

SECTION 11010 – STAGE RIGGING AND DRAPERIES

**PART 1 - GENERAL**

1.1 GENERAL CONDITIONS

- A. The General Conditions of the Contract Documents shall apply to the work in this Section.

1.2 WORK INCLUDED

- A. The work of this Section includes all labor, materials, equipment and services necessary to complete the work shown on the drawings and specified herein, including, but not limited to, the following:
1. Proscenium fire curtain and motorized lineshaft rigging.
  2. Manual counterweight set for the house curtain.
  3. T-bar battery for total inventory of undedicated, manual counterweight sets, spaced 6 inches center.
  4. 1600 pound capacity, single purchase, undedicated, manual counterweight sets. Quantity: as shown on the drawings.
  5. Upper and lower continuous lock rails and associated index strip lights.
  6. 3 motorized counterweight sets for the orchestra shell reflectors.
  7. 30,000 pounds of steel counterweights for the undedicated manual counterweight sets.
  8. Counterweights as required for all dedicated manual and motorized counterweight sets.
  9. 40 belaying pins.
  10. Rope blocks, rope, and cable cradles for stage lighting multiconductor cable pick-up.
  11. Rope blocks, rope, and related hardware for spotline rigging.
  12. Motorized, tracked variable acoustics curtain system.
  13. Hardware, additional steel, and mule blocks as shown on the Contract Documents.
  14. Additional hardware, steel, and mule blocks as required for operation of the system.
  15. All electrical work on the load side of the power feeds for motorized rigging, including conduit, wire and labor.
  16. Stage draperies.
  17. Studio Theatre pipe grid.
- B. The Owner reserves the right to request a Bill of Materials prior to the award of Contract.

1.3 RELATED WORK

- A. Related work which is not part of the work in this Section includes, but is not limited to, the following:
1. Rigging support steel, the gridiron, loading and fly galleries.
  2. Stage concert lighting systems, including junction boxes and multiconductor cables.
  3. Variable acoustics accommodations, including storage pockets, attachment surfaces, and motor access.
  4. Power feeds for motorized rigging.
  5. Mechanical system.
  6. Fire protection system.

1.4 ACCEPTABLE CONTRACTORS

- A. The following are acceptable Contractors:

1. J.R. Clancy, Inc.  
7041 Interstate Island Road  
Syracuse, New York 13209  
(315) 451-3440  
(315) 451-1766 FAX
2. InterAmerica Stage  
4300 St. Johns Parkway  
Sanford FL 32771  
(407) 302-0881  
(407) 302-0882 FAX
3. Pook Diemont and Ohl, Inc.  
701 East 132nd Street  
Bronx, New York 10454  
(718) 402-2677  
(718) 402-2859 FAX
4. SECOA  
8650 109th Avenue North  
Champlin, Minnesota 55316  
(763) 506-8800  
(763) 506-8844 FAX

*list continues...*

5. Texas Scenic Company  
5423 Jackwood Drive  
San Antonio, Texas 78238  
(210) 684-0091  
(210) 684-4557 FAX
6. I. Weiss  
2-07 Borden Avenue  
Long Island City, New York 11101  
(718) 706-8139  
(718) 482-9410 FAX

- B. Additional companies wishing to bid shall submit the following 10 days before submission of bids, for review and approval by the Theatre Consultant:
1. Firm history.
  2. A list of completed installations which are comparable in scope to the job described here.
  3. A minimum of 5 representative shop drawing sheets.
  4. If requested, a current certified financial statement showing sufficient financial base for the size of job described here.

#### 1.5 QUALITY ASSURANCE

- A. All equipment shall be manufactured and installed in accordance with the applicable standards of the following organizations:
1. American Society for Testing and Materials (ASTM).
  2. American National Standards Institute (ANSI).
  3. American Institute of Steel Construction (AISC).
  4. American Society of Mechanical Engineers (ASME).
  5. American Welding Society (AWS).
  6. American Gear Manufacturers Association (AGMA).
  7. National Electrical Code (NEC).
  8. National Electrical Manufacturers Association (NEMA).
- B. Design Standards
1. Minimum safety factor for rigging and related components: 8.
  2. Minimum diameter of wire rope sheaves and drums: 30 times the diameter of the wire rope.
  3. Maximum fleet angle: 1-1/2 degrees.
- C. Materials Standards
1. Structural steel: ASTM A-36.

2. Gray iron casting: ASTM A-48.
  3. Cold form steel: ASTM A-245.
  4. Bolts and fasteners: ASTM A-307 and A-563.
  5. Pipe battens: ASTM A-53 and A-120.
- D. Wire rope drums shall be grooved to accept the wire rope in a single layer, plus 3 dead wraps. Drum construction shall be all-welded. Lifting lines shall enter the drum through the tubing wall at a 45 degree angle, and shall be retained by a copper Nicopress stop sleeve.
- E. Rotary limit chain sprockets shall be pinned to prevent slipping and sized for maximum usable rotation of the switch cams.
- F. Gearmotor service factors and load classifications shall conform to AGMA recommendations. The minimum service factor shall be 1.0 for continuous operation and the minimum gearing service factor shall be 1.0 with a minimum mechanical strength service factor of 1.3.
- G. Limit switch chains and encoder belts located in trafficked areas shall be fully guarded.
- H. Shafting shall be keyed and designed to meet ANSI standards in order to properly transmit applied loads and torques with allowance for impact.
- I. This specification sets forth minimum safety standards, operational criteria, and minimum standards for quality in workmanship. It is the responsibility of the Contractor to design, engineer, furnish and install a safe, fully functional system in compliance with the design intent of the Contract Documents.
- J. Per the intent of this specification, "provide" means furnish and install.

#### 1.6 SUBMITTALS

- A. Within 3 weeks of the award of contract, submit written confirmation that related structural, miscellaneous metal and electrical work (as they appear on the Contract Documents) provide the necessary physical accommodations for the installation and operation of the equipment in this Section.
- B. Submit 1 reproducible set and 6 prints of shop drawings for review. Fabrication shall not commence until the Theatre Consultant and the Architect determine that the shop drawings are in compliance with the design intent of the Contract Documents. Shop drawings shall be revised and resubmitted as required.
- C. Shop drawings shall include the following:
1. 1/4 inch scale plans and elevations.
  2. To confirm related conditions and clearances, submit a 3/4 inch minimum scale composite section showing a typical loft block, the head block, arbor, T-bars, the loading and fly galleries, and the lock rail.
  3. Assembly drawings of all major components. Drawings shall include dimensions, weights, and bills of materials. Drawings shall show the construc-

- tion and capacity of each component, and the loads imposed on the building structure.
4. Manufacturer's product data for termination hardware, such as wire rope clips, turnbuckles, and chain.
  5. Finishes.
  6. Field survey information and dimensions.
  7. Estimated live and dead loads.
  8. Engineering calculations for all non-standard conditions. The Contractor shall be prepared to provide any engineering calculations requested by the Theatre Consultant, the Architect, or the Project Structural Engineer.
  9. Electrical riser and interconnection diagrams.
  10. Scale drawings of electrical and control system components provided by the Rigging Contractor.
  11. Locations of electrical and control system components provided by the Rigging Contractor indicated on building plans.
  12. Scale drawings of the control stations, which accurately depict all control devices and labeling.
- D. Drawing sheet size shall be uniform. Submittals of more than 5 drawings shall be bound. Drawings shall be rolled, not folded.
- E. Catalog information for standard equipment may be submitted instead of shop drawings. Such material shall be submitted on 8-1/2 x 11 sheets submitted in a 3-ring binder, GBC binding, or similar system.
- F. Upon completion of the installation, provide reduced sets of the shop drawings in 3-ring binders. Provide 2 copies for the Owner, 1 for the Theatre Consultant, and (if requested) 1 for the Architect.
- G. Provide 3 copies of an instruction and maintenance manual, 2 for the Owner and 1 for the Theatre Consultant. The manual shall include:
1. System description.
  2. Operation instructions, including safety measures.
  3. Maintenance instructions, including recommended procedures and schedules for inspecting system components.
  4. Catalog cuts for all purchased equipment
  5. Recommended spare parts list.

## 1.7 WARRANTY

- A. Warrant the equipment in this Section to be free of defects in materials and workmanship for a period of 2 years after acceptance of the completed installation by the Owner. Defective work shall be repaired and replaced at no cost to the Owner. The Warranty shall not cover the results of normal use, nor shall it cover damage due to neglect or improper use of the equipment.

- B. Provide all required maintenance or replacement within 30 days of notification by the Owner, with the following exception: All required maintenance or replacement which affects the safe operation of the installation shall be accomplished within 48 hours.
- C. The Warranty shall include 2 service visits by the Contractor. The visits shall take place at the end of each of the 2 years under Warranty. The Contractor shall consult with the Owner's staff, inspect the system, and perform any necessary maintenance and repair. The Contractor shall submit a report to the Owner and the Theatre Consultant after each service visit. The report shall include inspection and maintenance schedules based on the actual use of the equipment.

## **PART 2.00 - EQUIPMENT**

### **2.1 FINISHES**

- A. Metal parts shall be free from rust, scale, dirt, and welding spatter. All weldments or other metal components shall receive a coat of corrosion resistant primer prior to finish coating and component assembly.
- B. Finish coat shall be flat alkyd enamel. Color shall be black, except where noted otherwise in the Contract Documents.

### **2.2 FABRICS**

- A. Velour for stage draperies: 100 percent polyester, 25 ounce, inherently flame retardant fabric, JB Martin "Dante", or approved equal.
- B. Velour for variable acoustics curtains: 100 percent cotton, 25 ounce velour, KM Fabrics' "Majestic", or approved equal.
- C. Muslin Cyclorama: 100 percent cotton, .7 ounce per square foot, 32 foot wide, seamless fabric. Color: bleached white.
- D. Sharkstooth Scrim: 100 percent cotton, 31 foot wide seamless fabric.
- E. Where applicable, fabrics shall be flame treated in a manner approved by the appropriate local agency. A notarized affidavit shall accompany the draperies attesting that all fabrics have been flame treated in the approved manner.
- F. No pieced horizontal or split widths of fabric shall be incorporated in any part of any drapery.
- G. Fabrics of 1 color shall be from 1 dye lot.
- H. Velour nap shall run in a consistent direction. Nap shall run up for black velour masking pieces. Nap shall run down for the velour house curtain.

