

SECTION 11 61 33 - STAGE RIGGING AND CURTAIN SYSTEMS

PART 1 GENERAL

1.01 GENERAL CONDITIONS

- A. For the sake of brevity these specifications omit phrases such as "(Sub)Contractor shall furnish and install," "unless otherwise indicated or specified," etc., but these phrases are nevertheless implied. Mention of materials and operations requires the (Sub)Contractor to furnish and install such materials and perform such operations complete to the satisfaction of the Consultant. Exceptions are noted herein or shown on the drawings.
- B. No representative of the Owner shall have power to waive the obligations of this contract for the furnishing of good materials or of performing good work, as herein described, in full accordance with the contract documents. The failure of any representative of the Owner to condemn any defective work or materials shall not release the obligation to at once tear out, remove, and properly replace the same at any time prior to final acceptance upon discovery of said defective work or material. When requested, however, the Owner's representative shall observe and accept or reject any material furnished. In the event the material has been accepted once by the Owner's representative, such acceptance shall be binding on the Owner unless it can be clearly shown that such material does not meet the specifications for this work.
- C. All equipment and installation shall be the responsibility of a single contractor. This Contractor shall assume complete responsibility for the engineering, fabrication, transportation, and installation of the work in this Section.
- D. Field-verify all sizes, measurements and finishes prior to fabrication. Coordinate with scheduled work of other trades. Immediately notify Consultant in writing of any discrepancies, conflicts, or omissions prior to the commencement of work or correct the same at Contractor's expense.
- E. All equipment shall be fabricated, manufactured, and installed in accordance with applicable laws, codes, and standards, including:
 - 1. Rigging Manual (published by the Construction Safety Association)
 - 2. Wire Rope Handbook (published by Wire Rope Corporation of America)
 - 3. Wire Rope Users Manual (published by American Iron and Steel Institute)
 - 4. National Electric Code (NEC)
 - 5. American Society of Mechanical Engineers (ASME)
 - 6. American National Standards Institute (ANSI)
 - 7. American Society for Testing and Materials (ASTM)
 - 8. American Institute of Steel Construction (AISC)
 - 9. IEEE (Institute of Electrical and Electronic Engineers)
 - 10. ICEA (Insulated Cable Engineers Association)
 - 11. National Fire Protection Association (NFPA)
 - 12. National Electrical Manufacturers Association (NEMA)
 - 13. Any and all local governmental or other applicable codes.
- F. Where these Specifications call for a higher standard than the above-mentioned rules, the Specifications shall govern.

- G. Nothing in these Construction Documents is to be construed to permit work not conforming to applicable Codes.
- H. For all requirements not otherwise addressed by this Specification, the work shall be at a minimum compliant with the requirements of ANSI E1.4-1-2016 – Entertainment Technology - Manual Counterweight Rigging Systems and ANSI E1.6-1-2019 – Entertainment Technology – Powered Hoist Systems.

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Section, apply to work of this section.
- B. Refer to Contract Drawings TR series for plans, graphic representations, schedules, and notations showing Stage Rigging System. These TR series are for general reference only.

1.03 DEFINITIONS

- A. The term "Contractor" shall mean the contracting entity, also referred to herein as Stage Rigging Contractor or Manufacturer, responsible for the fabrication, assembly, installation, testing, instruction and completion of all work as covered in these Specifications and related Drawings.
- B. The terms "General Contractor" is used herein to refer to organizations, individuals, and their representatives as typically defined for construction projects. These terms refer to parties other than the Rigging Contractor ("Contractor").
- C. Technical terms unique to stage rigging and related work shall be construed in the following order, in accordance with:
 - 1. Related Drawings.
 - 2. Specifications
 - 3. Relevant usage and definitions of handbooks, guidebooks, or trade group recommendations by manufacturers' associations or professional and engineering societies, such as ASTM, ASME, ASHRAE, etc.
 - 4. Generally recognized theatrical usage
- D. Dead load is defined as the weight of the batten, lift lines, connecting hardware, and any permanently installed equipment including electric cable management.
- E. Live load is defined as the load produced by the attachment of portable equipment applied to the batten by the end user but does not include dead loads or environmental loads.

1.04 SCOPE OF WORK

- A. Stage Rigging and Curtain Systems will consist of counterweight and motorized rigging in the theater. Refer to Request for Proposals, Contract Drawings TR series for plans, graphic representations, schedules, and notations showing Stage Rigging System work.
- B. Work under this section shall include the furnishing of all labor, materials, tools, transportation, services, and supervision necessary to complete the installation of the Stage Rigging System, and other items as herein listed, all as described in these specifications and Request for Proposals, as illustrated on the drawings, and as directed

by the Consultant. Any question as to the installation of equipment should be cleared with the Consultant prior to installation. Work is comprised of, but not limited to, the following principal items:

1. Verification of dimensions and conditions at the job site,
2. Line sets, arbors, wire rope, battens, hardware, chain, blocks, etc.,
3. Stage curtains,
4. Curtain tracks and accessories,
5. Fire Curtain,
6. Motorized hoists and control,
7. Miscellaneous steel for mounting equipment,
8. Miscellaneous components and parts herein specified.
9. Portable and loose equipment
10. Proof of performance testing
11. Remove and replace any items including electrics hanging on battens.

- a. As part of agreement clarify what work, if any, Owner's house crew will remove and restore before construction work.

C. Furnish and install all renovation or repair work for a complete Stage Rigging System with all necessary apparatus, equipment, wiring, etc., required to insure complete systems in excellent working order as specified herein and on the attached diagrams.

D. Consistent with the detailed information contained herein and on the drawings, provide functional and complete overall systems. Verify complete parts lists, the accuracy of the type numbers, and the overall suitability of the equipment to produce complete functional systems coordinated and interfaced with related work.

E. Minor items of equipment needed in order to meet the requirements stated above, even if not specifically mentioned herein or on the drawings, shall be provided in quality equivalent to other conditions on the project with no claim for additional payment.

F. Coordinate with related existing equipment including but not limited to the following:

1. Fire protection systems
2. Stage lighting system
3. Lighting plugging devices
4. Building structure and catwalks
5. Smoke vents and roof hatches
6. General electrical work
7. Orchestra shell
8. Ductwork

1.05 JOB CONDITIONS

A. Coordinate layout and installation of rigging with other adjacent work, including structural, light fixtures, HVAC equipment, plumbing, and fire-suppression elements.

B. Verify all conditions on job site applicable or pertaining to this work. Notify Consultant in writing of discrepancies, conflicts, or omissions prior to commencement of work or correct the same at Contractor's expense.

- C. If conditions exist at the job site that make it impossible to install work as shown, prepare and submit drawings to the Consultant for approval showing how the work may be installed, and, on approval, install the work without additional cost to the Owner.
- D. Contractor shall take care not to damage any equipment or to disconnect any wiring other than as required to interface new system. Any contractor-damaged equipment shall be repaired or replaced by the Contractor at no additional cost to the Owner. Return any systems disturbed during work to found condition.
- E. Deliver materials to the job site such that they will be protected from damage. Store all materials at building site under cover.

1.06 APPROVED FABRICATORS

- A. The hardware and related components specified herein shall be fabricated by the following:

1. Electronic Theatre Controls, Inc., 3031 Pleasant View Rd, Middleton, WI 53562
www.etccconnect.com
2. H & H Specialties, Inc., 14850 Don Julian Rd., Ste B, City of Industry, California 91746
www.hhspecialties.com
3. Protech, 3431 N. Bruce St., North Las Vegas, NV 89030
www.protechlv.com
4. Texas Scenic Company, 8053 Potranco Rd, San Antonio, Texas, 78251
www.texasscenic.com
5. Tiffin Scenic Studios, Inc., 146 Riverside Drive, Tiffin, Ohio 44883
www.tiffinscenic.com
6. Wenger Corp/J. R. Clancy, Inc., 7041 Interstate Island Road, Syracuse, New York, 13209
www.jrclancy.com

- B. The draperies and related components specified herein shall be fabricated by the following:

1. I Weiss & Sons, 815 Fairview Avenue #10, Fairview, NJ 07022
www.i-weiss.com
2. J B Martin Corporation, 645 5th Avenue, Suite 400, New York, NY 10022
www.jbmartin.com
3. KM Fabrics, Inc., Box 7379, Branwood Station, Greenville, SC 29610
4. Rose Brand, 4 Emerson Lane, Secaucus, New Jersey 07094
www.rosebrand.com

5. Stage Decoration & Supplies, Inc., 3519 Associate Drive, Greensboro, NC 27405
www.stagedec.com
 6. Syracuse Scenery & Stage Lighting Co., Inc., 101 Monarch Drive, Liverpool, NY 13088
www.syracusescenery.com
 7. Texas Scenic Company, 8053 Potranco Rd, San Antonio, Texas, 78251
www.texasscenic.com
 8. Tiffin Scenic Studios, Inc., 146 Riverside Drive, Tiffin, Ohio 44883
www.tiffinscenic.com
- C. The track, track hardware, and related components specified herein shall be fabricated by the following:
1. Automatic Devices Company, 2121 South 12th Street, Allentown, PA 18103
www.automaticdevices.com
 2. H & H Specialties, Inc., 2203 Edwards Avenue, South El Monte, CA 91733
www.hhspecialties.com
 3. Texas Scenic Company, 8053 Potranco Rd, San Antonio, Texas, 78251
www.texasscenic.com

1.07 RIGGING CONTRACTOR QUALIFICATION

- A. Qualified rigging contractors shall have been actively engaged in the sales and installation of theatrical rigging systems and equipment for a minimum of five years. In addition, the qualified contractor shall have completed a minimum of three projects of similar scope and magnitude within the last five years. Contractors not demonstrating this minimum experience at the time of bid submission will not be considered qualified to perform the work specified in this section.
- B. Contractor shall employ only experienced stage riggers to direct the installation of work of this Section. A competent supervisor shall be maintained on this Project during the entire installation. The Contractor shall employ a qualified theater rigger to review installation of the system as it related to attachment to the Theatrical Rigging System and to building structure.
- C. All equipment and installation shall be the responsibility of a single contractor. This Contractor shall assume complete responsibility for the engineering, fabrication, transportation, and installation of the work in this Section.
- D. Approved contractors may, at their option, arrange for sub-contract field and special shop work to be done by others. Bid submissions must identify such subcontractors and indicate the work they are to do.

