carried out within two months of system acceptance:

A. Provide a total of 12 hours of instruction, on a maximum of two occasions. This is to be time on site, travel time is not to be included within the allotted time.

B. Provide operational assistance for the first usage of the system. This is to be on the owners time schedule but, not to exceed 8 hours.

3.7 WARRANTY

A. Contractor will warrant the system to be free from defects in materials and workmanship for a period of one year from the date of acceptance, or first beneficial use, which ever comes first.

B. Acts of god and owner abuse, or neglect are not covered.

C. During the warranty period the contractor will respond to and correct any call for service within one day of the call. Loaner equipment will be provided if necessary.

END OF SECTION 27 41 18