### 2.3 RIGGING BLOCKS: GENERAL

- A. Sheaves shall be made from one of the following: Class 30 grey iron, steel, high strength nylon resin, or reinforced polymer composite. All 8 inch diameter sheaves shall be high strength nylon resin, or reinforced polymer composite.
- B. Sheaves shall be machine turned and bored.
- C. Sheave grooves shall have tapered walls which support the wire rope and hand line rope between 135 and 150 degrees of their circumference.
- D. Sheaves shall have precision ball bearings, except as specified otherwise below. Bearings shall be rated for the maximum static and dynamic loads at maximum RPM, plus manufacturer's recommended safety factor. Minimum speed limit for manual counterweight sets: 200 FPM.
- E. Shafts shall be made of steel. Key each shaft at its head end to keep it from turning. Provide a fine thread self-locking nut at the opposite end for proper bearing adjustment.
- F. Sheave hubs shall be sized to provide adequate load support for the bearing assembly. Hub bores shall conform to the tolerances of the bearing manufacturer.
- G. Sheaves shall rotate plumb and true without touching the side plates.
- H. Pipe spacer bolt heads shall be located clear of adjacent lifting lines.
- I. All rigging blocks shall clamp in place for easy removal. Welding is not acceptable, except as approved by the Theatre Consultant.

### 2.4 HEAD BLOCKS

- A. Head blocks shall be designed and fabricated to support a 2000 pound minimum load.
- B. Head block sheaves shall be 12 inches in diameter with a groove for each wire rope lifting line and a groove for the hand line. Grooving shall be such that the centers of the wire rope and hand line have equal radii from the sheave axis.
- C. Sheaves shall have 1 inch minimum diameter shafts on tapered roller bearings.
- D. Side plate thickness shall be 8 gauge minimum. Provide pipe spacers to stiffen the side plates and prevent the lines from leaving the grooves.
- E. Base angles shall have their horizontal legs turned in. Weld the side plates to the base angles with interrupted passes, leaving no more than 60 percent clear. Weld a stop angle to the underside of the base angles, as shown on the drawings.
- F. Each head block with two 1/2 inch minimum mounting clips. Attach each clip with two 1/2 inch minimum diameter bolts. The clip system shall permit moving a head block and/or adding sets in the future without disturbing adjacent blocks.

- G. Locate the head block sheave in coordination with all related elements, including the loft blocks, loading and fly galleries, and lock rails. The onstage portion of the hand line shall be approximately 3 inches clear of the edge of the loading gallery.

## 2.5 LOFT BLOCKS

- A. Loft blocks shall be designed and fabricated to support a 500 pound minimum load.
- B. Loft block sheaves shall be 8 inches in diameter. Sheave material shall be high strength nylon resin, or reinforced polymer composite
- C. Sheaves shall have 5/8 inch minimum diameter shafts.
- D. Side plate thickness shall be 10 gauge minimum. Provide pipe spacers to stiffen the side plates and prevent the wire rope from leaving the grooves.
- E. Loft blocks shall have base angles and associated clips.
- F. Each loft block shall have a single-line sheave, except for the near block, which shall be grooved for each of the lifting lines in the set.
- G. The loft blocks between the near and far blocks shall have a 3 inch diameter, nylon idler sheave on ball bearings, with a groove for each adjacent lifting line. Provide a wire rope retaining pipe spacer for the idler sheave.

## 2.6 TENSION BLOCKS

- A. Tension block sheaves shall be 10 inches in diameter and grooved for a 3/4 inch diameter hand line.
- B. Sheaves shall have 3/4 inch minimum diameter shafts on sealed precision ball bearings.
- C. The tension block shall attach to the T-bars with 2 steel shoes. Provide steel backing plates for each shoe assembly.
- D. Provide each block housing with a kick plate angle.
- E. The tension block shall weigh a minimum of 40 pounds.

## 2.7 ARBORS

- A. Arbor tops and bottoms shall be connected by two 3/4 inch diameter solid steel rods and a back framing bar. Cast arbor components are not acceptable. Plate stock shall be a minimum of 3/8 inch thick.
- B. The 3/4 inch diameter rods shall be threaded at both ends and fitted with nuts. The bottom, onstage nut shall be a forged steel eye nut with cotter pin for attaching a capstan winch snap hook. Tap the holes in the arbor bottom to receive the rods for proper seating of the counterweights or provide additional nuts and a welded spacer bar.

- C. The back framing bar shall have 2 ultra high molecular weight (UHMW) polyethylene shoe assemblies for engaging the T-bars. Each assembly shall consist of 2 shoes, a minimum of 5/16 inches thick by 4 inches high with the width sized for working in T-bars 6 inches on center. Provide steel backing plates for each shoe assembly.
- D. Provide 2 forged steel, threaded, and plug welded eyes for the top and bottom hand line attachments.
- E. Provide each arbor with a 12 gauge spreader plates for every 2 feet of counterweights. Provide 2 lock collars with 1/4 inch thumb screws. Weld the onstage lock collar to the top spreader plate.
- F. Affix a sign nominally every 2 feet, on the back plate of each arbor, which says: "INSERT SPREADER HERE." Signs damaged during installation shall be replaced.
- G. Connect the hand line to the arbor directly over and under the arbor's center of gravity. Locate the lifting lines symmetrically around the hand line.
- H. Paint the bottom (underside only) of the arbor white, for visibility of the arbor from below during operation.

## 2.8 LIFTING LINES

- A. Lifting lines shall be 1/4 inch diameter 7 x 19 galvanized wire rope, with a minimum breaking strength of 7,000 pounds.
- B. Discard any damaged or deformed wire rope.
- C. Lifting line terminations at the arbor shall consist of a thimble and a copper Nicopress fitting. Secure the loose end of the wire rope to the standing portion of the line with plastic tie wrap. Attach the lines with a 5/16 inch screw pin anchor shackle, or approved substitute. Provide pipe spacers if required to keep the lines from shifting.
- D. Lifting line terminations at the batten shall consist of a thimble, a copper Nicopress fitting, and a 1/4 inch proof coil trim chain with screw pin shackles, and a safety bolt. Secure the shackles with plastic tie wrap after adjustment.

## 2.9 HAND LINES

- A. Hand lines shall be 3/4 inch diameter, 3-strand composite polyester rope, New England Ropes "Multiline II," or approved equal. Color: black.
- B. Attach the hand line to the arbor with 2 half hitches. Secure the rope ends to the standing portion of the line with plastic tie wrap.
- C. Provide sufficient length of rope so that the tension block is a minimum of 1 foot below the bottom bumper.

## 2.10 COUNTERWEIGHTS

- A. Counterweights shall be torch-cut, hand-smooth steel plate. Weights shall be 5 inches wide, weighing nominally 18 pounds per inch.
- B. 60 percent of the weights for the undedicated counterweight sets shall be 1 inch thick. 40 percent shall be 2 inches thick. Use 2 inch thick weights for those required to balance the unloaded batten.
- C. Paint the front and sides of the counterweights required to balance the unloaded batten navy blue. Weights shall be painted prior to installation.

## 2.11 T-BARS

- A. T-bar guides shall be 1-1/2 x 1-1/2 x 3/16 inch steel tees, or approved equal.
- B. T-bars shall be straight and have squared ends for smooth splice connections which do not interfere with arbor travel.
- C. Support the T-bar battery on 5 foot vertical and horizontal centers. T-bars shall be plumb.
- D. Wall battens shall be 2 x 2 inch angles supported by adjustable knees. Anchor the wall knees with two 3/8 inch anchor bolts. Spreader plates shall be 3/16 inch bar, attached with 3/8 inch bolts.
- E. Provide a continuous 2 x 2 inch angle for securing the bottom of the T-bars at the floor. Attach the angle with 3/8 inch concrete anchors.
- F. Provide a continuous bumper at the top of the T-bar battery, consisting of a 2 x 2 x 3/16 inch support angle and a 2 x 2 inch hardwood batten.
- G. In order to maximize arbor travel, locate the top of the tee bars and bumper so that the top of the arbor is nominally 15 inches below the shaft of the head block sheave.
- H. Paint the T-bars black.

## 2.12 LOCK RAILS

- A. Each lock rail shall consist of a continuous 4 x 3 inch angle with a 4 x 1/4 inch steel plate strip for index card holders.
- B. Provide formed index card holders for the full inventory of sets. Provide a blank plastic "write-on/wipe-off" card for each holder. Except for the set number, as described below, cards shall be blank, with no other writing or company logo.
- C. Rope locks shall consist of a one piece ductile iron casting, two iron cams and a 9 inch long handle. Adjustment shall be by means of a 3/8 inch minimum locking thumb screw at the rear of the housing.

- D. Rope locks shall hold a minimum of 250 pounds when properly adjusted. Normal recommended counterweight set imbalance shall be 40 pounds.
- E. Provide an oval keeper ring for each lock. Coat the handles and rings with red poly-vinyl.
- F. Design the lock rail to withstand a uniform uplift of 500 pounds per linear foot with two 1000 pound concentrations
- G. The lower lock rail shall include an angle frame which supports a continuous bottom bumper angle. Glue a continuous 1/2 inch thick rubber strip to the bumper angle.
- H. The lower lock rail shall have a continuous 3 inch square tube located 1 inch above the finished floor to serve as a kick-plate, and a means of attaching a 1000 pound capacity movable capstan winch.
- I. The upper lock rail shall have a 12 inch high kickplate.
- J. Fabricate the lock rail supports so that the top of the rail is 27 inches above the finished floor.
- K. The lower lock rail shall be attached to the concrete subfloor. The finished stage floor shall stop at the lock rail stanchion, under the capstan tube. Adjust the height of the lock rail support structure as required.
- L. Where the lock rail serves as a guardrail, extend the rail past the rope locks as required to provide continuous guardrail protection at both ends. Provide a 42 inch high horizontal pipe on the portion of the rail that extends past the rope locks.

