NOTE TO SPECIFYING ARCHITECT REGARDING
SECTION 11060
THEATRE AND STAGE EQUIPMENT
(FULL FLY RIGGING)

1. Full fly rigging is required for theatre stages with loft space to store stage curtains and stage scenery above the acting space (stored like parallel guillotines).
2. Close coordination with the structural engineer is required, both for loading requirements and specific location of required steel.
3. Ducts for air movement have to be placed in specific locations to avoid conflict with working equipment.
4. Every item of stage equipment including drapery, rows of performance lighting over the stage, scenery drops, projection screens, and unassigned battens should be counterweighted.
5. One side wall of the stage should be clear of obstructions and doorways (if practical) to provide a surface for the T–Channel tracks that are required for each set and extend from the stage floor to the steel overhead.
6. Telephone 1 800 548 8982 for clarification or explanation. No charge, of course.

SECTION 11060
THEATRE AND STAGE EQUIPMENT
(FULL FLY RIGGING)

PART 1—GENERAL

1.01 SCOPE

A. Contractor shall furnish and install stage curtains and tracks and related equipment in accordance with the following specifications, including, but not limited to the following:
   1. Stage curtains and tracks
   2. Projection screen and frame
   3. Fire stop shields
   4. Sound reflector panels
   5. Counterweight Sets
   6. Fire curtain and rigging

1.02 RELATED SECTIONS

A. Section 05120 - Structural Steel: Structural Support

B. Section 05500- Metal Fabrications: Steel angles, pipe, plates for support.

C. Section 06100 - Rough Carpentry: Wood blocking

1.03 REFERENCES

A. ASTM A36 -Structural Steel Members

B. ASTM A53 -Steel Pipe

C. ASTM A307 -Anchor Bolts, unless otherwise noted.

D. ASTM A325 -Nuts, Bolts and Washers

E. ASTM A500 -Structural Tubing

F. AWS D1.1 - Welding Materials: type required for materials being welded.

G. UL - Underwriters Laboratories

1.04 SUBMITTALS

A. Section 01300 - Submittals: Procedures for submittals

B. Product Data: Submit manufacturer specifications and product data for each type of material specified.

C. Shop Drawings: Submit shop drawings indicating plan, layout, elevations, and detailed sections of anchorage and rigging systems and elements. Show

anchors, hardware, operating equipment and other components. The submittal shall include a proposed arrangement for all equipment in this section. Items specified shall be labeled and shall be shown in plan and section.

D. Samples: Submit three samples, minimum size 12 x 12 of each type curtain material with full color line available.

E. Manufacturer's Installation Instructions: Indicate installation requirements and special conditions.

1.05 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum five years experience.

B. Fabricator/Installer: Company specializing in fabrication and performing the work of this section with minimum five years experience.

1.06 FLAME RESISTANT REQUIREMENTS

A. Class "A" rated.

1.07 LIMITED WARRANTY

A. Equipment and accessories shall be warranted against defective material and workmanship for a period of one year from date of Substantial Completion.

1.08 CERTIFICATION

A. Submit manufacturer's certification that theatre and stage equipment complies with requirements for flame resistance.

PART 2—PRODUCTS

2.01 MANUFACTURERS OF FABRIC

A. Fabrics shall be products of the following firms or equal approval by the architect.
1. K.M. Fabrics (Greenville, SC)
2. J.L. DeBall (NYC, NY)
3. Frankel Associates (NYC, NY)
4. Dazians (NYC, NY)

2.02 MATERIALS

A. Fabrics: All fabrics shall be either inherently flame resistant or shall be flameproofed by vat immersion process in accordance with standard industry practice and the requirements of the fire codes and regulations of both state and local jurisdiction. All fabrics shall comply with the standards established in Bulletin 701, National Fire Prevention Association. Notarized certificates of flameproofing shall be furnished by this contractor attesting that the fabrics used in manufacturing comply with the regulations. The flame retardant chemical that produces a Flame Spread Rating of 10, a smoke density of 15 and Fuel

Contributed Factor of 0 when tested in accordance with ASTM E-84 (Tunnel Test) shall be used.

B. Quality: All material hereinafter specified shall be first quality. All curtains shall be fabricated of standard width in full length. No horizontal splicing will be allowed or accepted. Standards of workmanship shall be of highest quality, and items deficient in workmanship shall be promptly replaced both before acceptance of the work and for a guarantee period of one year after acceptance.