- E. Approval indicates approval of the manufacturer only and not approval of specific products. The Contractor shall be required to provide equipment that will meet or exceed the intent of these specifications.

1.08 SUBSTITUTIONS

- A. Notwithstanding any reference in the specifications to any article, device, product, materials, fixtures, form, or type of construction by name, make, or catalog number, such reference shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition. The Contractor in such cases, may at his option use any article, device, product, material, fixture, form or type of construction which in the judgment of the Consultant expressed in writing, is equivalent to that specified.
- B. All materials and equipment specified herein have been determined to provide an overall physical appearance and background of proven operation desired by the Owner, and therefore, to establish a standard of quality required for this project. If equipment or material other than that specified is proposed to be furnished, this Contractor shall be required to furnish the Consultant with such samples as he requires, the same to be submitted by the Consultant to an independent testing laboratory selected by the Owner for tests to determine the actual equality of the proposed substitute items. All costs and charges incurred by these tests shall be borne by the Contractor. Should such tests prove the substitute materials and equipment equal and acceptable, the Contractor shall be so advised. However, the Owner reserves the right to examine, and where necessary, to have additional tests made by the same independent testing laboratory of the actual equipment delivered to the job site to insure that the delivered equipment is equal in fact to that specified. Should such secondary tests prove the equipment is satisfactory, the Owner will pay the cost for such tests. Otherwise, the Contractor shall pay for the test and shall proceed to remove unacceptable equipment from the job site and to provide that specified. The Consultant's decision, based on this test, will be final.
- C. The plans and specifications are based on specific equipment, accessories, processes and arrangements as indicated herein. Acceptance of the data sheet submittal indicates only the acceptance of the manufacturer and quality and assumes that the specific requirements and arrangements are in compliance with the intent of the plans and specifications. The Contractor shall, at no additional cost to the Owner, furnish all accessories, layouts, equipment, etc., and shall perform all work necessary for proper functioning and to fit Contractor's substitute items to the intent and arrangement indicated in the specifications.
- D. If a substitute system is selected, the Contractor, at no additional cost, shall provide any changes in architectural, electrical, or structural systems required as a result of the alternate system to the Owner. The decision of the Consultant as to the compliance of the proposed system based on the submitted data and demonstrated system shall be final.

1.09 SHOP DRAWINGS AND SAMPLES

- A. Equipment data sheets and any necessary Shop Drawings shall be submitted to the Consultant in accordance with the requirements of these specifications within 60 days after award of the contract. Failure to comply with this 60-day requirement shall be cause for disqualification of the Contractor and cancellation of the contract without cost to the Owner on the basis that the Contractor has not demonstrated the ability or intention to comply with the Contract Documents.

- B. Prepare all shop drawings and field changes under the supervision of a professional structural engineer so licensed by the state of the installation. As a courtesy, the first shop drawing submission does not require a Professional Engineer's stamp. Contractor shall issue a final shop drawing submittal with stamp prior to manufacture. All as-built drawings shall be stamped and certified by professional engineer. Structural Engineer's review shall include, but not be limited to, all elements related to overhead lifting, structural support of elements and all suspended elements provided under this section, including field modifications.
- C. Acceptance of submitted equipment shall be obtained prior to equipment purchasing or fabrication. If data sheets or shop drawings are rejected, correct and resubmit in the manner as specified. All shop drawing information shall be submitted at the same time; no partial submittals will be reviewed. Review is for conformance with design intentions only. Review does not relieve contractor of responsibility to verify field conditions; nor does it relieve the contractor of responsibility for errors, omissions, or deviations in submittals.
- D. The Contractor assumes responsibility for the accuracy of all dimensions and quantities.
- E. Shop drawings shall be performed at a scale of not less than 1/4" = 1'-0" for plans and sections and 1" = 1'-0" for details. Drawings and catalogs shall be marked to show the name of project, date, Owner, Consultant, Contractor and/or manufacturer and supplier.
- F. Drawings: Submit complete sets of drawings for review in Portable Document Format (PDF). Drawings shall indicate complete details and dimensions of all work to be performed. PDF shall include a Table of contents and bill of materials. Document shall also contain PDF bookmarks to plans, sections and major system details. Include all equipment types and locations, clearances required, guides, chains, linesets, contractor-fabricated equipment and all other details required to describe work to be performed. Shop drawings shall contain at least the following details:
1. Groove details for all sheaves and drums
 2. Complete rigging schematics with weights of all equipment
 3. Elevations of each rigging and curtain set type
 4. Complete hanging/attachment details
 5. Complete hardware details
 6. Weights of all equipment
 7. Schematic diagrams of all electrical work including motorized hoists
 8. Manufacturer's data sheets
 9. Indication of all variance from contract drawings
- G. Catalog Sheets: Submit copies of catalog data sheets (8-1/2" x 11"), neatly organized in sets with title page, table of contents, space for submittal stamps, and bookmarks between sections. Additional copies of this set of data sheets are required with as-built drawings. Shop drawing submittal shall contain data sheets in proper order with part or model number clearly indicated on all equipment proposed. Provide a complete list of proposed equipment with reference to its corresponding specification section/paragraph number or equipment title. Denote all deviations from specified equipment on the list.
- H. Sample Submittals
1. Rope: Submit a minimum of 2 samples of each type of rope to be provided.

- a. Sampson 3 -strand x 7/8" Pro-master
 - b. Grand Drape: 1-1/4" diameter equal to existing type.
2. Fabric Samples: Submit a minimum of two (2) sets of samples of all curtain materials with selected color.
 3. Finished Curtain Samples: Submit two (2) finished samples of each of curtain type. Each sample should be approximately 3' x 3' and consist of all details that will be included in the complete finished curtain less the hanging hardware. The traveler sample may have 4" hems (sample only) with specified fullness and other specified features. All other samples shall have specified hems, webbing, grommets, tie line and pipe pocket. Samples shall include but not limited to:
 - a. Main Curtain and Valance

1.10 RECORDS FOR OWNER

- A. Drawings: Maintain a full record set of drawings on the job to show the actual installation of the work performed. All as-built drawings shall be stamped and certified by Professional Engineer, and reflect field modifications. Submit four (4) hard copy sets of drawings and four (4) USB drives of electronic copy in PDF format showing 'as installed' work to the Consultant for initial review. If 'as installed' documents are rejected, correct and resubmit in the manner specified.
- B. Manuals: At the time of project closeout, submit four (4) sets each of the following manuals to the Consultant for review. Manuals (8-1/2" x 11") are to be neatly bound and include title page with the name of the project, date, Owner, Consultant, Contractor, Contractor and/or Manufacturer and Supplier. The manuals to be supplied are as follows:
 1. Operation and Instruction Manual, including:
 - a. Table of contents
 - b. Brief description of the operation of each system if renovation or repairs vary from existing system, (descriptions shall be written such that new personnel may read the manual and be able to set-up and operate the system).
 - c. Manufacturer's operation instructions for all user-operated equipment.
 - d. Small scale, clear laminated plan(s) showing the location of all equipment.
 2. Maintenance Data Manual, including:
 - a. Table of contents
 - b. A list of all equipment supplied by this contract with manufacturer's name, model and part number.
 - c. A listing of equipment manufacturer's/supplier's addresses for all equipment covered by this contract.
 - d. All equipment warranties and guarantees including contractor's guarantee. Explain the limits of the warranty, and whom to contact for service, etc.
 - e. Manufacturer's owner and service manuals on all equipment under this contract.
 - f. Replacement parts lists of all major items and equipment indicating specific part ordering numbers.
 - g. Approved shop drawing catalog data sheets.
 - h. All test results required under these specifications. Videos shall be submitted in appropriate format.

- i. Any and all other data and/or drawings required during construction.

1.11 TESTS AND OBSERVATIONS

A. The complete job shall be, during and/or after construction, subject to the following tests and observations:

1. By Consultant observations and tests conducted by or for Consultant in Consultant's presence. Upon notice, Contractor shall furnish not to exceed two (2) persons (one to be the job foreman) and tools to assist for a reasonable amount of time to make such tests and observations as are requested by the Consultant.
2. By any Government or local authority.
3. Operation and visual examination of all components.
4. Contractor shall demonstrate for Consultant:

- a. Operation of all components.
- b. Visual examination of all components.
- c. Testing of all linesets throughout their entire travel.
- d. Full load testing on 10% of each type, but not less than one (1) per type.
- e. Motorized sets, if included in scope of work:

1. Full load testing of all motorized sets that suspend loads. Testing shall include full range of travel in all axes of movement, directed by the installed control system. Test shall include both controlled stop and emergency stop conditions. Test weight shall be equal to the live load listed on the Drawings or documents. Contractor shall arrange for delivery, mounting and de-mounting of weight on motorized sets, and removal of test weight from project site.
2. Variable speed sets shall be tested at a minimum of three speeds: creep, 60%, and maximum specified. Tests shall be performed at each speed for the full range of travel.
3. For all sets, a test with the weight uniformly distributed across all lift lines shall be performed.
4. For ten percent of each set type, but not less than one per type, a test with the weight eccentrically distributed shall be performed. Test weight shall be equal to the capacity of the set and distributed so that one lift line shall carry the maximum load per lift line as shown in the Drawings.
5. Testing must be video-recorded with audio and submitted with written certification for each set.
6. Motorized curtain sets where the curtains are intended to be easily removable (legs, borders, etc.) shall be tested prior to curtain installation.
7. Motorized curtain line sets where the curtain is intended to be permanently mounted (bi-parting travelers, proscenium reduction curtains, etc.) shall have the required curtain and hardware installed prior to the full load testing.
8. Cable management systems on stage electrics, along with required plug strip, plug box, etc., must be installed and operating normally during the test.