#### 2.13 PIPE BATTENS

- A. Battens shall be 1-1/2 inch nominal diameter standard weight (Schedule 40) black iron pipes.
- B. Batten splices shall be made with an 18 inch long, 1 - 9/16 inch diameter DOM tube with a minimum wall thickness of 3/16 inch. Weld one end of the splice tube. Fasten the other end with two 3/8 inch bolts.
- C. No pipe section in a spliced batten shall be less than 10 feet long, unless there is prior approval by the Theatre Consultant.
- D. Paint the 12 inches at each end of the batten safety yellow. Mark the centerline of the batten with a 1/2 inch wide, painted safety yellow line.

#### 2.14 INDEX STRIP LIGHTS

- A. Index lights shall be as long as the lock rails, with 40 Watt "A" lamps at 1 foot intervals. Lamps shall alternate between white and blue, on 2 separate circuits.
- B. Paint the inside of the light housing white, and outside of the housing flat black.

- C. Attach the index lights to brackets which are attached to the wall, corresponding to the spaces between sets where the gridiron hangers occur.
- D. The stage level wall bracket shall have a continuous 1-1/2 inch nominal diameter standard weight (Schedule 40) pipe onstage of the index light, to serve as a scenery guard. The fly gallery wall bracket shall receive work lighting fixtures, which are by others.
- E. Locate the bottom of the index lights 10 feet above the finished floor.
- F. Hook-up to power is by others.

#### 2.15 ORCHESTRA SHELL REFLECTOR RIGGING

- A. Fabrication details for the motorized counterweight reflector rigging shall be similar to the manual counterweight rigging, where applicable.
- B. Motorized counterweight rigging shall include the following:
  - 1. Total set capacity: 3000 pounds, including a maximum winch capacity of 1000 pounds.
  - 2. Speed: 20 feet per minute, with electronic "soft" stops and starts.
  - 3. Truss batten.
  - 4. Quiet running, brakemotor with worm gear reduction and spring applied, electrically released brake.
  - 5. Overspeed brake.
  - 6. Closed loop chain drive. Traction drives are not acceptable.
  - 7. Incremental encoder for position monitoring and preset trims.
  - 8. Rotary limit switch for overtravel limits.
- C. Locate the motor to maintain the spacing with adjacent counterweight rigging sets.

#### 2.16 SET NUMBER LABELS

- A. Provide counterweight set number labels as follows:
  - 1. Lock rails: Consecutive set numbers at each index card holder, on the 4 x 3 inch plate.
  - 2. Lock rail index cards: Consecutive set numbers in the upper right hand corner. There shall be no other writing or company logos on the cards.
  - 3. Arbors: Consecutive set numbers on the top of the backplate.
  - 4. Head blocks: Consecutive set numbers, location to be determined in the field.
  - 5. Loft blocks: Consecutive set numbers on each block, on the side plates.
  - 6. Battens: painted consecutive set numbers at both ends of the batten.
- B. Arbor and batten labels shall be 1 inch high, white painted stencil numbers. All other labels shall be 1 inch high, white, Helvetica Medium, vinyl die-cut numerals, manufactured by the W.H. Brady Company, or approved equal.

- C. Labeling shall be straight and consistent. Use line guides and templates as required.
- D. Label any empty spaces consecutively in anticipation of adding sets in the future.

#### 2.17 SIGNAGE

- A. Provide a wall-mounted loading gallery sign which says the following in 3/4 inch high, Helvetica Medium characters: MAX LIVE LOAD: ON LOADING GALLERY LBS/SQ FT.
- B. Provide a "Rigging Information" sign, as illustrated below. Wall mount the sign upstage, near the lock rail.
- C. Protect the above signs with 1/4 inch thick clear plastic sheets screwed to the wall.
- D. Belaying pins shall be 22 inch long, 3/4 inch diameter solid steel rods with chamfered ends. Weld a 1 inch long, 3/4 inch I.D. stop-collar to each pin. Grind all welds smooth.
- E. Paint the pins to match the pinrails.

#### 2.18 ROPE RIGGING

- A. Rope blocks shall be upright style blocks which can be mounted either to the rope head block well or to the gridiron deck.
- B. Sheaves shall be 8 inches in diameter and grooved for a single 5/8 inch diameter rope. Multiple line blocks shall have separate sheaves for each line.
- C. Paint the rope blocks and cable cradles safety yellow.
- D. Provide the following for stage lighting multiconductor cable pick-up. Install as directed by the Theatre Consultant and in coordination with the Electrical Contractor.
  - 1. 48 single-line blocks with angle clamps.
  - 2. 24 cable cradles, Strand Lighting Number 1551, or approved equal.
  - 3. 3600 feet of 5/8 inch diameter, 3-strand composite polyester rope, New England Ropes "Multiline II," or approved equal. Color: black.
- E. Provide the following for spotline rigging. Locate spotline materials as directed by the Owner.
  - 1. 20 single-line blocks.
  - 2. 2 fifty pound sand bags.
- F. 1200 feet of 5/8 inch diameter 3-strand composite polyester rope, New England Ropes "Multiline II," or approved equal. Color: black
- G. Sand bags shall be made from heavy duty canvas with manila rope slings and heavy metal hooks with safety catches. Fill the bags with clean, dry sand.

## RIGGING INFORMATION

Theatre: *(name of theatre)*

Architect: *(name of project architect)*

Structural Engineer: *(name of project engineer)*

Theatre Consultant: Fisher Dachs Associates New York NY

Rigging Manufacturer: *(name, address, telephone number)*

Installation date: *(month and year)*

Rigging support steel: 1600 pound capacity counterweight sets, spaced 6 inches on center, with a maximum of 80% of the total set capacity.

Gridiron deck load: 50 pounds per square foot.

Gridiron point loading: The Structural Engineer was advised that chain hoist point loading could be as much as 50,000 pounds, distributed on 1 to 2 ton capacity hoists. Hoist loads must be properly attached and distributed on the gridiron.

Loading gallery floor load: 750 pounds per square foot.

Fly gallery floor load: 125 pounds per square foot.

Fly gallery pinrail and rope block wells: 500 pounds per linear foot.

Lock Rail: 500 pounds per linear foot with two 2000 pound concentrations.

Rope lock recommended imbalance: 40 pounds.

Head block working load limit: (by Manufacturer)

Loft block working load limit: (by Manufacturer)

Wire rope lifting lines: 1/4 inch diameter, 7 x 19 aircraft cable with an 875 pound working load limit (7,000 pound breaking strength with an 8/1 safety factor).

SAFETY FIRST. Always follow the Manufacturer's recommended operation and maintenance procedures.

*Illustration of "Rigging Information" sign.*

## 2.19 PROSCENIUM FIRE CURTAIN

- A. The proscenium fire curtain shall conform to all applicable codes and laws, and meet the approval of the appropriate local agency. Minimum standards, subject to local approval, are described below.
- B. The fire curtain shall be designed and constructed to prevent the passage of hot gases, flame, and smoke for a minimum of 30 minutes at a maximum temperature of not less than 1100 degrees Fahrenheit and an air pressure of not less than 5 pounds per square foot.
- C. The fire curtain shall close by its own weight within 30 seconds. The last 8 feet of curtain travel shall take a minimum of 5 seconds.
- D. Under emergency conditions the fire curtain shall close when the fireline is cut, when a fusible link separates, or (if required) when the electric fireline release is activated.
- E. The fire curtain shall overlap the fire-resistive proscenium opening by 18 inches on each side and 24 inches at the top.
- F. Curtain fabric shall be "Zetex", or approved substitute.
- G. The top and bottom of the curtain shall have 6 inch deep pockets with pipe battens inside. Battens shall have a minimum inside diameter of 1-1/2 inches.
- H. The sides of the curtain shall have 6 inch hems, reinforced as required.
- I. Provide a 3 inch thick, non-combustible, non-asbestos yield pad at the bottom of the curtain to form a seal at the floor.
- J. Provide a non-combustible, non-asbestos smoke stop along the top of the curtain.
- K. Provide steel smoke pockets. Smoke pockets shall consist of steel channels with 14 inch x 1/4 inch minimum steel plates opposite the proscenium wall
- L. The fire curtain shall travel on track guides. Design the guide system for smooth operation and resistance to air pressure.
- M. Paint the smoke pockets, including the insides, flat black. Paint the curtain black.
- N. The fire curtain rigging shall include the following:
  - 1. 1/4 inch diameter, 7 x 19 galvanized wire rope lifting lines.
  - 2. Lineshaft winch with 8 inch diameter helically grooved drums which accept the wire rope in a single layer, plus 3 dead wraps.
  - 3. Quiet-running brakemotor with worm gear reduction. Speed: 20 feet per minute.
  - 4. Clutch release.