C. Drapery to be provided:
   1. The front stage setting shall consist of a valance, and front stage curtain and the associated teaser and tormentor tabs.
   2. The concert setting shall consist of leg curtains, mid stage curtains, rear curtains and the associated cyclorama ceiling masking borders.
   3. Special items shall be provided as follows: projection screen, screen perimeter masking, scrim drop, sky cyclorama drop curtain, reinforced opaque vinyl backing for valance, teaser, and masking borders.

D. Curtain Fabric Requirements:
   1. Front Stage Setting: Manufactured from 54 inch napped cotton velour, weighing not less than 25 ounces per running yard.
   2. Concert Setting: Manufactured from 54 inch napped cotton velour, weighing not less than 20 ounces per running yard.
   3. Picture Screen Masking, Manufactured from 54 inch napped cotton velour, weighing not less than 20 ounces per running yard.
   4. Sky Drop: Manufactured from seamless muslin dyed light blue.
   5. Scrim Drop: Manufactured from seamless sharkstooth scrim fabric, dyed black.
   6. Opaque backing: 54 inch vinyl reinforced with polyester or nylon scrim weighing 12 ounces per running yard.

2.03 CURTAIN CONSTRUCTION

A. General: All fabric items shall be bound with 3 ½ inch jute webbing secured by three complete runs of number 24 glace thread. Fullness shall be added by box pleating to the jute webbing, with pleats of equal size located on each vertical seam and at equal intervals between the seams, not to exceed 12 inches. Number 3 brass grommets shall be centered on each box pleat.

B. Provide 75 percent added fullness for all front stage setting velour drapery. Borders and travelers have the same finished horizontal dimensions as the counterweight battens plus laps wherever required.

C. Provide 50 percent added fullness for the concert setting.

D. Sky Drop and Scrim Drop shall be manufactured without pleated fullness. Bottom hems of drop curtains shall be provided with pipe batten that weighs approximately 1-pound per foot.

E. Front Curtain shall have half-strip turnbacks on leading edges and trailing edges of all sections. Bottom hem shall be 6 inches for all draperies that extend to the

floor. Valance and borders shall have 3-inch hems where turnbacks are not required. Side hems shall be 2-inches.

F. Opaque backing shall be fabricated without fullness, approximately same size as valance, teaser, and borders, except 3-inches less in the vertical dimension.

G. Chain pockets and number 8 jack chain shall be inserted in bottom hems of floor length pleated drapery. Chain shall be 2-inches above the bottom of the drapery.

2.04 MANUFACTURERS OF TRACK

A. Tracks shall be products of the following firms or equal approved by the architect. Tracks shall be box style approximately 2 ½ inches by 3 inches with enclosed slot, and shall comply with track assemblies detailed specifications. Tracks shall be manufactured from extruded aluminum.
   1. Automatic Devices Co. Model 281A
   2. Janson Industries Model J9000AL
   3. J.R. Clancy Model 281A
   4. Substitutions: Under provisions of section 01600

B. Track sections shall not have mechanical splices unless the lengths exceed 30-feet 0-inches in length in order to eliminate mechanical splices.

2.05 TRACK ASSEMBLIES

A. All stage traveler curtain tracks shall be heavy duty, ball bearing type, complete with all necessary accessories.
   1. Straight traveler tracks shall be furnished with continuous operating lines, ball bearing end pulleys and ball bearing floor pulleys.
   2. Curtain carriers shall have metal bodies, shall incorporate two wheels and each wheel shall have a race of ball bearings with nylon or neoprene tires. Carriers shall have a swivel and bumper feature to eliminate binding of successive wheels.
   3. Track shall be roped for bi-parting operation.
   4. Provide full width traveler tracks for the front stage curtain, the mid stage curtains, and the rear curtain.
   5. All tracks shall be connected to counterweight pipes or fixed position pipes by means of pipe clamps on centers not to exceed 5 feet.
   6. Operating line shall be 3/8 inch non-stretch braided cotton or synthetic fiber with reinforced center. Color shall be black

B. Battens installed in a fixed position (dead-hung) shall be 1½-inch schedule 40 pipe supported by grade 30 chain (1/4-inch wire) on centers not to exceed 10-feet with a rated load not less than 1200 pounds.

2.06 PICTURE SCREEN AND FRAME

A. Projection screens shall be products of the following firms, or equal approved by the architect.
   1. Dalite Screen Co.
   2. Draper Screen
   3. Stewart Film Corp.