9. Line sets that have orchestra enclosure ceilings that are intended to be permanently mounted shall have the ceilings mounted and all cable management installed and operating properly.
10. Line sets indicated to have orchestra shell ceilings that are intended to be removeable shall be tested prior to ceilings being installed. Tests shall be performed as indicated above, with test weight equal to the existing live load.
11. Verification and fine-tuning of all hoist limit switch settings (ultimate and normal).
 - a) Line sets intended for masking curtains shall be tested prior to curtain installation.
 - b) Line sets for orchestra enclosure ceilings intended to be permanently mounted shall be tested after the ceiling and associated cable management is completely installed.
 - c) Line sets for orchestra enclosure ceilings intended to be removeable shall have limit switches tested with the ceiling removed from the batten.

B. After completion of installation and preliminary tests by the Contractor, observation of the work shall be performed by the Consultant.

1. The Contractor shall certify in writing to the Consultant that the work is complete and ready for observation.
2. System commissioning shall be supervised by a knowledgeable representative of the Contractor.
3. In order for the Consultant to conduct system commissioning observation, the following elements must be in place:
 - a. Rigging system must be complete, and curtains installed.
 - b. All electrical components must be operating on permanent building power.
 - c. Motorized linesets, if included in scope or work:
 1. Rigging control system must be operational.
 2. Preliminary hard limit positions set.
 - d. Stage electric line sets complete with plug strips, plug boxes, or other distribution devices as required along with complete cable management required for the device(s)
 - e. Complete access to areas where the rigging systems are installed, including the stage house, control panels, motors, and other system components.
 - f. Stage floor installation complete.
4. Contractor is to provide any equipment that may be necessary to access system components, including personnel lifts and/or ladders.
5. Contractor shall provide two personnel to operate equipment during commissioning observation. These technicians must be familiar with safe operating procedures for this equipment.

C. The cost of periodic trips to the job site for final observation by the Consultant has been provided for in the Consultant's contract. The cost of any additional trips to the job site due to delays, omissions, or mistakes by the Contractor shall be borne by the Contractor.

- D. The Contractor shall make any adjustments or modifications necessary from the punch list to bring the work into conformance with established Contract requirements and shall then certify that all work is complete and ready for final observation.
 - 1. The Consultant will perform a final review to verify punch list completion.
 - 2. A knowledgeable representative of the Contractor must be present for the final review, with crew as required to move system components.
 - 3. Should deficiencies due to faulty equipment or installation require re-inspection after final inspection, all expenses of such re-inspection, including time and travel of the Architects or Consultants shall be the responsibility of the Contractor without cost to the Owner.

1.12 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver curtains until spaces to receive them are clean, dry, and ready for their installation. Ship to jobsite only after roughing-in, painting and other finishing work has been completed, installation areas are ready to accept work. If curtains are installed before dust-generating work is complete, curtains shall be appropriately protected from damage.
- B. Handle and install materials to avoid damage.

1.13 GUARANTEE

- A. All labor and materials provided under this contract, unless otherwise noted, shall be guaranteed for a period of one (1) year following the date of final acceptance of the installation.
- B. All equipment with factory warranties greater than one year shall have their warranties under the Owner's name.
- C. All defects occurring in labor or materials within the guarantee period shall be rectified by replacement or repair. Contractor shall, within this guarantee period, be required to answer all service calls within a 24-hour period and repair or replace any faulty item within 48 hours after the initial service call without charge to the Owner.

PART 2 PRODUCTS

2.01 GENERAL

- A. All materials shall be new and of first quality.
- B. State-of-the-art assurance: No products shall be accepted if they have been discontinued or superseded at the time of shipment. For such items, the manufacturer shall make products of comparable function to the specification available to the project at no additional cost. Should the manufacturer have developed a later model of specified units, the latest developed unit shall be provided without additional cost to the Owner. Should the manufacturer develop products of comparable function above and beyond the specification of the listed product, the manufacturer may offer the newly developed product for use on the project. The manufacturer shall notify the Consultant of any developments to the specified products and shall note any change in the requirements of building infrastructure(s) to support the developments. The Architect and Consultant shall then determine whether upgraded products shall be accepted.

- C. All load bearing rigging components shall be rated for overhead lifting; capable of supporting design loads as shown and shall be of, or treated with, corrosion resistant materials. Where not specifically called out in this Section, rope and wire rope shall be selected using a minimum design factor of eight to one, (8:1). All chain, shackles, and other hardware shall be selected using a minimum design factor of five to one, (5:1).
- D. Operating parts of all equipment shall be machine finished, and tolerances, finishes, fit, etc., where not specified, shall conform to good trade practices.
- E. All items necessary for a complete, operational, and safe system shall be provided, including bolts, nuts, washers, fittings, anchors, supports, hinges, and all other items required for completeness and operational safety. Where not specified elsewhere in this Section, all bolts shall be Grade 5 or better.
- F. The rigging products of certain manufacturers are specified by catalog number for establishing a standard of quality. Items equal in quality and performance by manufacturers other than those specified will be permissible upon acceptance by the Consultant.
- G. Equipment quantities are "as required" or "as shown on drawings" or "as specified elsewhere" unless otherwise noted.
- H. Provide all guards and other protective devices required to ensure protection of individuals who may be near or adjacent to equipment and devices during normal operation.
- I. Loading capacity of systems is defined as the live load exclusive of the dead load.
- J. Dead load is defined as installed infrastructure such as pipe battens, truss battens, sandbags, hooks, plug strips, etc.
- K. Should the Contractor choose to suggest alternate methods that require heavier dead loads, the Contractor shall be responsible for increasing the capacities of the individual components, including the arbor capacities, accordingly. Any alternate methods must be approved specifically by the Consultant.

2.02 ENGINEERING RESPONSIBILITY

- A. The engineering of all equipment, devices, machinery, and systems shall have the following considerations:
 - 1. Safety to personnel during operation, use, and maintenance.
 - 2. Adequate load supporting capability and fail-safe design.
 - 3. Proper consideration of all systems and elements, including electrical insulation levels, interrupting capacities, protective relays, impact strength, breaking strength, emergency stopping distances, acceleration and decelerations rates, and normal working stress capabilities of equipment and all components.
 - 4. Reliability, with consideration for special or unusual requirements of the unit or installation.
 - 5. Ease of operation and maintenance.
 - 6. System operating sequences, including accounting for simultaneous as well as sequential operation of systems and sub-systems.
 - 7. Coordination with associated and/or adjacent systems provided by others.
 - 8. Quiet operation.

2.03 MISCELLANEOUS COMPONENTS AND SUPPLEMENTAL SUPPORT

- A. Additional supplemental support structure not furnished under other sections and other fittings required for installation, support, bracing and/or operation of Stage Rigging System components are the responsibility of this Section. Provide all supplementary support necessary for safe and proper static and dynamic conditions of all systems and components required for the work of the Specifications. All attachments, anchorages, connections, and miscellaneous supplemental support shall be designed, supplied, and installed by the Contractor and reviewed by the Consultant.
- B. Special components may be required for muling around structural components to meet wire rope fleet angle requirements, supporting hoisting cable, or dropping lines through structure to battens. These special components shall meet or exceed comparable equipment specified herein. Idler blocks, pivot blocks, structural support for these blocks, etc., required to make all lines fully operable, whether such components are specifically named or not, shall be furnished without claim for additional payment.
- C. Additional mounting components, such as miscellaneous steel, wood blocking, and fittings, required for installation, support, bracing, and operation of equipment under this Section shall be provided without claim for additional payment. These components shall be coordinated with other trades.
- D. Patented channel type structural steel shall accommodate the required load but shall equal Unistrut Series P1000 at minimum.
- E. Flame cutting is not acceptable.
- F. Miscellaneous steel shall be of suitable types and sizes. All straps, rods, anchors, clip anchors, clip angles, and other hardware necessary for the attachment shall be supplied.
- G. This Contractor shall coordinate these locations and requirements with the General Contractor.
- H. All methods of connection and imposed loads resulting from the Contractor's work shall be submitted to the Consultant prior to fabrication.

2.04 ARBOR GUIDE SYSTEM

- A. Existing arbor guide system is to be re-used.
- B. Repair any guides that are mis-aligned or in need of repair.

2.05 ARBOR - STANDARD

- A. For single purchase T-track system, arbor shall be mounted between tees, or jays, to accommodate counter-weights. Arbor top and bottom is to be a fabricated steel weldment of 1/4" plate formed into a channel with 3" sides and is to be properly fitted to receive the required number of cables. The top and bottom of the arbor shall be tied together by means of two 3/4" rods which shall be threaded at each end to accommodate the below mentioned nuts. Each rod is to have two 3/4" nuts above and one below the arbor top and one above and two below the arbor bottom. Each rod shall be equipped with one retaining collar with thumbscrew (no tools required) to lock weights in place. Arbors shall also be equipped with sliding spacers, one (1) for every 2'-0" of arbor height equal in width to

bottom of arbor. The arbor shall be equipped with a 1/2" x 3" steel tie bar that is bolted between the arbor top/bottom and the guide shoe assembly. Arbor shall accept required number of hoist lines. Arbors utilizing cast materials are not acceptable. Arbor backbone shall be painted to show 1'-0" increments.

B. Approved Equipment:

1. J.R. Clancy, Inc. Model No. 007-15x
2. H & H Specialties, Inc. Model No. 990

C. Quantity: One per counterweight lineset.

2.06 HEAD BLOCKS

A. Existing Head block to be re-used.

2.07 LOFT BLOCKS AND MULE BLOCKS

A. Existing Loft blocks to be re-used in base bid. Provide new idlers for all blocks and existing idlers.

B. (See itemized list): Replace first loft block with multi-line block.

C. Loft blocks and mule blocks shall have one sheave (mules may require more than one sheave) of sufficient width to accommodate required number of wire rope grooves. Sheave shall conform to cable manufacturer's recommendation on depth and design of groove and shall have a 1/64" tolerance. Pitch diameter from any groove to any other shall not vary by more than .001". Blocks shall be equipped with life-time lubricated, sealed bearings as specified below. The shaft shall be SAE Grade 8 steel bolt with head keyed to prevent shaft rotation. Blocks shall be equipped with at least 2 spacers of 1/2" pipe to prevent jumping of cable from the grooves. Side plates shall be at least 10 gauge securely welded to base frame with a continuous staggered weld. Provide base angles as necessary for support to structure. Fasteners shall be SAE Grade 5 or better.