5. Hydraulic speed governor.
  6. Rotary limit switch for high, low and overtravel trims.
  7. Additional winch-mounting steel, as required.
  8. Safety stay chains at each end of the curtain and centered between the lifting lines
  9. 1/8 inch minimum wire rope release line and associated release system.
  10. Electrically activated mechanical fireline release device that is linked to the building fire protection system, J.R. Clancy "Sure-Guard", or approved substitute. Wiring to the fire protection system is by others.
  11. A minimum of six 165-degree fusible links along the release line: 2 on each side of the proscenium and 2 along the top.
  12. Manual emergency release levers on both sides of the proscenium, each consisting of a sign which says IN CASE OF FIRE PULL LEVER TO LOWER FIRE CURTAIN. Levers shall be JR Clancy No. 016-14L, with protective enclosures, or approved substitute.
  13. Wall-mounted control station, labeled FIRE CURTAIN, consisting of a key switch, "dead man" style UP and DOWN pushbuttons, and a mushroom head EMER STOP pushbutton.
- O. Design the fire curtain system for 100 percent impact loading.
- P. Conduct a test of the fire curtain for both normal operation and emergency release. Any damage to the fire curtain or any part of the theatre as a result of this test shall be repaired by the Contractor at no cost to the Owner. The test shall be conducted in the presence of the Architect, the Theatre Consultant and an Owner's representative.

## 2.20 HOUSE CURTAIN COUNTERWEIGHT SET

- A. The head block shall be a 16 inch diameter block, grooved for 1/4 inch diameter lifting lines, plus a 1 inch diameter hand line.
- B. Loft blocks shall be 12 inch diameter single-line blocks. Each block except the far block shall have a 3 inch nominal diameter, nylon idler sheave on ball bearings, with a groove for each adjacent lifting line.
- C. The arbor shall be 20 percent longer than the required length, based on the estimated weight of the curtain.
- D. Provide aluminum lattice track arbor guides. Allow 2 feet of overtravel at the top of the guides to accommodate curtain "bounce" at low trim.
- E. Provide shock absorbing spring bumpers at the top and bottom of the arbor guides.
- F. The hand line tension block shall be a 12 inch diameter, self-adjusting, combination floor block/rope lock.
- G. Lifting lines shall be 1/4 inch diameter, 7 x 19 galvanized wire rope.

- H. Lifting line terminations at the batten shall consist of a thimble, a copper Nicopress sleeve, and a jaw/jaw turnbuckle, and a full pipe clamp.
- I. Hand line shall be 1 inch diameter polyester rope, with a core of parallel polyester filaments, New England Ropes "Stage-Set X", or approved equal. Color: black.
- J. The pipe batten shall be a 2 inch nominal diameter standard weight (Schedule 40) pipe with an eye for engaging a guide wire at each end.
- K. House curtain guide wires shall be 1/4 inch diameter wire rope. Provide turnbuckle adjustment at the gridiron on upright frames. Provide flush D-rings at the stage floor, with snap hook attachment of the guide wires to the D-rings.
- L. Design the house curtain set to produce minimum noise and friction during operation. Design the curtain rigging so that one stagehand can raise and lower the curtain within 5 seconds.

#### 2.21 VARIABLE ACOUSTICS CURTAINS

- A. Variable acoustics curtains shall be unlined, 25 ounce velour, sewn with 100 percent fullness.
- B. Curtain fabrication shall be as described below, under "Drapery Fabrication," where applicable.
- C. Track shall be Gerriets Trumpf 95, or approved equal.
- D. Provide stay chains to keep the trailing edges of the curtains from leaving the pockets when the curtains are deployed.
- E. Curtain machines shall be selected based on the track configuration, and the curtain size and weight. Curtain machines shall be Gerriets Trac Drive, or approved equal.

#### 2.22 MOTORIZED RIGGING CONTROLS

- A. The control device shall include system key switch, "dead man" pushbuttons for operation, and a mushroom head EMERGENCY STOP pushbutton. The device shall be the Mitsubishi F940GOT "Handy", or approved substitute.
- B. The control device shall operate the following:
  - 1. Orchestra shell reflector rigging.
  - 2. Variable acoustics curtains.
  - 3. Orchestra lift.
- C. The control display shall always include the current position of the selected equipment above the stage, where applicable.
- D. Program the REFLECTOR controls as directed by the Acoustical Consultant for a maximum of 6 preset trims, in addition to STORED and SET-UP trims.

- E. VARIABLE ACOUSTICS control groups shall be symmetrical pairs of curtain motors and curtains on centerline. Program the control groups as directed by the Acoustical Consultant with a maximum of 6 presets, in addition to ALL STORED and ALL DEPLOYED
- F. Orchestra lift control shall be from the control device described above. Coordinate control interface and screen programming with the Lift Contractor. With the exception of initiating commands and registering feedback from a common device, the rigging and lift control systems shall be separate systems, designed by their respective contractors.

2.23 PIPE GRID

- A. The pipe grid shall consist of 1-1/2 inch nominal diameter standard weight (Schedule 40) pipe connected with clamps. Clamps shall be JR Clancy “Cross Grid Connectors”, or approved substitute.
- B. Provide steel rod hangers, pipe hanger clamps and beam clamps as required for suspending the pipe grid. Design the hanger assemblies for the dead load plus a 30 pounds per linear foot live load.
- C. Paint the pipe grid and hanger assemblies in a color determined by the Architect.

2.24 PIPE AND HANGING HARDWARE

- A. Provide pipe and dead-hanging assemblies as required for hanging the Studio Theatre stage draperies described below.
- B. Dead hanging assemblies consist of a pipe clamp, proof coil chain with shackles at both ends, and a beam clamp. Chains shall be of sufficient length to hang a batten 1 inch below the underside of the wire rope grid, plus an additional 18 inches.

2.25 STAGE DRAPERY SCHEDULE

- A. Stage drapery schedule for the Proscenium Theatre is as follows:

Description	Quantity	Height	Width
House curtain	1	<i>per drawing</i>	<i>per drawing</i>
Borders	6	12'	61'
Legs	12	30'	12'
Tabs	10	30'	8'
Bi-part traveler	1	30'	61'
Cyclorama	1	30'	61'
Black scrim	1	30'	61'
White scrim	1	30'	61'

- B. Stage drapery schedule for the Studio Theatre is as follows:

Description	Quantity	Height	Width
Legs	10	20'	12'
Bi-part traveler	1	20'	30'
Cyclorama	1	20'	30'
Black scrim	1	20'	30'
White scrim	1	20'	30'

- C. Dimensions for the house curtain and traveler are finished dimensions. The house curtain is in 2 halves, with a 3 foot overlap in the center. The traveler is in 2 halves, with a 2 foot overlap in the center.
- D. Furnish and install curtain track assemblies for the travelers. The house curtain is not on a traveler track.
- E. Confirm Studio Theatre drapery heights during shop drawing review.
- F. Provide individual canvas storage bags for all drapery pieces, except the house curtain.
- G. Provide castered canvas storage hampers with hinged plywood tops and caster "donuts" as required for accommodating all filled storage bags.

## 2.26 DRAPERY FABRICATION

- A. All draperies are sewn flat and are unlined, except for the house curtain.
- B. Reinforce the top of each piece with 3-1/2 inch wide, 12 pound jute webbing with heavy-duty grommets at 1 foot intervals.
- C. Provide 36 inch long black tie lines on the black velour pieces. Provide the traveler with carrier-to-curtain fasteners.
- D. Hem the bottoms of the legs, tabs and travelers with a 6 inch deep double turned hem with a separate canvas chain pocket approximately 3 inches above the bottom of the face fabric.
- E. Hem the bottoms of the borders, cyclorama and scrim with a 6 inch deep double turned hemmed pipe pocket. Line the pocket with nylon fabric to prevent tearing. Furnish appropriate lengths of pipe for each piece. Cap both ends of each pipe.
- F. Sew back the face fabric of each piece 4 inches on both sides. The sides of each drapery piece shall hang plumb within 2 inches.

## 2.27 HOUSE CURTAIN FABRICATION

- A. The house curtain shall be in 2 halves with a 3 foot overlap at the center. The curtain is in 2 halves for center bows. It is not a traveling curtain.
- B. The house curtain shall be sewn with box pleats to 100 percent fullness.
- C. Reinforce the top of the curtain with 4 inch wide, 12 pound jute webbing with heavy-duty grommets at 1 foot intervals. Provide 36 inch long black tie lines.
- D. Lining shall be sewn with the same fullness as the face fabric and be fully sewn into the top webbing. Lining shall be sewn with an integral shrinkage tuck.
- E. Hem the bottom of the curtain with a 6 inch deep double turned hem with a separate canvas pocket approximately 3 inches above the bottom of the face fabric. Provide a galvanized or vinyl-coated jack chain in the pocket.
- F. Reinforce the offstage sides of the curtain with 4 inch wide jute webbing. Provide lignum vitae guides on 2 foot centers, with 1-1/2 inch metal straps which encircle the guides and bolt through the webbing.
- G. Finish the onstage edges over the entire height of the curtain so that no stitches are visible on the face.
- H. Face back the center edges with 2 widths of the face fabric. Provide fabric hand loops for paging.

## 2.28 TRAVELER TRACK

- A. Curtain track and related hardware shall be Trumpf 95 track. Supply track lengths with the minimum possible number of splices. Color: black.
- B. Master and single carriers shall have neoprene-tired, ball bearing wheels. Carriers shall have swivel eyes, trim chains, rubber spacers and back-pack guides. Provide carriers on 1 foot centers.
- C. Provide live and dead-end pulleys, end stops, and lap clamps as required.
- D. Operating lines shall be 3/8 inch stretch-resistant cord with a fiberglass center.
- E. Provide a 6 inch diameter floating floor pulley for each track assembly. Suspend a lined canvas sandbag from the pulley to keep tension on the operating lines without attaching the block to the floor. Attach the sandbag to the tension pulley with an ad just able trim chain and snap. When in the operating position, the sandbag shall rest on the floor, hold the lines taut and prevent twisting. Provide each floor pulley with a protective canvas bag.
- F. Provide clamps for attaching the track to the pipe battens.

## **PART 3.00 - EXECUTION**

### **3.1 COORDINATION**

- A. The Contractor is responsible for reviewing all drawings, specifications, and field conditions which affect the work in this Section. Notify the Architect whenever field measurements, analysis of the drawings and specifications, or progress of other trades indicates that the work in this Section cannot be completed as specified or as scheduled.