B. Contractor shall furnish and install one Theatre Screen, matte white, for screen size 15 ft. vertical by 20 ft. horizontal.
   1. Screen shall be fungus proof and washable, flameproofed, and grommeted around the perimeter at 6 inch centers to a 2 ½ inch webbing.

C. Screen frame shall be of all aluminum construction using 3 inch by 2 inch by 1/4 inch extruded aluminum angles. Corners shall have aluminum plate gussets to achieve a rigid structure.
   1. The front surface of the screen frame, shall present a surface in one plane.
   2. Screen shall be laced to frame with 1/8 inch braided cotton cord.
   3. Five pairs of pipe clamps, miscellaneous hardware and 3/8 inch bolts shall be used to connect the frame to the supporting pipe.
   4. Furnish a 2 inch by 3/4 inch aluminum channel or the equivalent extrusion and bolt to each side of the frame approximately 12 inches above the bottom of the frame. The purpose of the extrusion is to support the bottom masking border.
   5. Screen frame shall be connected to a supporting counterweight pipe batten, specified herein.

2.07 SCREEN MASKING

A. Screen masking shall be manufactured from 20 ounce napped black velour, flameproofed.
   1. Furnish and install two side legs, a top masking border and a bottom masking border.
   2. All screen masking shall be made without fullness.
   3. The side legs and top border shall be grommeted at the top, furnished with tie-lines to connect directly to the counterweight batten that supports the screen. The bottom masking border shall be supported from the horizontal extrusion provided as a part of the screen frame.
   4. The side legs shall finish four feet in width and the side legs and bottom border shall trim 6 inches below the screen frame.
   5. The screen masking shall hide the frame, grommets and lacing and provide a black border around the image to absorb ambient light.

2.08 FIRE-STOP SHIELDS

A. Fire-stop shields shall be products of the following firms, or equal approved by the architect:
   1. The Palmer Co. (Boston, MA)
   2. J.R. Clancy (Syracuse, NY)
   3. Janson Industries (Canton, OH)

B. Provide (20) independent fire-stop shields for teaser and all borders, manufactured from inherently flame resistant, asbestos free, fiberglass fabric.

C. Fire shields shall be black in color, shall be sewed flat, and shall finish 60 inches in vertical dimension by 10-ft 0-inches in horizontal dimension. Weight of fabric shall be 32-ounces per square yard.

1. Fabric shall withstand continuous temperatures of up to 1100 degrees F, and short duration temperatures up to 2000 degrees F.

D. Shields shall be tied to the teaser and border battens to provide a protective fire barrier. Provide number 3 black grommets and black tielines.

2.09 SOUND REFLECTOR PANELS (OVER STAGE)

A. Sound reflectors shall be products of (as a standard for the specifications) Janson Industries (800-548-8982; FAX 330-455-5919).

B. Furnish and install sound reflector panels, hardware, fittings and rigging necessary for a complete functioning installation.

C. Panels shall consist of painted aluminum fabrication using material that is .125 in thickness.
1. Panels shall comply with fire resistance standards and properties of authorities having jurisdiction.
2. The color shall be selected by the Architect and shall be applied to both faces of each panel.

D. Panels shall be 6'-0" (front to rear) by modular dimensions aligned to provide two continuous rows, each of which is approximately equal to the width of the stage opening less 2'-0" in length.

E. Panels shall be aligned by through-bolting aluminum angles (3" x 2" x 1/4") as required. Angles shall be located out of sight of the audience and assure a flat surface for the ceiling sets.

F. Furnish and install pivot devices on 8 foot centers. These devices shall permit storage in a vertical mode and shall allow variable tilt in the use mode. These devices shall keep the panels in a plane.

G. The pivot devices shall be connected to a counterweight pipe batten. The tilt position shall be easily adjustable by means of shackle devices.

H. Each row of sound reflector panels shall be installed to a separate counterweight set as specified herein.

I. Install materials in accordance with manufacturer's printed instructions and recommendations, and comply with governing codes and regulations.

2.10 MANUFACTURER OF RIGGING HARDWARE

A. Rigging hardware shall be products of the following firms or approved equal by the architect.
1. J.R. Clancy Co.
2. Janson Industries
3. H and H Specialties

2.11 COUNTERWEIGHT RIGGING (T-BAR SYSTEM)

A. Furnish a total of 25 sets of multi-line counterweight rigging firmly and securely attached to structure in the best and most workmanlike manner, fitted and arranged to clear all existing building construction, properly counterbalanced, adjusted, tensioned and otherwise ready for operation in accordance with the requirements of the specifications and commonly accepted good practice for stage rigging.