D. Provide idlers on each block with sufficient number of sheaves to support passing wire rope on each loft block.

E. Provide a multiline sheave for the first loft block (line 1) on each counterweight set.

F. Approved Sheave Material:

1. NYLATRON GS
2. ZYTEL GRZ

G. Sheave Diameter:

1. Standard Rigging - 8"
2. High Capacity - 12"

H. Bearings:

1. Standard Rigging Loft Blocks - Precision Ball Bearings
2. Standard Rigging Mule Blocks with two or less lines - Precision Ball Bearings

3. Standard Rigging Mule Blocks with three or more lines - Sealed Timken Tapered Roller Bearings
- I. Minimum Shaft Diameter:
 1. Standard rigging - 5/8"
 2. High capacity - 1"
 - J. Approved Equipment:
 1. Upright Loft Block: H & H Specialties Series 840N25
 2. Underhung Loft Block: H & H Specialties Series 30
 3. Underhung Pivot Loft Block: H & H Specialties Series 44NS
 4. Underhung Swivel Loft Block: H & H Specialties Series 46NS
 5. Upright Mule Block: Atlas Silk Series 80NS
 6. Underhung Mule Block: H & H Specialties Series 81NS
 - K. Quantity: Refer to drawings and as required

2.08 WIRE ROPE

- A. Wire rope shall be first quality, galvanized carbon steel, and impregnated with a dry lubricant. All cable ends shall be neat, seized and smoothed to prevent scratching and catching. Wire rope shall be terminated with cable thimbles and utilize one of the following termination methods:
 1. Nicopress sleeves as manufactured by National Telephone Supply, applied in conformity with manufacturer's instructions.
 2. Forged wire rope clips as manufactured by The Crosby Group, Inc. (Crosby® Clips), applied in conformity with manufacturer's instructions.
- B. Wire Rope Diameter:
 1. Standard Rigging – 1/4"
 2. Motorized Rigging – 3/8"
 3. Fire Curtain Hoist – 1/4"
- C. Approved Equipment:
 1. Hoist and Rigging – MacwhYTE 7 x 19 Utility Cable

2.09 HOIST LINE TERMINATION ASSEMBLIES - WIRE ROPE

- A. Batten termination
 1. Type 1 – Wire rope shall be terminated as specified elsewhere or as shown on drawings and fitted with 36" long trim chain. Trim chain shall be connected through the cable thimble and terminated as specified elsewhere. Chain shall make at least one full wrap around the pipe batten. Type 1 terminations will be installed on all single batten linesets unless otherwise noted
 2. Type 2 – Wire rope shall be as specified elsewhere or as shown on drawings and fitted with rated jaw-jaw turnbuckles. Type 2 terminations will be installed on all double batten linesets unless otherwise noted.

- B. Arbor terminations - Wire rope shall be terminated as specified elsewhere and fitted with an appropriately sized, Grade 8 bolt passed through the arbor top.
- C. Arbor terminations - Wire rope shall be terminated as specified elsewhere and fitted with an appropriately sized screw pin shackle attached to the arbor top. Mouse shackle with wire after installation.

2.10 CHAIN

- A. Dead hanging battens and batten termination assemblies (trim chains).
 - 1. Each chain shall be 36-inches long fabricated from 1/4-inch alloy Theatrical Chain, specifically designed for theatrical overhead lifting applications.
 - 2. The chain shall have a minimum breaking strength of 13,000 pounds.
 - 3. The chain shall be compatible with industry-recognized chain hardware. Individual link size shall match the National Association of Chain Manufacturers, Welded Steel Chain Specifications for Grade 30 Proof Coil Chain.
 - 4. Each link of the chain shall be stamped with the manufacturer's identifying mark.
 - 5. The chain shall be lot traceable, with a coded date stamp on every tenth link of chain.
 - 6. Chain shall have a black finish.
- B. Approved product:
 - 1. Wenger/J.R. Clancy Alpha Chain
 - 2. Texas Scenic Company, Theatrical Chain
 - 3. Peerless Theatrical Rigging Chain

2.11 CHAIN TERMINATIONS

- A. A shackle shall be used for termination of dead hanging chain and hoist line terminations (trim chains). Shackles shall be "moused" shut with wire, after proper installation
 - 1. Approved Equipment: Crosby Load Rated Forged Screw Pin Anchor Shackle.
- B. Quick link for termination of certain special components. Quick links may only be utilized when specifically indicated herein or on drawings.
 - 1. Approved Equipment: Cooper Group Rapid Link load rated at 880 lbs.

2.12 BATTENS

- A. Pipe battens shall be nominal 1 ½" black steel pipe (1.9" O.D.) ASTM A53/A Strong (Schedule 40), stripped and painted with at least one coat of black primer and one coat of flat black paint free of surface irregularities, in lengths as indicated on rigging schedule.
- B. Splices shall be close-fitting internal steel sleeves with a wall thickness of not less than 0.1875 inch, and min. 24 inches long. Both sides of the splice shall be held in place with a minimum of two (2) plug welds per side. Splices may also be bolted with two bolts evenly spaced on one side of the splice. Bolts shall be oriented 90° off access from adjacent bolts. Bolt length shall not extend more than three threads beyond the properly tightened nut.

- C. Battens shall be engineered and installed for straight installation.
- D. Paint on every batten a 1" wide strip at center stage of the batten.
- E. Quantity as shown in detailed list.

2.13 FIBER ROPE

- A. Reuse or replace existing operating rope with same exact type and manufacturer. If existing rope is reused, furnish enough spare coils to replace all sets
- B. Fiber rope shall be a synthetic rope consisting of combination filament and staple/spun polyester wrapped around fibrillated polyolefin.
- C. Fiber rope diameter:
 - 1. Counterweight sets – 7/8"
 - 2. Grand Drape – 1-1/4"
- D. Approved Equipment:
 - 1. Counterweight sets: Samson 3-strand x 7/8" Pro-Master. Color: White.
 - 2. Grand Drape: Replace existing arbor operating (fiber) rope with same or equal. Rope is 1-1/4" diameter.
- E. Quantity:
 - 1. Reuse or replace existing operating rope with same exact type and manufacturer. If existing rope is reused, furnish enough spare coils to replace all sets
 - 2. Counterweight: As required for replacement of all sets.
 - 3. Grand Drape: As required

2.14 BATTEN PIPE CLAMPS

- A. Full pipe clamps
- B. Pipe clamps shall be made of tow strips of 12 gauge (2.780 mm) by 2 inch hot rolled steel formed to encompasses and clamp the pipe batten to prevent its rotation. Corners shall be rounded.
- C. There shall be a 3/8 inch x 1 inch hex bolt with lock nut above and below the batten. A 5/8 inch hole in the top of each clamp half allows the attachment of cable, chain, or other fitting.
- D. Full pipe clamps shall have manufacturer's recommended load rating of at least 750 lbs.

2.15 COUNTERWEIGHT

- A. Existing counterweight is to be re-used.

2.16 FIRE CURTAIN

- A. GENERAL

1. Fire curtains shall comply with the current version of ANSI E1.22 – Fire Safety Curtains, and NFPA 80. Ensure that all aspects of materials and installation are in accordance with applicable codes in every respect.
- B. Stay chain.
1. Existing stay chain to be re-used.
 2. The curtain shall be provided with safety anchor chains of a size and strength to safely support the weight of the curtain with safety factor herein specified. There shall be one more chain, in number, than the number of hoist lines and they shall be located centered between the hoist lines and at each end of the top batten or frame.
 3. Stay chains shall be fastened to pipe clamps on the top batten of an unframed fire curtain. For framed curtains, stay chains shall attach to steel angle along the top of the frame with rated and properly sized shackles. Mouse shackles after adjustments are completed.
 4. The stay chains shall be so adjusted that they support the curtain when it is in its lowered position and the bottom of the yield pad, over entire width of curtain, is in continuous contact with the stage floor.
 5. Stay chains shall be fastened to the gridiron, building structural steel, or proscenium wall. Connection points shall be sized for the shock loads imposed.
 6. Approved Equipment:
 - a. Crosby 3/8" SAE Grade 4 high test
- C. Curtain fabric
1. Existing Fire safety curtain fabric to be re-used.
- D. Hoisting system
1. Brown Theater
 - a. Existing fire curtain motor mechanisms to remain.
 - b. Fire curtain shall be suspended from existing motorized hoisting system. Curtain shall be capable of either motorized or non-motorized emergency operation. Emergency operation shall be by release of motor brake to allow fire curtain to lower itself at a controlled, and adjustable, rate of speed.
 - c. Fire curtain motor or other existing method shall be equipped with a hydraulic gear pump or other method to decelerate fully the free-falling fire curtain. If hydraulic method used, adjustable metering valve shall control rate of flow of hydraulic fluid which, in turn, controls speed of falling curtain.
 - d. Repair or replace dash pot (Brown Theater only). Another device for descending safety curtain may be used, if meeting all requirements of NFPA 80 release requirements ,and approved by Owner and Theater Consultant.
 2. Cullen Theater
 - a. Re-design and install fire curtain release mechanism to replace existing chain device at center grid chain release of overbalance bar at grid system with a new deck/mount style fire curtain hoist.
 - b. Replace wire rope lift lines.
 - c. Replace terminations at top batten with rated hardware.

- d. Inspect stay chain connection hardware at grid and batten. Replace with rated hardware if existing hardware is not rated. Do not replace stay chains
- e. Re-route release lines and other lines in the grid so they do not touch other lines or bind. Replace release lines.
- f. Emergency release mechanism.

- 1. Re-design and install fire curtain release mechanism to replace existing device at center grid chain release of overbalance bar at grid system with a new Deck/Wall mounted style fire curtain hoist with integrated emergency lowering release.

- a) Add Deck/Wall mounted fire curtain hoist and associated equipment. Provide emergency lowering speed controlled equipment with hydraulic governor to slow emergency curtain travel to comply with NFPA 80
- b) Provide motorized hoist for normal operation.
- c) Provide push button control station.
- d) Provide connection ability for integration for operation with existing automation rigging control system.