### **3.2 JOB CONDITIONS**

- A. The Contractor shall visit the site and verify all dimensions and existing conditions. The Contractor shall also be familiar with the work of adjoining trades and coordinate with their work.
- B. The Contractor is ultimately responsible for the equipment fitting the intended spaces without interference.

### **3.3 INSTALLATION**

- A. Only trained personnel shall install the equipment in this Section.
- B. Provide scaffolding and platforms as required for installation.
- C. Wire ropes shall be aligned and muled so as not to touch anything except their sheave grooves and terminations.
- D. Install all rigging components to maximize batten travel. High trim: 6 inches below the gridiron.
- E. Provide a means of trim adjustment, such as a turnbuckle, for all wire rope lifting lines.
- F. Turnbuckles shall be moused with plastic tie wrap after adjustment. Jam nuts are not acceptable.
- G. Shackle screw pins shall be moused with plastic tie wrap.
- H. Wire rope clips shall be spaced and bolts shall be tightened to the manufacturer's recommended torque.
- I. Attach Nicopress sleeves according to the manufacturer's instructions. Check the crimps with the manufacturer's go/no-go gauge. Check the adjustment of the Nicopress tool after every 50 crimps. Maximize the number of in-shop Nicopress attachments.
- J. Use lock washers with all pipe clamps.
- K. Battens shall be level and shall all trim to the same high and low positions within 1 inch.

- L. Adjust set locations in the field as required and as directed by the Theatre Consultant for final adjustment, such as maintaining clearances, and minimizing spacing where desirable.
- M. Secure all loose equipment, tools and debris from falling from the gridiron and galleries during all phases of the installation.
- N. At the end of each day during the installation period, remove all refuse and scrap materials to collection points specified by the Owner Upon completion of the installation, leave all areas broom clean.
- O. Locate all loose system parts as directed by the Owner.

#### 3.4 PROTECTION OF EQUIPMENT

- A. Protect the equipment in this Section from damage and deterioration during all phases of the work, from the time of manufacture to the acceptance of the completed installation. Rust appearing during the Warranty period shall be corrected by the Contractor at no cost to the Owner.

#### 3.5 CLEANING AND REPAIR

- A. When construction is complete, restore all system components to their delivered condition. This includes dusting, cleaning, and removal of construction materials such as fireproofing.
- B. Repair any work or finishes that are damaged during installation. This includes the work in this Section and the work of others. Where the work of others is damaged, reimburse the appropriate contractor for the repair.

#### 3.6 OPERATION OF EQUIPMENT

- A. Prior to completion of the installation and turnover to the Owner, the equipment in this section shall be operated by employees of the Contractor, those authorized by the Contractor, or those under the Contractor's supervision.
- B. The Contractor shall advise the General Contractor in writing of any unauthorized operation of the equipment.

#### 3.7 COMMISSIONING

- A. The Contractor shall work with the General Contractor to arrange for a commissioning period for the work in this Section. The commissioning period shall take place at least 2 months before the first scheduled rehearsal onstage. Commissioning shall consist of a minimum of two 8-hour days. The building schedule shall be such that no other conflicting or obstructing activity is taking place. The Contractor shall demonstrate the operation of every component of each system specified here, including individual counterweight sets.

3.8 INSTRUCTION

- A. Assist the Owner in becoming familiar with the completed installation and personally instruct representatives of the Owner in the proper operation and maintenance of all equipment provided.

3.9 ACOUSTICAL TUNING

- A. The Contractor shall be present during all phases of acoustical tuning and initial orchestra rehearsals, to make trim and preset adjustments as directed by the Acoustical Consultant. For pricing purposes, assume 3 three-day sessions within a 3 week period.
- B. Provide all labor and equipment necessary for acoustical tuning.

3.10 OWNER'S ACCEPTANCE

- A. The Owner will accept the work in this Section upon the satisfactory completion of all punch list items.
- B. Prior to final acceptance, the Owner reserves the right to use any completed portion of the work in this Section at no additional cost, unless said use poses a potential hazard to personnel or risks damage to the work in this Section or the work of others.
- C. The Warranty period shall commence upon final acceptance by the Owner.

END OF SECTION

SECTION 11020 – ORCHESTRA LIFT

**PART 1 - GENERAL**

1.1 WORK INCLUDED

- A. The work of this Section includes all labor, materials, equipment and services necessary to complete the system as shown on the drawings and specified herein, including, but not limited to, the following:
  - 1. Orchestra lift.
  - 2. All electrical work on the load side of the power feed, including conduit, wire and labor.
  - 3. Demountable guardrail system, including sockets.
  - 4. Hinged closure skirt.
  - 5. Storage dollies for guardrails.

1.2 RELATED WORK

- A. Related work for the lift which is not part of the work in this Section includes, but is not limited to, the following:
  - 1. A legal, waterproof hoist way with the features necessary to accommodate the lift, as shown on the Contractor's shop drawings.
  - 2. Guide chases.
  - 3. Wooden subfloor and finished floor.
  - 4. Floor edge trims which permit attachment of astragal switches for shear point protection.
  - 5. Lighting and sound system receptacles.
  - 6. Hoist way work lights.
  - 7. Power feeds.
- B. Related work for the guardrail system includes, but is not limited to, the following:
  - 1. Concrete work which receives sockets.

1.3 ACCEPTABLE CONTRACTORS

- A. The following are acceptable Contractors:
  - 1. J.R. Clancy, Inc.  
7041 Interstate Island Road  
Syracuse, New York 13209  
(315) 451-3440  
(315) 451-1766 FAX

2. GALA Theatrical Equipment  
2049 La Habra Street  
Escondido CA 92026  
(760) 738-5555  
(760) 738-5511 FAX
  4. Pook Diemont and Ohl, Inc.  
701 East 132nd Street  
Bronx, New York 10454  
(718) 402-2677  
(718) 402-2859 FAX
  5. SECOA  
8650 109th Avenue North  
Champlin, Minnesota 55316  
(763) 506-8800  
(763) 506-8844 FAX
  6. Serapid Inc.  
5400 18 Mile Road  
Sterling Heights, Michigan 48314  
(586) 274-0774  
(586) 274-0775 FAX
  7. Texas Scenic Company  
5423 Jackwood Drive  
San Antonio, Texas 78238  
(210) 684-0091  
(210) 684-4557 FAX
  8. I. Weiss and Sons  
2-07 Borden Avenue  
Long Island City, New York 11101  
(718) 706-8139  
(718) 482-9410 FAX
- B. Additional companies wishing to bid shall submit the following 10 days before submission of bids, for review and approval by the Theatre Consultant:
1. A current certified financial statement showing sufficient financial base for the size of job described here.
  2. A properly notarized statement on company letter head stating that the company has been in the business of manufacturing and installing orchestra lifts for at least 5 years.

3. A list of at least 5 jobs which are comparable in scope to the job described here.

#### 1.4 QUALITY ASSURANCE

- A. All work and materials shall conform to the requirements of all applicable local codes and the National Electrical Code.
- B. This specification sets forth minimum safety standards, operational criteria, and minimum standards for quality in workmanship. It is the responsibility of the Contractor to furnish and install a safe, fully functional system designed and engineered by the Lift Manufacturer in compliance with the design intent of the Contract Documents.

#### 1.5 SUBMITTALS

- A. Submit 1 reproducible set and 6 prints of shop drawings for review. Fabrication shall not commence until the Theatre Consultant and the Architect determine that the shop drawings are in compliance with the design intent of the Contract Documents. Shop drawings shall be revised and resubmitted as required.
- B. Drawing sheet size shall be uniform. Submittals of more than 5 drawings shall be bound. Drawings shall be rolled, not folded.
- C. Within 8 weeks after the award of the contract, the Contractor shall submit the following:
  1. Plans confirming hoist way construction details, including the depth, the locations of guide rail chases, any necessary embedments, and additional electrical power (if required).
  2. Plans illustrating the locations of junction boxes, panels, cabinets, astragal switches, and safety interlocks.
  3. Electrical riser and interconnection diagrams, including the location of all electrical components.
- D. Lift shop drawings shall include the following:
  1. The over all layout and dimensions of the lift.
  2. Lifting load capacity.
  3. Sustaining load capacity.
  4. Nominal travel speed.
  5. Number of preset stops.
  6. Platform superstructure construction, including accommodations for related work.
  7. Lifting mechanism and related components.
  8. Dead loads.
  9. Engineering calculations for live loads imposed on the building structure, platform superstructure, and lifting mechanism.
  10. Half full size scale drawings of the control pendant, and rack panel, and Emergency Stop stations.

- E. Lift shop drawings shall be stamped by a licensed engineer.
- F. Guardrail drawings shall include the layout of sockets along the edge of the audience seating area.
- G. Upon completion of the installation, provide reduced sets of the shop drawings in 3-ring binders. Provide 2 copies for the Owner, 1 for the Theatre Consultant, and (if requested) 1 for the Architect.
- H. Provide 3 copies of an instruction and maintenance manual, 2 for the Owner and 1 for the Theatre Consultant. The manual shall include:
  - 1. System description.
  - 2. Operation instructions, including safety measures.
  - 3. Maintenance instructions, including recommended procedures and schedules for inspecting system components.
  - 4. Recommended spare parts.
  - 5. Reduced drawings of all system assembly drawings necessary to perform maintenance or system instruction.
- I. Submit the following to the Architect and the Owner prior to turning the lift system over to the Owner:
  - 1. Inspection certificates and operating permits as required by local agencies. The Contractor shall pay for any expenses associated with these certificates and permits.
  - 2. Instruction and maintenance manual.

#### 1.6 GUARDRAIL MOCK-UP

- A. Provide a mock-up of 3 adjacent guardrail sections, including sockets, for review. The mock-up shall be complete in every respect, including finishes. Mock-up the socketing for review of guardrail stability. Fabrication shall not proceed until the mock-up has been approved. The Architect and Theatre Consultant reserve the right to request a second mock-up.
- B. Mock-ups shall be reviewed on site.