B. Provide fixed pipe battens for all equipment not counterweighted. These pipe battens shall be supported from 3/16-inch proof coil chain on centers not to exceed 10-feet. Items on fixed pipe battens consist of the valance and the front curtain.

C. All rigging hardware shall be painted black color.

D. Summary of major components:

ITEM	DESCRIPTION
Head block, tapered roller bearings	12 inch
Loft blocks, ball bearings	8 inch
T-Bar carriage (HMD guides)	6 ft.
Floor block, ball bearings (HMD guides)	10 inch
Rope lock	10 inch
Copper ferrules and cable clips	1/4 inch
Lead cables (galvanized preformed aircraft)	1/4 inch 7 by 19
Pipe battens (Schedule 40)	1½" ID
Counterweights	700 lb. per set
Rope (non-stretch multi-line)	3/4 inch
Locking Rail	As req'd
Muling blocks, tapered roller bearings	8 inch
Trim chains (1200 pound test)	1/4 inch x 36 inch

2.12 HEAD BLOCKS

A. Head blocks shall be made of class 30 grey iron conforming to ASTM specification A-48, shall have a minimum hub diameter of 3" and shall be free of holes and casting flaws. The sheave shall be machine faced and turned with the required size and quantity of cable grooves. Cable groove depths shall be sufficient to encompass the cable fully and shall have sloped sides. Cable grooves shall conform to rope and cable manufacturers' standards for groove shape and tolerance. The sheave shall be fitted with 1" diameter tapered roller bearings, properly sized for the required load and speed. The one inch diameter steel shaft shall have a Dutchman to engage the keyhole in the side plate. Proper adjustment of the bearings shall be accomplished by means of a fine thread, self locking nut on the opposite end of the shaft. The block housing shall have two 10 gauge side plates rigidly fastened together with at least three 1/4" bolts and three pipe spacers. Head block base angles and connecting hardware shall conform to manufacturer's standards.

2.13 LOFT BLOCKS

A. Loft blocks shall be of unit parallel type construction with heavy steel side plates extending above sheaves to accommodate three cross bolts and spacers to positively prevent cables escaping from grooves. All sheaves shall run on precision ball bearings. Shaft shall be not less than 5/8 inch in diameter. Class 30 gray iron conforming to ASTM A-48 shall be used. The housing shall also have drop forged steel centers with 3/4" threaded ends fastened to the side plates by two 5/16" bolts. All bolts shall have lock nuts. The centers shall be threaded to provide for a 4"grip adjustment range for the block mounting. A cut in the side plate shall be made with a ½" or 3/4 throat so as to grip the flange of the mounting beam properly. The block shall be fastened to the steel beam by means of an angle clip mounted on the threaded end of the ¾-inch bolt to properly grip the lower flange of the beam when the nut is tightened. Alternatively, the loft blocks may be furnished with a pair of properly sized base angles and heavy clips to clamp to structural flanges.

B. Loft block idler assemblies shall be provided to carry the weight of the cables and prevent rubbing against adjacent block side plates. Idler assemblies shall consist of one or more 2-1/2 inch diameter, plastic idler pulleys mounted on the side of the loft block in a steel housing. The housing shall consist of a 12 gauge side plate and two 1/4 inch bolts and pipe spacers to mount the housing and captivate the cables in the grooves. The sheaves shall have ball bearings, 1/4 inch cable grooves and shall ride on a 1/4 inch shaft. All nuts shall be of the nylon insert locking type. Furnish sheaves for all cables passing the corresponding loft block.

2.14 CARRIAGES

A. Counterweight carriages shall have 3/4 inch carriage side members. Guide blocks shall be of high molecular density hard durable plastic designed to work snugly and to operate smoothly and freely in the guide tracks. Provide double nuts at top and bottom or rods. Carriages shall be rigidly constructed to eliminate racking using a continuous 3-inch by ¼-inch steel bar (backbone) that supports the HMD guide blocks. Provide spacer bars on 24-inch centers to eliminate spreading of the ¾-inch rods and provide a safety collar and set screw for each rod.