- g. Replace or re-condition of the emergency mechanism so mechanism runs smoothly. Replace or re-condition pulleys at grid and realign as necessary. Align lines so they do not bind on pulleys or at corner redirection support pipe keepers.
- h. Remain existing normal day to day operation
- i. Comply with NFPA 80
- j. Electrical power circuit and installation to be provided by Owner.

- 1. Coordinate install requirements with Owner's Electrical Contractor

- 3. When in the raised position, bottom of the curtain shall not be visible from any seat in the first row of auditorium.

E. Emergency Release

- 1. Emergency operation of the curtain shall be effected by gravity, with the release of the motor brake by a release line equipped with a minimum of six 165° fusible links.
- 2. Fire Curtain Release Boxes shall be located each side of the proscenium opening. Verify mounting location on the proscenium wall.
- 3. Emergency release line shall be routed from the Fire Curtain Release Boxes vertically up the proscenium wall then horizontally across the face of the proscenium wall above the gridiron. No fusible link shall pass over a sheave.
- 4. Curtain, when released, shall close within applicable code requirements.
- 5. Recondition Release mechanism to be in good working order. Replace or recondition release pulleys (Cullen Theater particularly.)
- 6. Repair or replace dash pot (Brown Theater)

F. Top Batten Clamp Two Part Clamps for Fire Safety Curtains

- 1. Lift line attachment to curtain top batten shall be made with pipe clamps made of minimum 12-gauge steel with corners rounded and entire assembly deburred. Clamps shall attach to the batten using minimum 3/8 inch Grade 5 bolts, with the

lift cable securely attached using a thimble and swaged fitting. No method of attachment shall required cutting the curtain fabric as to leave exposed cut edges.

2.17 MOTORIZED RIGGING COMPONENTS

- A. All motors, hoisting cables, chain, sheaves, hardware, etc., shall be rated for overhead lifting; capable of supporting design loads as shown and shall be of, or treated with, corrosion resistant materials.

2.18 CURTAIN FABRICS

- A. Cullen Theater: Only Cullen Theater is replaced in this current scope of work.
- B. Refer to attached "Specifications for House Curtains for Brown and Cullen Theaters – Wortham Theater Center" for specific requirements for replacement of Cullen Theater Grand Drape.
- C. The replacement curtain are to match the existing House Curtain in every detail. Notify Consultant of any deviation. Any deviation or changes shall be approved by Consultant and Wortham Theater Center.

2.19 STAGE CURTAIN TRACK ACCESSORIES

- A. For the purposes of establishing a standard of quality desired, curtain tracks and certain other products of Automatic Devices Company (ADC), 2121 S. Twelfth St., Allentown, PA, (610) 767-6000, have been used in this specification and in the drawings.
- B. Refer to Itemized list and any Drawings and/or Rigging Schedule for equipment types, sizes and quantities.
- C. Channel Traveler Track Type - Silent Steel 283-R Series Track complete with all necessary accessories for manual rope pull operation. Specific track lengths are shown in the Rigging Schedule. Included equipment:
 - 1. 8" Floating Sandbag Tension Pulley: ADC No. FSBTP-8.
 - 2. 8" Adjustable Floor Pulley: ADC No. 2866-A
 - 3. 8" Live End Pulley: ADC No. 2863-A
 - 4. 8" Dead End Pulley: ADC No. 2864-A
 - 5. 1/2" Synthetic center pull cord: ADC No. 2830 Cord
 - 6. Single Carriers equipped with neoprene-tired ball bearing wheels: ADC No.2849
 - 7. Master Carriers equipped with neoprene-tired ball bearing wheels ADC No.2850
 - 8. Back-Pack Guide: ADC No.2833-A
 - 9. Rubber Bumpers ADC No. 2825
 - 10. Curtains shall be connected to Carriers by means of a heavy-duty steel self-closing clip at each Carrier which connects the trim chain of each Carrier to grommets located at the top of the curtains. Connection by means of S-Hook or other device requiring tools to open or close shall not be acceptable.

2.20 SYSTEM SIGNAGE

- A. Provide placard(s), placed in conspicuous location(s) and as indicated on Drawings, visible from the operating area(s), with information on stage rigging system.

- B. Sign shall be screen-printed plastic, permanently secured, filled with contrasting paint, with text as shown in the Drawings.
- C. Size and quantity per Drawings.
- D. Coordinate mounting location in the field with Consultant.
- E. Sign shall contain the following information:
 - 1. Lineset loading capacities
 - 2. Weight of each size of counterweight brick
 - 3. Safety warning information
 - 4. Other information as required

PART 3 EXECUTION

3.01 INSTALLATION, LABOR AND SUPERVISION

- A. Employ only fully trained stage riggers, assisted by competent common laborers, for the erection and installation of the stage equipment and related accessories herein specified. Stage Riggers shall be adequately and properly trained in the erection and installation of the style of rigging specified herein. Employ a competent superintendent on the work at all times.
- B. Install all items of the stage rigging where indicated and completely connect and make operative as specified. Install in accordance with generally accepted theater industry practices and the following references.
 - 1. USITT Recommended Guidelines for Stage Rigging and Stage Machinery
 - 2. Macwhyte Wire Rope Handbook (published by Macwhyte Wire Rope Company)
 - 3. Rigging Manual (published by the Construction Safety Association)
 - 4. Wire Rope User's Manual (published by American Iron and Steel Institute)
- C. Install draperies (House Curtain/Grand Drape) at scheduled locations. After installation, all curtains and draperies shall be thoroughly brushed to remove all loose dust, visible dirt, fabric lint, loose threads, etc. Wrinkles will be permitted to fall out naturally. All curtains, or draperies, shall hang level and be uniformly in contact with the stage floor along the entire width of the curtain, or drapery.
- D. Existing draperies and other existing equipment on linesets
 - 1. Contractor shall be responsible to move all soft goods and other equipment from uncompleted linesets to completed or alternate lineset.
 - 2. Protect soft goods and other existing sets (such as Electrics) from damage.
- E. Install cable clips where specified in accordance with manufacturer's installation instructions with correct amount of torque on nuts. After installation, apply a load to each batten and re-check for proper torque on nuts of cable clips.
- F. Battens shall be trimmed level to the horizon and parallel to the stage or auditorium floor to a tolerance of $\pm\frac{1}{2}$ inch over the length of the batten. A batten shall not deviate from true straight installation by more than $\pm\frac{1}{2}$ inch.

- G. Maintain wire rope fleet angles at one and one-half degrees ($1\frac{1}{2}$) or less. Install Mule Blocks as required to maintain specified angles. System should run quietly in every respect when operated.
- H. Install electrical devices provided under this section for proper hoisting of equipment. Install cable saddles and rigging for plug strips and hanging plug box SO cables. Cable saddles are existing and uninstalled and re-installed under this section. Electrical cables shall be installed in such a manner that the entire length of all cables is in a plane parallel to the associated set and so that, except for the terminal, no portion of the cable ever rests on or interferes with the electrical device supplied. Provide support, muling, and turning blocks as required for proper support and movement of the electrical cables and cords.
- I. Install counterweight arbors so they may be loaded at the loading gallery when batten is at scheduled low trim.

3.02 FLAMEPROOFING OF FABRICS

- A. Fabrics shall comply with all State and local codes and regulations including:
 - 1. IBC 410.3.6 and 806
 - 2. NFPA 701
- B. Treat fabric in accordance with the requirements of the State and other governing authorities (unless fabric is inherently flameproof)
- C. Mark each curtain, drape, leg, border, or other fabric item with flameproofing information as required by applicable codes.
- D. Provide three copies of certificates of flame resistance treatment to the Architect for distribution to Owner and Fire Department Official.

3.03 FLAMEPROOFING OF FABRICS

- A. All fabrics used in the fabrication of the curtains and draperies herein specified, if not inherently flame-resistant by nature and fiber content of their own construction, shall be chemically flameproofed, by immersion process with pressure rolled extraction, in a formula approved by the Bureau of Standards of the United States Department of Commerce, and the finished fabrics, after treatment shall pass such tests as required by the Fire Marshal of the city of installation. A certificate for each type and color of cloth used in the fabrication of curtains and draperies for this project shall be furnished to the Architect before request for payment for such equipment is made. The certificate shall provide the following information:
 - 1. The name of the Rigging Contractor.
 - 2. The name and color of the fabric covered by the certificate.
 - 3. The name of the firm doing the flameproofing (chemical treatment).
 - 4. The date of the treatment.
 - 5. The date of re-treatment will be required.
 - 6. The name of the chemical formula used.
 - 7. The method of application of the chemical used.
 - 8. The signature of an officer of the company doing the flameproofing.
 - 9. The signature of an officer of the company installing the equipment, herein known as the Rigging Contractor.

10. Both signatures shall be affixed to the certificate. A Notary Public appointed within the State where the flameproofing is done may witness the signature of the officer of the company doing the flameproofing. The signature of the Rigging Contractor may be notarized by a Notary Public appointed in the state of the installation or where the Rigging Contractor's office is located.