#### 1.7 WARRANTY

- A. Warrant the equipment in this Section to be free of defects in materials and workmanship for a period of 2 years after acceptance of the completed installation by the Owner. Defective work shall be repaired and defective parts shall be replaced at no cost to the Owner. The Warranty shall not cover the results of normal use, nor shall it cover damage due to neglect or improper use of the equipment.
- B. Provide all required maintenance or replacement within 30 days of notification by the Owner, with the following exception: the safe operation of the lift shall be accomplished with in 48 hours.

- C. The Warranty shall include 2 service visits by the Contractor. The visits shall take place at the end of each of the 2 years under Warranty. The Contractor shall consult with the Owner's staff, inspect the system, and perform any necessary maintenance and repair.

## **PART 2 – EQUIPMENT**

### **2.1 FINISHES**

- A. All metal parts shall be free from rust, scale, dirt, or welding spatter. All weldments or other metal components shall receive a coat of rust inhibitor primer prior to finish coating and component assembly.
- B. Finish coat shall be flat alkyd enamel. Color for lifts: black. Color for guardrails: custom color determined by the Architect.

### **2.2 LIFT MECHANISM**

- A. The lift mechanism shall be one of the following:
  - 1. "Spiralift" tubular thrust screw modules, as manufactured by GALA.
  - 2. "LinkLift" rigid chain modules, as manufactured by Serapid.

### **2.3 DESIGN CRITERIA**

- A. Lifting Capacity: 50 pounds per square foot live load, plus dead load, or dead load of the chair wagons plus dead load, whichever is greater.
- B. Sustaining Capacity: 150 pounds per square foot live load, plus dead load.
- C. Nominal travel speed: 10 feet per minute.
- D. Preset trim repeatability: 1/8 inch.
- E. Level tolerance: 1/8 inch.
- F. Maximum clearance between the finished edges of the lift and the fixed perimeter around the lift: 1/4 inch.
- G. Maximum deflection: 1/360 under full contact load.
- H. Minimum safety factor: 3 times the lifting capacity.
- I. The lift shall not drift. It shall lock and remain stationary at any elevation, including random stops, while supporting the maximum sustaining capacity.
- J. The lift shall travel smoothly at all times, with no shuddering. The lift shall have "soft" stops, starts, and reversals.

- K. The purpose of the stage lifts is to change the configuration of the stage and audience seating. The lifts are not intended to be a means of conveying people from one level to another.

#### 2.4 PLATFORM

- A. Provide a structural steel frame which meets the design criteria described above.
- B. Provide steel joists 16 inches on center to accommodate attachment of the subfloor and finished floor.
- C. Provide an opening in the lift platform structure for an access floor trap.
- D. Coordinate the fabrication of the lift platform as required to accommodate the attachment of architectural skirts.

#### 2.5 DRIVE MECHANISM

- A. Motors shall have high starting torque characteristics and magnetic brakes capable of a minimum of twice the torque of the motor.
- B. The lift shall support the maximum sustaining load at any point in its travel when stopped during normal operation, when stopped by the activation of a safety device, or when stopped due to power failure.
- C. Where applicable, lifting modules shall be synchronized to maintain the level tolerance described above. The synchronization system shall automatically stop the lift should the lift exceed the allowable level tolerance.
- D. Provide a safety disconnect switch at the lift motor.
- E. Where applicable, screws shall be protected from dust and dirt by collapsible, neoprene-coated nylon boots, Joyce Boots or approved equal.

#### 2.6 GUIDES

- A. Provide T-rail guides to maintain lateral and rotational stability at any point in the lift's travel.
- B. Horizontal movement between the guide rail and guide shoe shall not exceed 1/8 inch at any point in the lift's travel.

#### 2.7 LIMIT DEVICES

- A. Provide direct struck limits switches, plus overtravel limits, for each trim.

#### 2.8 SHEAR EDGE PROTECTION

- A. Provide heavy duty, pressure sensitive astragal switches at all shear edge conditions.
- B. A minimum pressure of 2 pounds at any point shall activate the switch.

- C. Astragal switch attachment shall not depend solely on adhesive.
- D. Coordinate astragal switch attachment to architectural surfaces as required.

#### 2.9 SAFETY INTERLOCKS

- A. Provide electromagnetic locks for all doors which provide access to all areas within the lift's travel. Provide a key switch outside each electrically locked door which cuts power to the lock for authorized access when the lift is not at that level. Provide a mushroom head pushbutton inside each door which cuts power to the lock for emergency egress.
- B. Provide interlock switches at the sockets for the removable guardrails.

#### 2.10 WARNING SKIRTS

- A. Provide a continuous net skirt along all lift edges where there is a potential falling hazard. The net shall provide a visual warning for performers, musicians and technicians in the lift area.
- B. Net shall be Sinco Products, 3/4 inch mesh debris net, or approved equal. Color: white.
- C. The safety net shall travel with the lift. Provide continuous horizontal steel rods approximately 2 feet on center on the safety net to keep the net taut. Provide deflecting plates as required to keep the net clear of lift machinery.

#### 2.11 DEMOUNTABLE GUARDRAIL SYSTEM

- A. Provide guardrail sections and mating sockets, as shown on the drawings. Guardrail sections shall be interchangeable wherever possible.
- B. Furnish and supervise the installation of sockets along the edge of the audience seating area.
- C. Finish detailing shall be as shown on the Architectural drawings.
- D. Provide flush caps for all sockets.
- E. Provide castered storage dollies for the guardrails and socket caps. Dolly quantity shall anticipate the "worst case" storage condition: when the lift is at stage level.

#### 2.12 HINGED CLOSURE SKIRT

- A. Provide a hinged closure skirts under the stage edge, as shown on the drawings. Skirt panels shall consist of steel tube frames faced with 1/2 inch MDO plywood, painted a color determined by the Architect.
- B. Provide locking arms which hold the skirt in both the stored and deployed positions.

- C. Skirt panels shall bolt to the rear face of the lift when deployed. Provide direct-struck limit switches which are activated when the skirt is stored, to prevent the lift from moving when the skirt is deployed.

#### 2.13 SIGNAGE

- A. Provide signs on doors which provide access to areas within the lift's travel which say the following: ORCHESTRA LIFT AREA AHEAD. AUTHORIZED PERSONNEL ONLY BEYOND THIS POINT.

#### 2.14 CONTROLS

- A. Lift control shall be from a hand-held device provided by the Rigging Contractor. A Mitsubishi F940GOT "Handy", or approved substitute, has been specified. Coordinate control interface and screen programming with the Rigging Contractor. With the exception of initiating commands and registering feedback from a common device, the rigging and lift control systems shall be separate systems, designed by their respective contractors.
- B. The hand-held control display shall include the following:
  - 1. Preset selections.
  - 2. Hazard indicators for activation of safety devices, such as astragal switches.
- C. Provide two mushroom head LIFT EMER STOP pushbuttons in the orchestra pit.
- D. The lift shall have the following preset stops:
  - 1. Stage level.
  - 2. Audience level.
  - 3. Orchestra pit level.
- E. The lift control parameters shall include the following:
  - 1. The control display shall indicate when the lift is at a preset stop. When the lift is between preset stops, the control display shall indicate the distance between the lift and the stage floor.
  - 2. When the EMERGENCY STOP push button is activated, the lift shall automatically stop. The lift will not move until the mushroom head button is pulled out and the RESET function on the control display is activated.
  - 3. When a shear edge switch is activated, the lift shall automatically stop and immediately travel 2 inches in the reverse direction before stopping again. The lift will not move until the astragal switch is cleared and the RESET function on the control display is activated.
  - 4. If the UP or DOWN button is pushed and an interlocked door is open or an interlocked guardrail is not in place, the lift will not move until the door is closed or the guardrail is in place and the RESET function on the control display is activated.
  - 5. When an interlocked door is opened by use of the local key switch or when an interlocked guard rail is removed during lift operation, the lift will automatically stop. The lift will not move until the door is closed and locked or the guard rail is restored, and the RESET function on the control display is activated.

6. An interlocked door shall be electrically locked when the lift is not at the level of that door. All interlocked doors shall be electrically locked when the lift is operating.
7. If the hinged closure skirt is deployed, the lift shall not move.
8. If the UP or DOWN button is pushed and the lift is out of level the lift will not move until the lifting modules are adjusted and the RESET function on the control display is activated.
9. If the lift becomes out of level during operation it will automatically stop. The lift will not move until the lifting modules are adjusted, and the RESET function on the control display is activated.
10. When any of the above hazard conditions occur, a red HAZARD indicator on the control display will flash until the problem is corrected and the RESET function on the control display is activated.

### **PART 3 - EXECUTION**

#### **3.1 INSPECTION**

- A. The Contractor shall visit the site and examine all related conditions which affect the installation. Notify the General Contractor in writing of any conditions which will impede the proper installation or performance of the lift. Do not proceed with the lift installation until the unsatisfactory conditions have been corrected in a mutually acceptable manner.

#### **3.2 COORDINATION**

- A. Coordinate the lift installation with the work of other trades as directed by the Architect and the General Contractor.

#### **3.3 PROTECTION OF EQUIPMENT**

- A. Protect the equipment in this Section from rust and deterioration due to moisture or exposure during all phases of the work, from the time of manufacture to the acceptance of the completed installation. Rust appearing during the Warranty period shall be corrected by the Contractor at no cost to the Owner.
- B. Protect all mechanical components from dust and dirt during all phases of the work.

#### **3.4 CLEANING AND REPAIRS**

- A. Clean the lift superstructure and mechanical components upon completion of the installation.
- B. Repair any work or finishes that are damaged during installation. This includes work in this Section and the work of others. Where the work of others is damaged, reimburse the appropriate contractor for the repair.