2.15 FLOOR BLOCKS

A. Floor blocks shall be manufactured from gray iron as a one piece casting fitted with a ten inch diameter sheave, lathe turned, for 3/4 inch hand line, operating on precision ball bearings. Provide guide blocks of high molecular density hard durable plastic to operate in the guide tracks.

2.16 ROPE LOCKS

A. Rope locks shall be manufactured as a unit casting of first grade iron with sand blast finish. Furnish cast iron jaws for clamping 3/4 inch line. The jaws shall be mounted on smooth pins or rivets. Handles shall be at least 9 inches in length and shall consist of a one piece cast eccentric of nodular iron or drop forged steel. Each rope lock shall have a cadmium plated thumb screw and lock nut for adjustment of jaw openings. Each lock shall be equipped with a steel oval

retaining ring. Each rope lock shall have a pair of flanges to align holes that permit padlocking any counterweight set.

2.17 CABLE

A. Lead line cable shall be of aircraft construction 7 by 19 (galvanized, preformed) with breaking strength not less than 7000 pounds for ¼ inch cable.

2.18 HANDLINES

A. Handlines shall be of good quality multi-line non-stretch composite braided rope with polyester outer jacket for abrasion resistance and with an polyolefin center for strength. Rope shall be ¾-inches in diameter, free from slivers and foreign matter.

2.19 PIPE BATTENS

A. Counterweight pipe battens shall be 1 ½ inch (inside diameter) schedule 40 steel pipe. All joints shall be sleeve spliced internally using not less than 18 inch splice pieces. Bolts or rivets shall connect each end of the internal splice pieces to the pipe batten. Furnish 4 bolts with lock nuts at each splice. Bolts shall be oriented at 90-degrees on each side of the splice.

2.20 COUNTERWEIGHTS

A. Counterweights shall be cut from steel plate free from rough edges or foreign matter, with slots at each end to accommodate the vertical members of the counterweight carriages. All equipment shall be balanced and the surplus weight shall be neatly stacked. All counterweights shall be shop painted on all exposed surfaces in a smooth finish coat of black. Fifty percent of the weight shall be 2-inches thick and 50 percent of the weight shall be 1-inch thick.

2.21 MULING BLOCKS

A. Muling blocks, as required, shall be provided. Sets shall be installed in direct lines where practical, but if required, due to physical location of stairs, doorways, or obstructions, all muling blocks, extra head blocks, and floor blocks necessary, together with supporting brackets, miscellaneous steel and additional cable and rope shall be furnished and installed to achieve a properly functioning system for each set. Blocks shall have an 8 inch diameter with tapered roller bearings. Class 30 gray iron conforming to ASTM A-48 shall be used in manufacture.

2.22 LOCKING RAILS

A. Locking rails shall be fabricated to locate sets as required. The angle on which the rope locks are mounted shall be formed to an angle shape no smaller than 3" x 2" x 1/4". Stanchions made from ½" x 3" flat bar braced diagonally with 1/4" x 3" flat bar shall be provided on 5 foot maximum centers. The entire locking rail shall be designed and installed to withstand a minimum up load of 500 pounds per foot. There shall be an index card holder strip bolted to the top on-stage toe of the locking rail angle. This strip shall be punched to receive formed clips that hold plastic write-on cards centered on the installed sets. Provide one

numbered plastic write-on card for each set installed. Locking rail shall be punched or drilled as required to locate sets on centers defined in shop drawings.

B. Furnish layouts for inserts, clips or other supports required to be installed by other trades for anchoring locking rail(s).

2.23 FEED CABLES

A. The stage equipment contractor and the electrical contractor shall have the joint responsibility of assuring that feed cables are not visible from any seat in the audience. The electrical contractor shall install the fixture pipe batten, and the bar stock that connects the counterweight pipe (by stage equipment contractor) to the fixture pipe, (by stage equipment contractor). The electrical contractor shall furnish and install the connecting bar stock, plug-in strips, the lighting instruments, and the electrical cable. The stage equipment contractor shall furnish and install any loft blocks, cables, and cradles required.