3.04 FABRICATION OF CURTAINS

- A. Refer to attached "Specifications for House Curtains for Brown and Cullen Theaters – Wortham Theater Center" for specific requirements for replacement of Grand Drapes.
- B. The replacement curtains are to match the existing House Curtains in every detail. Notify Consultant of any deviation. Any deviation or changes shall be approved by Consultant and Wortham Theater Center.
- C. Any items not covered under "Specifications for House Curtains for Brown and Cullen Theaters – Wortham Theater Center" shall conform to the information contained below and in this section.
 1. All fabrics shall be sewn with box-pleats to specified fullness to jute upholstery webbing. Pleats shall be spaced 12" on center. All thread used in sewing these curtains and draperies shall be cotton mercerized and shall be the color of the fabric on which it is used, both in the needle and bobbin. The needle thread shall not be lighter than #16 in size, and the bobbin thread shall not be lighter than #24 in size. The same size thread shall not be used in both needle and bobbin. Double rows of stitching shall be used to sew the fabrics to the webbing. Bad stitching, missed stitches, puckered seams and hems, etc., will not be acceptable. All seams shall be sewn in straight and even lines.
 2. All panels of fabric shall be of a single piece for the entire height of the curtain in which it is used. No splicing of fabric to achieve a desired length of cloth will be acceptable.
 3. Linings shall be sewn into the top hem with same fullness as curtain. Vertical hems shall be 1-1/2" and shall fall 6" inside the curtain size. Tack to curtain with 3/4" webbing on 12" center. Bottom hem to be 3" and 6" shorter than curtain. Tack to curtain same as sides. Webbing tacks to allow enough slack to keep from distorting curtains in any way, and to allow for stretching of curtain fabric.
 4. Bottom hems of all curtains shall be 6" and shall be weighed with a #6 galvanized pump chain. This chain shall first be encased within a heavy canvas pocket, with the pocket being sewn inside the top half of the hem, thus keeping the chain from resting on the bottom of the hem.
 5. Center of all curtains shall be marked clearly on the top webbing. If ties are provided with the curtain, they shall be black in color, except at center, unless otherwise noted.
 6. Curtains, which are to be operated on traveler tracks, shall be equipped with black brass grommets set on 12" centers along the top webbing. The curtain or drapery shall be connected to the track carriers by means of a galvanized carrier-to-curtain fastener, as previously specified, at each grommet. Traveler panels shall be sewn with half-width fold-back on both leading and trailing edges.
 7. After installation in the building in their proper positions and prior to Owner turnover, all curtains shall be thoroughly brushed to remove all loose dust, visible dirt, fabric lint, loose threads, etc. Wrinkles will be permitted to fall out naturally.

8. Curtains shall have a permanent tag (no larger than 4" x 3") affixed to the top, upstage right corner of each finished panel. Each tag shall include the following information:
 - a. Name of Facility.
 - b. Name of company installing the equipment specified in this section.
 - c. Date installed.
 - d. Finished size (example 24'-0" H x 5'-0" W).
 - e. Use (see Rigging Schedule).
 - f. Fabric manufacturer, name, weight, and color.

3.05 CLEARANCES

- A. Entire rigging system and components shall, when completed, be free running and free from binding, rubbing, bumping, etc., in all respects.
- B. Trim all curtains or draperies that are operated on traveler tracks at the drapery trim chain. Curtains shall be trimmed ¼" above the finished floor with a tolerance of +/-1/8".

3.06 INSTRUCTION OF OWNER PERSONNEL

- A. A representative of the Contractor, fully knowledgeable and qualified in Rigging Systems operation, shall provide four (4) hours of instruction to the Owner designated personnel on the use and operation of this System. Designated instruction times shall be arranged through the Owner and will occur over up to two sessions.
- B. Instruction shall be scheduled in conformance with test and instruction schedules, and availability of Owner, staff, Consultant, and their representatives. While it may be possible to schedule the instruction session(s) to coincide with commissioning, such coincidence shall not be assumed.

3.07 CLEANING OF THE SITE

- A. Remove from the site all rubbish, trash, discarded packing materials, cartons, and other debris caused by daily operations. Upon completion of work, the entire area of work shall be left in broom and mop clean condition.

(SEE SPECIAL ANNEX "SECTION FOR HOUSE CURTAINS FOR BROWN AND CULLEN THEATERS – WORTHAM THEATER CENTER")

NOTE: THIS IS THE ORIGINAL HOUSE CURTAIN SPECIFICATON AND THE NEW REPLACEMENT CURTAINS AS NOTED IN ITEMIZED LIST FOR 2024 and 2025 RENOVATION IS TO MATCH THE EXISTING CURTAIN IN EVERY RESPECT.

**SPECIFICATIONS
FOR
HOUSE CURTAINS
FOR
BROWN & CULLEN THEATERS
WORTHAM THEATER CENTER**

SCOPE:

The intent of these specifications is to provide documentation for the purchase of House Curtains for both the Brown Theater and the Cullen Theater at the Wortham Theater Center. It is intended that these House Curtains will replace existing curtains, which have been in service for 18 years. The furnishing and delivery of these House Curtains specified herein shall be the sole responsibility of the successful bidder. Any changes or modifications to these specifications must be discussed with Derwood J. Freitag, Director of Backstage Operations, Wortham Center Operating Company, prior to submitting bid.

GENERAL DRAPERY CONSTRUCTION SPECIFICATIONS:

All fabrics shall be inherently flameproofed in accordance with standard industry practice and applicable codes. All fabrics shall pass NFPA 701 – Small Scale Test, State of California, Reg. 85.05. Spray method of flameproofing will not be considered. The successful bidder upon completion of all work shall provide flameproofing certificates to the Wortham Center Operating Company. Fabric samples of sufficient size for comparison purposes shall be submitted to the Wortham Center Operating Company for all fabrics to be provided.

BROWN THEATER HOUSE CURTAIN SPECIFICATIONS:

Brown Theater House Curtain shall consist of two (2) curtains, each **36-feet 0-inches** high by **38-feet 0-inches** wide. Fabric for the curtain shall be 26-ounce first quality red velour that must match the existing house curtain fabric in both quality and color. Unless there is an exact color match, standard manufacturer colors will not be considered. Existing house curtain was fabricated from 26-ounce velour, special custom dyed to match theater-seating fabric, distributed by Frankel Associates. Curtains shall be fabricated with velour from one and the same dye lot. The fabric shall be without flaws, with each width of cloth continuous for the full height of the curtain with no horizontal seams or piecing. There shall be 60% extra width of material fabricated into each curtain for fullness. The nap of the velour shall be DOWN.

Each curtain shall be flat-pleated onto best quality 3-1/2 inch wide jute webbing with pleats occurring at equal intermediate intervals of 12-inches. Heavy-duty grommets shall be inserted

at each pleat, at 12-inch intervals and at each on-stage leading and off-stage trailing edge. The on-stage leading edge of each curtain shall have 60-inches sewn completely flat without fullness and the off-stage trailing edge shall have 12-inches sewn completely flat without fullness. Turn-backs are created folding the on-stage and off-stage edges around the finished Lining/Interlining which is 4-feet narrower than the finished velour face fabric. The on-stage edge of both curtains shall have a 1-inch hem along with two vertical rows of 1-inch x 12-inch strips of Velcro tape spaced 2-feet apart, sewn on the non-nap side at the hem and at 36-inches from the hem, for the full height of the curtain. Each seam shall have 1-inch x 12-inch strips of Velcro tape spaced 2-feet apart, sewn along the full length of the seam, to hold the Interlining. The off-stage edge of both curtains shall have a 1-inch hem along with two vertical rows of 1-inch x 12-inch strips of Velcro tape spaced 2-feet apart, sewn on the non-nap side at the hem and at 12-inches from the hem, for the full height of the curtain. Strong spring snaps (A.D.C. #CCF-2) shall be attached to each grommet; S-hooks are unacceptable. Snap hooks (Mutual Hardware #2340) shall be attached, at 36-inches from each on-stage edge and at 12-inches from each off-stage edge, with strong fastenings by means of canvas straps passed through the loops of the snap hooks and sewn along the tops and sides for not less than 12-inches. Each curtain shall have a 5-inch bottom hem with an interior chain pocket fabricated from duck and inserted with a Number 8 jack chain. The chain pocket shall be fabricated in such fashion that the chain is held 2-inches above the bottom of the fabric.

Each curtain shall have a Lining and Interlining fabricated together with a finished width of **34-foot 0-inches**. Lining and Interlining shall have the same fullness but be fabricated separate from the velour face fabric. Lining shall consist of a Sanforized warped sateen fabric (Frankel Associates), beige in color, 100% cotton and pre-shrunk. The Lining shall have a 5-inch bottom hem with an interior chain pocket fabricated from duck and inserted with a Number 8 jack chain. The Lining chain pocket shall be fabricated in such fashion that the chain is held 2-inches above the bottom of the fabric. The Lining shall be fabricated 2-inches shorter than the specified length of the velour face fabric. Interlining shall consist of a black double-face acoustical felt (Valley Forge #1200 black acoustical felt) and be fabricated 2-inches shorter than the Lining. The Interlining shall have a 3-inch bottom hem. The Lining shall be joined to the Interlining at the top via the jute webbing and at the bottom using canvas straps attached to the top of the bottom hem and spaced 24-inches apart. Each on-stage and off-stage edge of the Lining shall be joined to the Interlining using canvas straps spaced 12-inches apart for the full height of the Lining. Each on-stage edge of the Lining shall be joined to the velour face fabric using 1-inch Velcro tape spaced 36-inches apart for the full height of the Lining. Each off-stage edge of the Lining shall be joined to the velour face fabric using 1-inch Velcro tape spaced 12-inches apart for the full height of the Lining. Interlining shall be joined to the bottom of the velour face fabric and down each vertical seam using 1-inch x 12-inch strips of Velcro tape. All attachment points must be spaced exactly the same on the Lining, Interlining and velour face fabric so that each curtain hangs straight.

There shall be a heavy #8 duck pocket fabricated into the Lining of the off-stage left trailing edge to receive the demountable draw-curtain floor block. Pocket shall be 15-inches wide by 36-inches high. Top of the pocket shall be located 10-feet above the bottom of the curtain and be sealable with 2-inch Velcro tape. Fabric fasteners shall be located along the trailing edge at equal 1-foot intervals for a length of 12-feet above top of this pocket to secure the hauling line. Three non-looped paging straps spaced 4-feet apart shall be fabricated into the backside of the leading edge of the stage left curtain.

Successful bidder shall supply an additional 40 yards of the same fabric from the same dye lot as is used to fabricate the Brown Theater House Curtain.

BROWN THEATER CURTAIN TRACK HARDWARE:

NOTE: THE EQUIPMENT BELOW IS FOR REFERENCE. SEE ITEMIZED LIST FOR SPECIFIC ITEMS TO BE PROVIDED FOR 2024/2025 RENOVATION.

Bidder shall furnish all Brown Theater curtain track hardware specified below.