3.5 TEMPORARY PROTECTION

- A. When the lift installation commences, the Lift Contractor is responsible for maintaining the safety of the lift area and the safe operation of the lift. The Lift Contractor shall provide temporary guardrails, barriers and warning signs as required. The Lift Contractor shall inform the Architect and the General Contractor in writing of any unsafe conditions which are beyond the Lift Contractor's control, such as absence of guardrail protection and unauthorized or improper operation of the lift.

3.6 COMMISSIONING

- A. The Contractor shall work with the General Contractor to arrange for a commissioning period for the work in this Section. The commissioning period shall take place at least 2 months before the first scheduled rehearsal onstage. The building schedule shall be such that no other conflicting or obstructing activity takes place during commissioning. The Contractor shall demonstrate the operation of the lift and each safety device, as well as the deployment and storage of the chair wagons and guardrails.

3.7 INSTRUCTION

- A. Instruct the Owner's personnel in the proper operation and maintenance of the systems. The instruction session shall be scheduled at the Owner's convenience.

END OF SECTION

## SECTION 11030 – ORCHESTRA SHELL

### PART 1 - GENERAL

#### 1.1 WORK INCLUDED

- A. Furnish and install an orchestra shell, as shown on the drawings and specified here.
- B. The full stage symphonic acoustical shell shall consist of a system of acoustical panels of appropriate construction, and adjustable to proper positions, to control and reflect a maximum range of audible frequencies.
- C. The shell shall consist of two parts:
  - 1. Free-standing, self-supporting moveable towers for the back and side walls.
  - 2. Ceiling panels, which may include integrated lighting, to be suspended and flown from stage rigging.
- D. Stage rigging and battens are not included in this request.

#### 1.2 RELATED WORK

- A. Related work includes, but is not limited to, the following:
  - 1. Motorized counterweight rigging for the reflectors.
  - 2. Concert lighting control system.

#### 1.3 FLEXIBILITY

- A. The shell must be flexible permitting rearrangement to various size configurations. Ceiling panels must be capable of angular adjustment for proper blending and projection of sound.

#### 1.4 STORAGE

- A. Wall towers shall be designed so that they may be nested for storage without dismantling and shall nest in the designated storage area. Ceiling panels shall be designed to hang from theatrical rigging, and can be rotated to a vertical position and stored in the fly loft.

#### 1.5 SUBMITTALS

- A. Submit drawings showing shell size, panel configuration and dimensions, as well as all details of fabrication.
- B. Submit a complete list of manufactured products to be incorporated in the work shall be provided with manufacturer's identification, grade, conformance to standards and specifications, and U.L. labels, as required.
- D. Submit wiring and connection diagrams for lighting.

## 1.6 PERFORMANCE REQUIREMENTS

- A. All structural framing shall be extruded aluminum components to enhance stiffness and reduce weight.
- B. All panels shall be composite construction with fiber honeycomb core and stressed-skin surface to provide maximum panel rigidity.
- C. Stability of the base and tower assembly shall be enhanced by a diagonal brace. Diagonal brace shall ensure a perpendicular connection between base and tower frames, and distribute loads throughout the base assembly.
- D. Tower movement shall be accomplished by means of an air transport, which improves handling and reduces floor damage caused by heavily-loaded casters.
- E. Shell ceiling panels shall feature an integral truss with electrical raceway that will deflect not more than 1/8" per foot.

## 1.7 INSTRUCTIONS

- A. At the time of installation, furnish Operation and Maintenance Manuals, which will include instructions for safe handling and deployment, warranty statement, replacement parts, regular maintenance requirements, and contact information for future service and information.
- B. At the request of the owner, a sample owner's manual may be submitted for inspection and approval at the time of bid.
- C. All maintenance and operation information shall be bound into an 8-1/2" x 11" booklet with cover stock front and back covers.

## 1.8 COMPLETION, TRAINING

- A. After installation is complete, owner's on-site representative shall be contacted by installation crew lead for final inspection.
- B. Installation crew lead shall provide training to persons of the owner's choice, which shall include:
  - 1. Review of all instructional and maintenance documentation.
  - 2. Complete run-through of shell deployment from storage to performance position, and back again.
  - 3. Adjustment of ceiling panel angles as requested.
  - 4. Adjustment of lighting fixtures as requested.
  - 5. Completion of any deficient work as requested.

1.10 WARRANTY

- A. The manufacturer shall warrant this equipment to be free from defects in materials and workmanship, under normal use and service, for a period of three years from date of installation. A full corporate warranty statement shall be provided upon request.

1.11 ESTIMATED PRODUCT LIFE CYCLE

- A. The shell shall be designed for a 20 year life cycle based on average usage.

**PART 2 - CONSTRUCTION**

2.1 ACCEPTABLE ORCHESTRA SHELL

- A. The shell shall be the Diva Acoustical Shell as manufactured by Wenger Corporation, Owatonna, MN, or approved equal.
- B. Products of other manufacturers will be considered for acceptance provided they equal or exceed the material requirements and functional qualities of the specified product. Requests for approval by owner's representative and complete technical data with detailed specifications for evaluation must be received at least ten days prior to bid due date. Additional approved manufacturers will be issued by addendum.

2.2 ACOUSTICAL PANELS

- A. Composite Construction
  1. All panels shall be of composite construction.
  2. Core shall be 1-1/2" thick resin-impregnated fiber honeycomb of 80-60-15 composition (15% resin minimum).
  3. Stressed skins shall be: Painted; 3/16" tempered hardboard face and back. (Select one for bid documents.)
  4. Lamination shall be by means of water-activated urethane adhesive (no contact adhesive acceptable).
  5. Panels shall include integral extruded aluminum caps along the straight edges.
  6. All front surface panels shall be free of exposed fasteners.
- B. Shape
  1. All towers shall feature panels with a 60" radius curve.
  2. Ceilings shall feature panels with either 60" or 120" radius curves.

## 2.3 SHELL WALL TOWERS:

### A. Configuration

1. Each tower shall consist of one 4' center panel and two 4' (or 3') adjustable wing panels, which create an approximate 12'- wide tower.
2. Lower wing panel may be specified as door in any locations required.
3. Door shall have a minimum opening clearance of 36". Double doors shall allow access for concert grand piano.
4. All instructions pertaining to the safe handling and operation of towers shall be permanently attached to the back of each tower in plain view.

### B. Vertical Framework

1. Framework of towers shall be extruded aluminum alloy joined at connections by formed steel components.
2. Vertical frame shall be constructed of 6063-T6 extruded aluminum. Extrusion profile shall feature multiple-cavity structural I-beam with integrated pivot centers and electrical raceway.

### C. Horizontal Framework

1. Horizontal frame shall be constructed of 6063-T6 extruded aluminum. Extrusion profile shall feature single-cavity structural beam, and shall join vertical frame members.

### D. Base

1. Each tower shall be equipped with a counterweighted base assembly for stability.
2. Framework of base shall be extruded aluminum alloy joined at connections by formed steel components.
3. Base framework shall be constructed of 6063-T6 extruded aluminum. Extrusion profile shall feature multiple-cavity structural I-beam with integral electrical raceway.
4. Base frame components shall be connected by formed steel components.
5. Tower frame and base frame shall be connected by formed steel components.
6. Counterweight shall be profiled steel plate. Weight shall be determined by size of tower.

### E. Diagonal Brace

1. Stability of the base and tower assembly shall be enhanced by a diagonal brace. Diagonal brace shall ensure a perpendicular connection between base and tower frames, and distribute loads throughout the base assembly.
2. Diagonal brace shall be constructed of a steel threaded rod assembly.
3. Diagonal brace shall be connected to base and vertical frame with threaded formed steel components.

F. Hardware

1. Wing-stays
  - a. Telescoping wing-stay shall allow the locking of tower wings in performance or storage positions.
  - b. Wing-stay shall position wing panels in their optimal performance position.
  - c. Wing-stay lock shall be operable from the floor.
2. Wing and Door Hinges
  - a. Wing and door panels shall be mounted to frame with split aluminum hinge featuring self-lubricating Delrin thrust and radial bearings.
  - b. Hinges without integral bearings that prevent metal-upon-metal friction shall not be acceptable.
3. Door hardware
  - a. Doors shall feature a slide-lock mechanism to lock door to wing for use when transporting and storing towers.
  - b. Doors shall incorporate inside door handles.
4. Leveling
  - a. Each tower shall incorporate leveling adjustment means.

G. Transport

1. Towers shall be moved and positioned by means of an air cushion device.
  - a. Each tower shall be equipped with swivel casters at the rear of the base and adjustable non-marking pads at the front of the base.
  - b. A separate air transporter shall lift and transport the towers.
  - c. Air transporter shall prevent damage to stage floor by lifting the majority of tower weight on a cushion of air.
  - d. Tower movement systems that require wheels or casters to transport the majority of tower weight shall not be acceptable due to the risk of damage to stage flooring.
  - e. Tower systems using hydraulic means to lift tower weight shall not be acceptable due to the risk of damage to stage and stage equipment from leaking hydraulic fluid.

H. Storage

1. Each tower shall be designed to nest within another to minimize storage space.
2. Lower portion of center shell tower panel shall be removable to allow nesting of towers, as well as provide visual access for tower positioning.
3. Removable panel shall be removable from the back side of the shell tower.
4. Removable center panel shall store securely on the back side of the shell tower during storage and transport.

I. Trim Strip

1. Trim strip shall be constructed of 6063-T6 extruded aluminum required to prevent backstage light from shining between panels of shell towers.

## 2.4 SHELL CEILING PANELS

### A. Configuration

1. Shell ceiling panels shall feature an integral truss and shall hang from stage rigging without requirement of a pipe batten.
2. Ceilings shall store in a vertical position, and shall rotate as an entire row to and from an angle specified by the user for performance.