2.24 CHANNEL GUIDE TRACK SYSTEM

A. Furnish a complete extruded aluminum guide track system for each counterweight carriage and mount to the building wall construction. Each guide track shall consist of a four inch by two inch extruded channel (.250 inch wall thickness) with two flanges that fit the carriage guide blocks. A pair of flanges shall guide the carriages for each counterweight set. The guide tracks for the counterweight carriages shall be erected vertically and shall extend from the locking rails to the head blocks to permit maximum movement (travel) by the carriages. The guide flanges shall be held parallel to within 1/16 inch. Provide wall knees (brackets) for supporting the guide track in a vertical plane regardless of irregularities in the masonry wall. Secure to masonry by means of suitable toggle bolts in masonry unit shells and expansive devices in mortar joints or solid masonry units. Horizontal angles, 3 inch by 2 inch shall be provided on five foot centers between the stage floor and the head block beam. Each of these angles shall extend for the full depth of the counterweight battery wherever practical. One flange of the wall batten angles shall be bolted to the wall knee brackets and the other flange shall be bolted to each extruded channel. The purpose of the wall batten assembly is to assure a perfectly vertical plane for the counterweight carriage operation. Completed work will be leveled, tested, and left ready for use.

B. Individual channels shall be furnished for each counterweight set and shall extend from the head block beam to the floor. Not more than one splice shall be used in assembly and the splice plate shall be not less than 24 inches in length.

C. The stage equipment supplier shall provide a layout for approval by the architect and/or owner. The equipment shall be properly spaced to avoid all conflict with equipment furnished by other trades. Approval of the drawing is to facilitate cooperation among trades, but full responsibility for a properly functioning installation remains the obligation of the stage equipment contractor.

D. All work shall be executed using high standards of workmanship in fabrication and erection. The finished installation shall be complete and functional in every respect with channel guide tracks plumb and secure and left ready for use.

2.25 FIRE-STOP CURTAIN AND RIGGING

A. Furnish and install fire stop curtain and rigging, including miscellaneous metal, smoke pockets and all other equipment specified.

B. Furnish and install a manually operated, automatically closing fire safety curtain as required by state and local building codes.

C. This contractor shall furnish and install fire line and related equipment as required for a complete installation, ready for operation.

D. The curtain shall be arranged to intercept fire and smoke and prevent glow from severe fire on the stage from showing on the auditorium side for at least five (5) minutes in order to permit safe egress of all people from the auditorium.

E. It is the intention of this specification to provide a fully functioning fire safety curtain system. Listed below are major items.
   1. Actual equipment and components must reflect building conditions.
   2. Brail curtain shall be used to facilitate operations of the stage, especially re-cocking of the fire stop curtain. Provide D-ring columns to align with loft blocks on centers not to exceed 8-feet.
   3. All dimensions must be field verified by the Rigging Contractor.
   4. Any conditions detailed in the drawings not covered in these specifications shall determine actual equipment needs.

F. The curtain shall close by gravity due to over-balance of the curtain as specified below. Emergency closing must occur in less that thirty seconds when the fireline is severed or released, or fusible links separate.

G. Curtain shall be raised by means of a hand operated winch, to compensate for the unbalanced load. The winch must have an integral hydraulic control device to regulate the rate of descent. The final 8-feet of descent shall be slowed sufficiently by the control device to allow people to move to either side of the fire stop curtain.

2.26 CURTAIN GUIDES

A. The side edges of the curtain shall be fitted with guides located on 18 inch centers, attached with bolts. The fire stop curtain shall be guided on each side by steel cable held taut with turnbuckles. The method of guiding shall be by means of standard curtain guides with brass spools spaced not more than 18 inches apart.

2.27 RETAINING CHAINS

A. Furnish number 5/16 log type, welded proof coil retaining chains adequately secured to the structural steel.
   1. Chains shall be securely fastened to upper batten of curtain and length of chains shall be sufficient to support the curtain in lowered position and have approximately four inches of slack in each chain. Provide half pipe clamps at the top to secure to the batten without puncturing the fabric.
   2. Chains shall be galvanized or plated to resist corrosion.

3. Provide a quantity of retaining chains equal to the quantity of loft blocks plus one.

2.28 FIRE-STOP CURTAIN FABRICATION

A. Fire-Stop safety curtain: horizontal dimension 3 feet greater than the width of the proscenium opening and vertical dimension 4 feet greater than height of proscenium opening.