- 2 – Nylon Tired Ball-Bearing Master Carrier (ADC #2852)
- 80 – Nylon Tired Ball-Bearing Single Carrier (ADC #2851)
- 80 – Backpack Guides (ADC #2833)
- 80 – Rubber Spacer (ADC #2826)
- 80 – Rubber Spacer (ADC #2827)
- 1 – Four-inch Nylon Wheel Live-End Pulley (ADC #2803)
- 1 – Four-inch Nylon Wheel Dead-End Pulley (ADC #2804)
- 1 – Five-inch Ball-Bearing Nylon Wheel Detachable Floor Block (ADC #DFB-2)
- 1 – 250 foot length of Black #12 Solid-Braid Sash Cord

CULLEN THEATER HOUSE CURTAIN SPECIFICATIONS:

Cullen Theater House Curtain shall consist of two (2) curtains, each **32-foot 0-inches** high by **30-foot 0-inches** wide. Fabric for the curtain shall be 26-ounce first quality maroon velour that must match the existing house curtain fabric in both quality and color. Unless there is an exact color match, standard manufacturer colors will not be considered. Existing house curtain was fabricated from 26-ounce “Ruby” color velour distributed by Frankel Associates. Curtains shall be fabricated with velour from one and the same dye lot. The fabric shall be without flaws, with each width of cloth continuous for the full height of the curtain with no horizontal seams or piecing. There shall be 60% extra width of material fabricated into each curtain for fullness. The nap of the velour shall be DOWN.

Each curtain shall be flat-pleated onto best quality 3-1/2 inch wide jute webbing with pleats occurring at equal intermediate intervals of 12-inches. Heavy-duty grommets shall be inserted at each pleat, at 12-inch intervals and at each on-stage leading and off-stage trailing edge. The on-stage leading edge of each curtain shall have 60-inches sewn completely flat without fullness and the off-stage trailing edge shall have 12-inches sewn completely flat without fullness. Turn-backs are created folding the on-stage and off-stage edges around the finished Lining/Interlining which is 4-feet narrower than the finished velour face fabric. The on-stage edge of both curtains shall have a 1-inch hem along with two vertical rows of 1-inch x 12-inch strips of Velcro tape spaced 2-feet apart, sewn on the non-nap side at the hem and at 36-inches from the hem, for the full height of the curtain. Each seam shall have 1-inch x 12-inch strips of Velcro tape spaced 2-feet apart, sewn along the full length of the seam, to hold the Interlining. The off-stage edge of both curtains shall have a 1-inch hem along with two vertical rows of 1-inch x 12-inch strips of Velcro tape spaced 2-feet apart, sewn on the non-nap side at the hem and at 12-inches from the hem, for the full height of the curtain. Strong spring snaps (A.D.C. #CCF-2) shall be attached to each grommet; S-hooks are unacceptable. Snap hooks (Mutual Hardware #2340) shall be attached, at 36-inches from each on-stage edge and at 12-inches from each off-stage edge, with strong fastenings by means of canvas straps passed through the loops of the snap hooks and sewn along the tops and sides for not less than 12-inches. Each curtain shall have a 5-inch bottom hem with an interior chain pocket fabricated from duck and inserted with a Number 8 jack

chain. The chain pocket shall be fabricated in such fashion that the chain is held 2-inches above the bottom of the fabric.

Each curtain shall have a Lining and Interlining fabricated together with a finished width of **26-foot 0-inches**. Lining and Interlining shall have the same fullness but be fabricated separate from the velour face fabric. Lining shall consist of a Sanforized warped sateen fabric (Frankel Associates), beige in color, 100% cotton and pre-shrunk. The Lining shall have a 5-inch bottom hem with an interior chain pocket fabricated from duck and inserted with a Number 8 jack chain. The Lining chain pocket shall be fabricated in such fashion that the chain is held 2-inches above the bottom of the fabric. The Lining shall be fabricated 2-inches shorter than the specified length of the velour face fabric. Interlining shall consist of a black double-face acoustical felt (Valley Forge #1200 black acoustical felt) and be fabricated 2-inches shorter than the Lining. The Interlining shall have a 3-inch bottom hem. The Lining shall be joined to the Interlining at the top via the jute webbing and at the bottom using canvas straps attached to the top of the bottom hem and spaced 24-inches apart. Each on-stage and off-stage edge of the Lining shall be joined to the Interlining using canvas straps spaced 12-inches apart for the full height of the Lining. Each on-stage edge of the Lining shall be joined to the velour face fabric using 1-inch Velcro tape spaced 36-inches apart for the full height of the Lining. Each off-stage edge of the Lining shall be joined to the velour face fabric using 1-inch Velcro tape spaced 12-inches apart for the full height of the Lining. Interlining shall be joined to the bottom of the velour face fabric and down each vertical seam using 1-inch x 12-inch strips of Velcro tape. All attachment points must be spaced exactly the same on the Lining, Interlining and velour face fabric so that each curtain hangs straight.

There shall be a heavy #8 duck pocket fabricated into the Lining of the off-stage left trailing edge to receive the demountable draw-curtain floor block. Pocket shall be 15-inches wide by 36-inches high. Top of the pocket shall be located 10-feet above the bottom of the curtain and be sealable with 2-inch Velcro tape. Fabric fasteners shall be located along the trailing edge at equal 1-foot intervals for a length of 12-feet above top of this pocket to secure the hauling line. Three non-looped paging straps spaced 4-feet apart shall be fabricated into the backside of the leading edge of the stage right curtain.

Successful bidder shall supply an additional 25 yards of the same fabric from the same dye lot as is used to fabricate the Cullen Theater House Curtain.

CULLEN THEATER CURTAIN TRACK HARDWARE:

NOTE: THE EQUIPMENT BELOW IS FOR REFERENCE. SEE ITEMIZED LIST FOR SPECIFIC ITEMS TO BE PROVIDED FOR 2024/2025 RENOVATION.

Bidder shall furnish all Cullen Theater curtain track hardware specified below.

- 2 – Nylon Tired Ball-Bearing Master Carrier (ADC #2852)
- 60 – Nylon Tired Ball-Bearing Single Carrier (ADC #2851)
- 60 – Backpack Guides (ADC #2833)
- 60 – Rubber Spacer (ADC #2826)
- 60 – Rubber Spacer (ADC #2827)
- 1 – Four-inch Nylon Wheel Live-End Pulley (ADC #2803)
- 1 – Four-inch Nylon Wheel Dead-End Pulley (ADC #2804)
- 1 – Five-inch Ball-Bearing Nylon Wheel Detachable Floor Block (ADC #DFB-2)
- 1 – 200 foot length of Black #12 Solid-Braid Sash Cord

WARRANTY:

Standard manufacturer's warranty shall be provided.

RECOMMENDED BIDDER:

Rosebrand Fabrics
<http://www.rosebrand.com>

END OF SECTION ANNEX 11 61 33

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**WORTHAM THEATER CENTER
 RIGGING RENOVATION
 HOUSTON, TX**

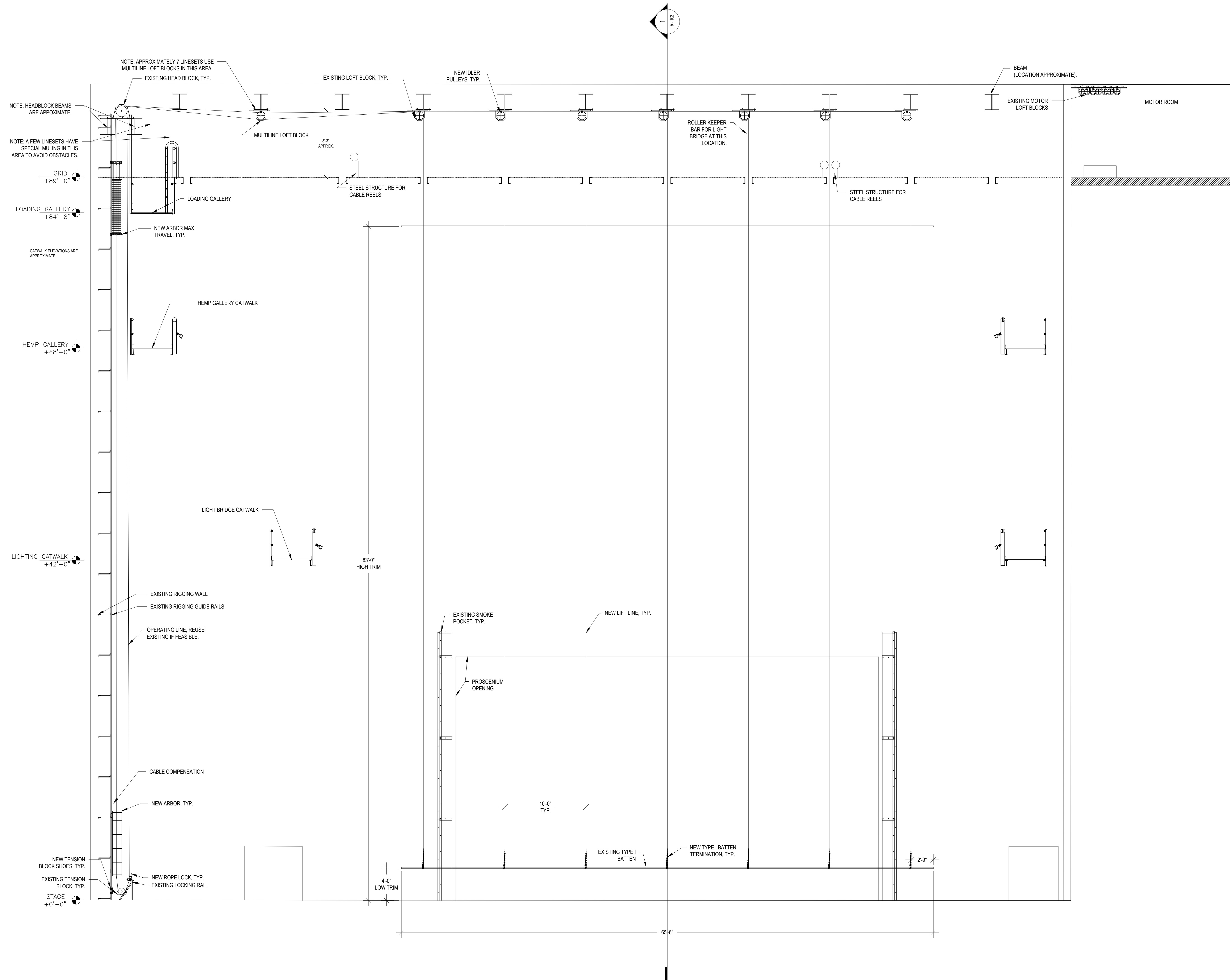
WORTHAM THEATER CENTER
 801 TEXAS AVENUE
 HOUSTON, TX

ISSUANCES		
#	DESCRIPTION	DATE

DATE: 12 15 23
 SCALE: AS NOTED
 DRAWN: BS
 APPROVED:
 PROJECT #: 2352.00

**ELEVATION -
 BROWN THEATRE
 UTILITY LINESET**

TR - 103



1 ELEVATION - BROWN UTILITY LINESET
 SCALE: 3/16" = 1'-0"

DRAWING NAME: 231115 WORTHAM RIGGING RENOVATION (240119) | PLOTTED BY: KENT CONRAD | DATE PLOTTED: 29-Mar-24 | SCALE: 1:1