### B. Suspension

1. Shell ceiling shall incorporate an integral truss of 6063-T6 extruded aluminum alloy.
2. Extrusion profile shall feature multiple-cavity structural I-beam with integral pivot centers and electrical raceway.
3. Ceilings that do not attach directly to rigging cables, or within one inch of rigging cables, shall not be acceptable.
4. Ceiling panels shall be suspended from their edges to transfer and distribute the load uniformly throughout the panel.
5. Suspension by through-bolts or attachment to panel skins shall be unacceptable.

### C. Hardware

1. Shell ceiling angle shall be variable by means of an adjustment mechanism.
2. Ceiling angle adjustment means shall allow repeated deployment of ceilings to performance position without resetting angle.
3. Ceiling panels shall be mounted to integral truss with split aluminum hinge featuring self-lubricating Delrin radial bearings.
4. Ceilings without integral bearings that prevent metal-on metal friction shall not be acceptable.

### D. Lighting

1. Integral ETC Source Four 575W fixtures (MCM Series) with a complete set of lenses. Install with the WFL lens.
2. System shall incorporate mercury switches to prevent unintentional activation while in storage.
2. Provide junction boxes and associated conduit and wiring. Terminations at the junction boxes and feeder cables are by others.

### E. Operation and Storage

1. Ceiling shall rotate from performance to vertical storage position.
2. Ceiling shall be balanced such that each row shall require no more than two people to deploy.

## 2.5 FINISHES

- A. Panel Face painted Class "A" fire retardant finish unless otherwise noted. Color to be determined by Architect.
- B. Panel Back: Painted black
- C. Trim strip: Paint color to be determined by Architect.

## PART 3 - EXECUTION

### 3.01 GENERAL

- A. Fabrication shall be free of sharp edges and corners, tightly assembled and free from rattles, buzzes and resonant frequencies in the audible range. Hinges and pivots shall be aligned with no binding or excess friction.
- B. Design and fabrication shall be completed such that transport and installation costs to the owner are minimized to the greatest extent possible.

### 3.02 INSTALLATION

- A. Shall be in accordance with manufacturers instructions.
- B. Original installation shall be completed by the manufacturer.

END OF SECTION

SECTION 11040 - DEMOUNTABLE PLATFORMS

**PART 1 – GENERAL**

1.1 GENERAL

- A. The General Conditions of the Contract Documents shall apply to the work in this Section.

1.2 WORK INCLUDED

- A. The work in this Section includes all labor, materials and equipment to furnish and install the following:
  - 1. Seating riser system.
  - 2. Sound mix platform

1.3 RELATED WORK

- A. Related work includes, but is not limited to, the following:
  - 1. Studio Theatre door access.
  - 2. Fixed seating.

1.4 SUBMITTALS

- A. Submit shop drawings for fabrication and installation. Include plans, detail sections, and related conditions. Indicate materials, methods, finishes, attachments, and accessory items.
- B. Shop drawings shall reflect field survey information.
- C. Submit load data for the platform system, including safe working loads, proof loads, and any special conditions relating to the use of the platform system.
- D. Shop drawings for the riser systems shall illustrate the intended riser configurations, after those shown on the Contract Documents.

1.5 WARRANTY

- A. Warrant the equipment in this contract to be free of defects in materials and workmanship for a period of 1 year after acceptance of the completed installation by the Owner. Defective work shall be repaired and replaced at no cost to the Owner. The Warranty shall not cover the results of normal use, nor shall it cover damage due to neglect or improper use of the equipment.

1.6 APPLICABLE STANDARDS

- A. Aluminum Association:
  - 1. AA Standard AA-M12C22A41.

2. AA Standard AA-M12C22A42/44.
- B. American Institute of Steel Construction: AISC Manual of Steel Construction
- C. American Plywood Association: US. Product Standard PS 1-83
- D. American Society for Testing and Materials
  1. ASTM A36: Standard Specification for Structural Steel.
  2. ASTM A283: Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
  3. ASTM A307: Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
  4. ASTM A325: Standard Specification for High-Strength Bolts for Structural Steel Joints.
  5. ASTM A500: Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
  6. ASTM A501: Standard Specifications for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
  7. ASTM A570: Standard Specification for Steel, Sheet and Strip, Carbon, Hot-Rolled, Structural Quality.
  8. ASTM B209: Standard Specification for Aluminum-Alloy Sheet and Plate.
- E. American Welding Society (AWS):
  1. AWS D1.1 Structural Welding Code-Steel.
  2. AWS D1.3 Structural Welding Code-Sheet Steel, Second Edition.
- F. National Fire Protection Association (NFPA): NFPA 102: Standard for Assembly Seating, Tents, and Membrane Structures.

## **PART 2 - PRODUCTS**

### 2.1 ACCEPTABLE PRODUCTS

- A. The following are acceptable products and manufacturers:
  1. "SC90" single sided deck  
"SC200" riser system  
Staging Concepts  
7008 Northland Dr. North Suite 150  
Brooklyn Park, Minnesota 55428  
(763)533-2094 phone  
(763)553-2096 fax

2. "Z80" deck  
"ML-1600" riser system  
StageRight Corporation  
495 Holley Drive  
Clare, Michigan 48617  
(517) 386-7393  
(517) 386-3500 FAX
3. "Versalite" deck  
"Upper Deck" riser system  
Wenger Corporation  
555 Park Drive  
Owatonna Minnesota 55060  
(507) 455-4100  
(507) 455-4258 FAX

## 2.2 TYPICAL PLATFORM DETAILS

- A. Platforms shall support a minimum live load of 125 pounds per square foot.
- B. Platforms shall have integral locks for attaching adjacent sections.
- C. Platform edging shall be extruded aluminum with a milled finished designed to accept accessory components.
- D. Support legs shall permit 2 inch fine-leveling adjustment with a non-marring screw foot.
- E. Bridge supports are acceptable, if applicable to a manufacturers' system.

## 2.3 SOUND MIX PLATFORM

- A. The finish deck surfaces for the sound mix platform shall consist of two layers of 3/4 inch plywood. The top layer shall be MDO plywood. Paint the decks to match the adjacent floor.
- B. Attachment hardware on the sound mix platforms for fixed audience seating is by others. Coordinate the means of attachment with the seating manufacturer.

## 2.4 SEATING RISER SYSTEM

- A. Provide decks, supports, steps, closure panels, chair stops guardrails, aisle lights and related components as required, to achieve the riser configurations shown on the drawings.
- B. Design guardrails, posts, and their anchorage to withstand the following horizontal forces applied separately:
  1. 200 pounds applied at any point and in any direction along the top rail.
  2. 50 pounds per foot acting outward and/or inward at top rail.

3. Intermediate rails, panel fillers and their connections shall be capable of withstanding a load of 25 pounds per square foot applied horizontally at right angles over the entire tributary area, including openings and spaces between rails.
    - C. Handrail and post anchoring systems designed to withstand a force of 200 pounds applied at any point and in any direction on the railing system.
    - D. Undercarriage: Capable of supporting live load specified in addition to platform dead loads. Lateral bracing shall be provided to support 3 percent of the total superimposed live load. Seating risers shall have lateral sway bracing loads of 24 pounds per foot parallel and 10 pounds per foot perpendicular to the seat.
    - E. Provide folding riser support assemblies where applicable. Riser assemblies shall fold to a minimum of 15 percent of their extended depth.
    - F. Support assemblies shall be on casters, to facilitate the extension, closure and transport of the assembly. When the casters are disengaged, the riser shall be fully supported on the main vertical columns.
    - G. Casters shall engage and disengage by means of a removable lever bar. The lever bar shall require a maximum of 60 pounds of force to operate the caster. Provide 4 lever bars.
    - H. Guardrails shall be the manufacturer's standard.
    - I. Provide UL approved, low voltage aisle lights, with associated transformers and wiring. Aisle lights shall plug in a standard convenience outlet. Aisle lights shall be movable along the platform, to permit different aisle configurations.
- 2.5 STORAGE DOLLIES
- A. Provide castered storage dollies for the seating riser decks and all loose (i.e. non-folding) riser components.
  - B. Riser deck storage dollies shall accommodate 15 deck sections, secured with ratchet straps. Guardrail dollies shall be double height, to minimize required storage space.
  - C. All riser system storage dollies shall include integral fork lift guides and associated bracing. Platform deck storage dollies shall also include heavy duty push/pull bars, welded to the dolly frame.

### **PART 3 – EXECUTION**

#### **3.1 COORDINATION**

- A. The Contractor is responsible for reviewing all drawings, specifications, and field conditions which affect the work in this contract. Notify the Owner whenever field measurements, analysis of the drawings and specifications, or progress of other trades indicates that the work in this contract cannot be completed as specified or as scheduled.

3.2 JOB CONDITIONS

- A. The Contractor shall visit the site and verify all dimensions and existing conditions. The Contractor shall also be familiar with the work of adjoining trades and coordinate with their work.
- B. The Contractor is ultimately responsible for the equipment fitting the intended spaces without interference.

3.3 PROTECTION OF EQUIPMENT

- A. Protect the equipment in this contract from damage and deterioration during all phases of the work, from the time of manufacture to the acceptance of the completed installation. Rust appearing during the Warranty period shall be corrected by the Contractor at no cost to the Owner.

3.4 CLEANING AND REPAIR

- A. Repair any work or finishes that are damaged during installation. This includes the work in this contract and the work of others. Where the work of others is damaged, reimburse the appropriate contractor for the repair.

3.5 COMMISSIONING

- A. Install the platform systems, making any necessary adjustments.
- B. The Contractor shall work with the General Contractor to arrange for a commissioning period for the work in this Section. The commissioning period shall take place at least 2 months before the first scheduled rehearsal. Commissioning shall consist of a minimum of two 8-hour days. The building schedule shall be such that no other conflicting or obstructing activity takes place during commissioning. During the commissioning period, the orchestra pit filler shall be deployed in each of its intended positions, and the seating risers shall be deployed in each unique configuration.

END OF SECTION