2.29 MATERIALS SPECIFICATIONS

A. Fire-Safety Curtain: The fire safety curtain shall be fabricated from highly texturized silica based, abrasion resistant, asbestos-free, non- carcinogenic yarn, 20x7 weave of .07 thickness weighing at least 40 ounces per square yard, and shall not incorporate wire within the weave.
   1. All strips of fabric shall be in continuous lengths running the full height of the curtain. There shall be no horizontal seams. Each seam shall be sewn with two lines of stitching using fiberglass thread.
   2. Top and bottom pockets shall be 6 inches. The bottom pocket shall be equipped with a 3 inch yield pad filled with the same material used for the curtain.
   3. The fabric shall withstand continuous temperatures of up to 1100 degrees F, and higher short duration temperatures up to 2000 degrees.
   4. Fabric shall have independent laboratory test results proving that the fabric complies with the specifications.
   5. D-ring columns on centers not to exceed 8-feet shall be provided.
   6. Vertical edges of curtain shall have hems to which brass guide spools on 18-inch centers shall be bolted.

2.30 HEAD BLOCKS

A. The head block shall conform to the following requirements. The 12 inch diameter sheave shall be made of class 30 grey iron conforming to ASTM specification A-48. The sheave shall be machine faced and turned with the required size rope or cable groove. Cable groove depths shall be sufficient to encompass fully the cable and shall have sloped sides and shall conform to rope and cable manufacturers' standards for groove shape and tolerance. The sheave shall be fitted with precision tapered roller bearings, properly sized for the required load and speed. The block housing shall have two 10 gauge side plates rigidly fastened together with at least five 3/8 inch bolts and 5 pipe spacers. Each side plate shall be fastened to a 1½" x 2" x 1/4" base angle with a proper length for the mounting conditions.

B. The block shall be fastened to auxiliary structural channels or beams as necessary with 3/8 inch bolts (grade 5) and nuts (locknuts).

2.31 LOFT BLOCKS

A. Loft blocks shall conform to the following requirements. The 8½ inch diameter sheaves shall be made of class 30 grey iron conforming to ASTM specification A-48, shall have a minimum hub diameter of 2 inches and shall be free of holes and casting flaws. The sheave shall be machine faced and turned with the required size rope or cable groove. Cable groove depths shall be sufficient to

encompass fully the cable and shall have sloped sides. Rope and cable grooves shall conform to rope and cable manufacturers' standards for groove shape and tolerance. The sheave shall be fitted with 5/8 inch diameter precision ball bearings, properly sized for the required load and speed. The 5/8 inch diameter steel shaft shall have a Dutchman to engage the keyhole in the side plate. Proper adjustment of the bearings shall be accomplished by means of a fine thread, self locking nut on the opposite end of the shaft. The block housing shall have two 12 gauge side plates rigidly fastened together with at least five ¼" bolts and 5 pipe spacers. Each side plate shall be fastened to a 1" x 1" x 3/16" base angle of length appropriate to the mounting conditions.

B. The blocks shall be fastened to auxiliary structural elements referred to the roof structure. Channels, beams or Unistrut shall be bolted with 3/8 inch bolts (grade 5) and nuts (locknuts).

2.32 MULE BLOCK

A. Mule block shall conform to the following requirements. The 8 inch diameter sheave shall be made of class 30 grey iron conforming to ASTM specifications A-48 and free of holes and casting flaws. The sheave shall be machine faced and turned with the required size cable groove. Cable groove depths shall be sufficient to encompass fully the cable and have sloped sides. Cable grooves shall conform to cable manufacturers' standards for groove shape and number of grooves. Steel side plates with a minimum thickness of 7 gauge shall fully protect the sheave and shall be fillet welded to the base. Each block shall have four spacers placed to prevent cables from escaping the sheave grooves. Each block shall run plumb and true without rubbing side plates when rotated.

B. Mule blocks shall be furnished if required to clear obstructions of building elements.

2.33 FIRE CURTAIN WINCH

A. Winch shall be a hand operated chain reduction unit of sufficient capacity to handle the load and shall be mounted on a metal standard of the proper height for easy operation. The drum shall be of welded steel construction. It shall be locked by a non-asbestos lined brake that is held by a lever rigged to the fireline. Gear ratios shall be selected to facilitate operation by the removable hand crank which shall be supplied.

B. The unit shall be equipped with an adjustable hydraulic speed governor to provide maximum control and safety in the free fall of the fire curtain.

C. The winch and stand shall be enclosed in a removable metal enclosure for safety. The winch shall be off-stage of the house curtain and shall be parallel to the fire curtain.

2.34 BATTENS

A. Battens shall be made of 1 ½ inch I.D., schedule 40 black iron pipe. All joints shall be sleeve spliced with 24 inch long sleeves with 12 inches extending into each pipe held by two 3/8 inch hex bolts and lock nuts on each side of the joint.