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 HOUSTON, TX**

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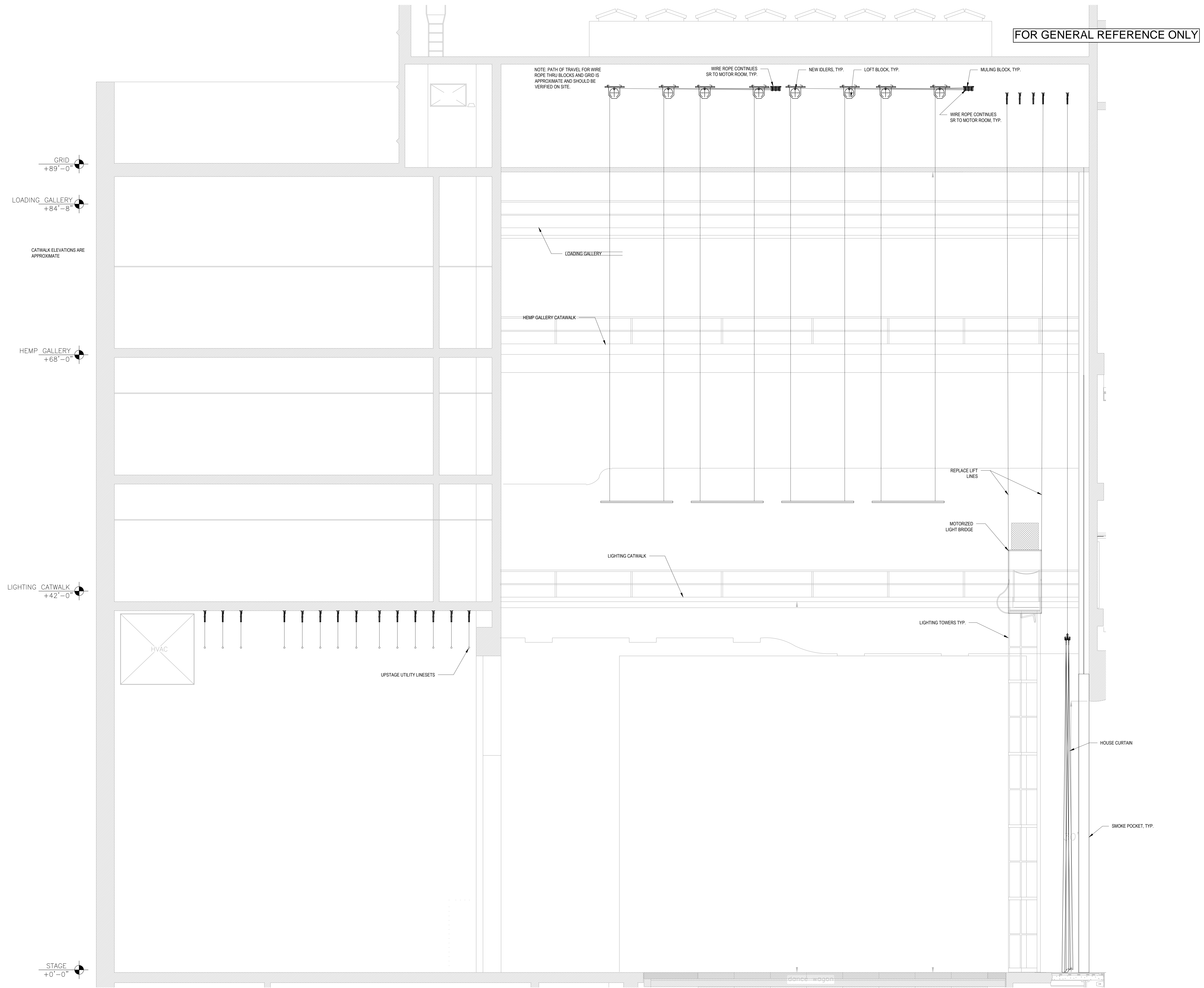
ISSUANCES		
#	DESCRIPTION	DATE

DATE: 12 14 2023
 SCALE: AS NOTED
 DRAWN: BS
 APPROVED: XXX
 PROJECT #: 2352.00

**ELEVATION -
 BROWN THEATRE
 MOTORIZED
 LIGHT LADDERS**

TR - 105

FOR GENERAL REFERENCE ONLY



1 ELEVATION - MOTORIZED LIGHTING LADDERS, TYP.
 SCALE: 1/4" = 1'-0"

DRAWING NAME: 231115 WORTHAM RIGGING RENOVATION-240119 | PLOTTED BY: KENT CONRAD | DATE PLOTTED: 29-Mar-24 | SCALE: 1:1

\\schuler-shook.com\Users\kconrad\Projects\231115 Wortham Rigging Renovation\240119\240119.dwg | 231115-Wortham-Rigging-Renovation-240119.dwg | 2/23/24 10:42:44 AM

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**WORTHAM THEATER CENTER
 RIGGING RENOVATION
 HOUSTON, TX**

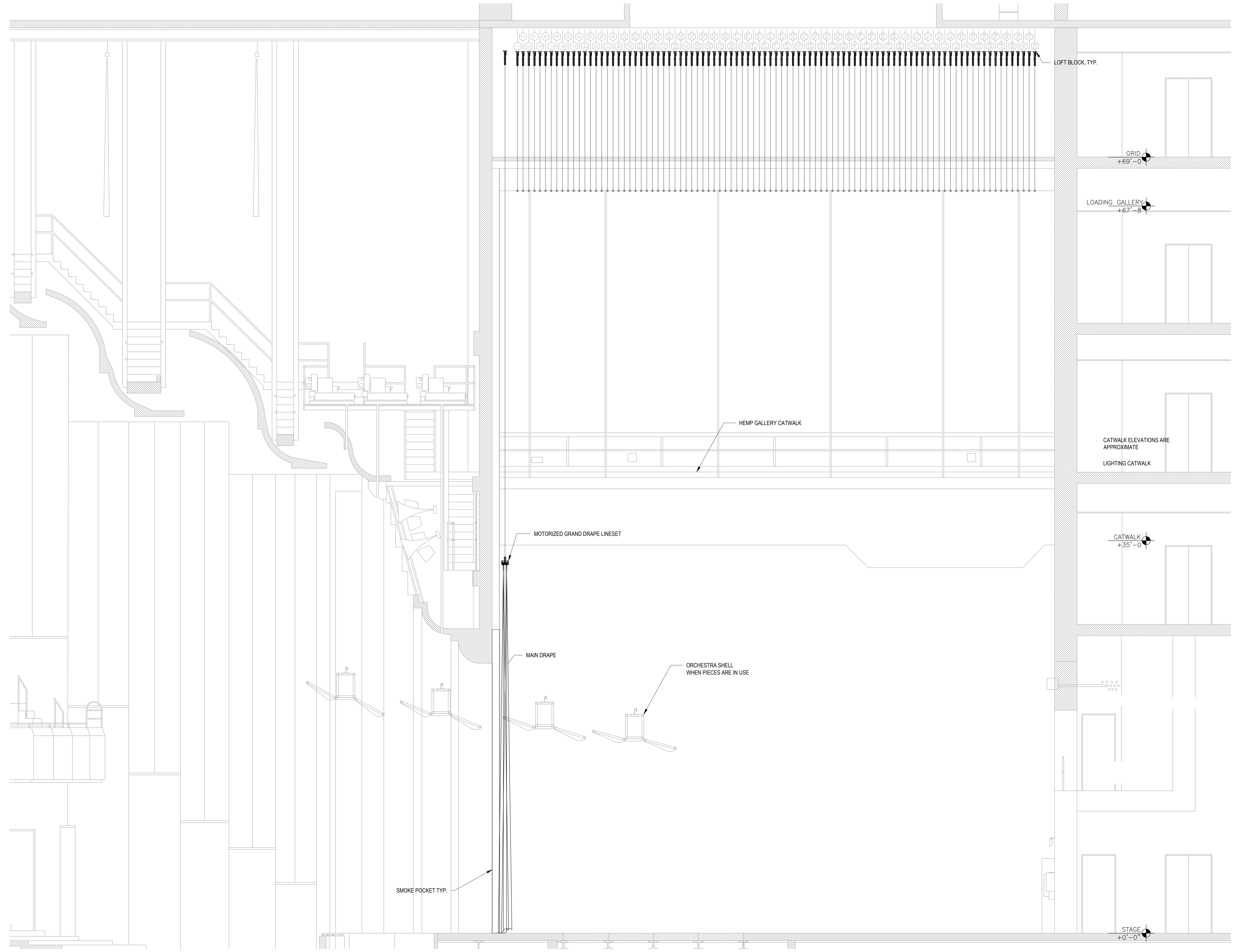
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 801 TEXAS AVENUE
 HOUSTON, TX

ISSUANCES		
#	DESCRIPTION	DATE

DATE: 12 15 23
 SCALE: AS NOTED
 DRAWN: BS
 APPROVED: XXX
 PROJECT #: 2352.00

CENTERLINE SECTION - CULLEN THEATRE

TR - 202



1 CENTERLINE SECTION - CULLEN THEATRE
 SCALE: 1/4" = 1'-0"

DRAWING NAME: 231115 WORTHAM RIGGING RENOVATION-240119 | PLOTTED BY: KENT CONRAD | DATE PLOTTED: 28-Mar-24 | SCALE: 1:1

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