2.35 FIRELINE SYSTEM

A. The manual fireline release system shall consist of a 1/8" diameter aircraft cable, 6 fusible links, 3 inch pulleys as required, a round weight arbor with 50 pounds of weight, and an arbor guard. The 6 fuse links shall be distributed evenly along the fireline. A pull handle release device and a sign shall be mounted 5 feet above the stage floor on both sides of the proscenium immediately adjacent to the firelines. The sign shall read "In case of fire pull handle to lower fire curtain".

2.36 ELECTRICAL FIRELINE RELEASE

A. The fire curtain shall be equipped with an electro-mechanical fireline release mechanism operated by a relay that can be activated by normally open, rate of rise heat detectors, smoke detectors, emergency switches, etc. (The detectors shall be furnished and installed by others) or by release of tension in the fireline. A switch shall be mounted in the release mechanism enclosure for testing system operation.

B. Activation of release mechanism shall release tension in the fireline which, in turn, allows the arbor to rise and the fire curtain to close in the normal manner.

C. The relay contains an integral battery and charger to provide emergency power during power interruptions. The relay requires operating power from 24 VDC or 24, 120, 208, 230 VAC power sources. Wiring, conduit and connections are not in this contract.

2.37 SMOKE POCKETS

A. Furnish and install one pair of smoke pockets to extend from the stage floor to an elevation equal to the highest elevation of the raised curtain. Pockets shall consist of 10 inch channels and 1/4 inch plates bolted on 2'-0" centers. Welded construction or bolted construction is acceptable. Channels shall be anchored to the walls on 4'-0" centers. Smoke pockets shall have a shop coat of black paint. Formed steel fabrication using 1/4 inch thick steel may be used in lieu of channels and plates.

2.38 GUIDE CABLES

A. Provide 1/4 inch wire rope guide cables at each side of the curtain. These cables shall be attached to brackets on the smoke pockets at the stage floor level and extend to the roof steel where they shall be attached with 3/8" x 6" forged turnbuckles, thimbles, cable clips and other fittings as required.

2.39 LIFT CABLES

A. The curtain lift cables shall be 1/4 inch diameter 7 x 19 galvanized aircraft cable. Cables shall be terminated with corresponding cable thimbles and two 1/4 inch cable clips or copper (oval swaging) fittings at each end.

2.40 DRAW CABLE

A. The draw cable shall be 3/8-inch, 7 x 19 galvanized aircraft cable, attached to the guided clew using a thimble and two cable clips of appropriate size.

Breaking strength of the draw cable shall have a factor of safety 8 times the weight of the fire stop curtain and the pipe battens.

2.41 UNISTRUT

A. Unistrut number 1001 and Unistrut clamps shall be installed directly above the fire-stop curtain. Every structural beam shall be used for support. The Unistrut will be spliced as required and shall extend from the head block to the farthest loft block. All loft blocks shall be installed to the Unistrut and shall be aligned with the columns of D-rings. An additional length of Unistrut shall be used to support the head block. The Unistrut supporting the loft blocks shall be continuous in order to cancel horizontal loads.

2.42 AUXILIARY STRUCTURAL CHANNELS AND BEAMS

A. Auxiliary mounting steel shall consist of structural steel or aluminum channels, beams, angles, and pipes as required to provide anchorage for rigging blocks wherever they are needed. All blocks and all chain and cable tie-off points shall be fixed to auxiliary metal as required, and shall be designed to handle the imposed loads.

2.43 FINISH

A. All items provided under this section shall have the manufacturer's standard finish and color, except as noted.

B. All turnbuckles, clips, tracks, chains and other items of incidental hardware shall be furnished plated or painted.

2.44 EQUIPMENT SUMMARY (MAJOR ITEMS)

A. The following items shall be shown in plan and section and properly labeled on shop drawing submission. Indicate whether item is installed to a counterweight set or to battens fixed in elevation.

Valance
Front curtain
Teaser
Mid Stage Curtain
Masking Borders (3 required)
Leg Curtains (4 pairs required)
Rear Curtain
Scrim Curtain
Sky Drop
Projection Screen, Frame and Masking
Traveler Tracks (3 required)
Opaque Backing for Masking (5 required)
Fire Shields (20 required)
Sound Reflector panels (2 rows required)
Counterweight Sets (25 required)
Fire Stop Curtain and Rigging
Smoke Pockets (pair)

PART 3—EXECUTION

3.01 INSTALLATION

A. The horizontal, end-to-end dimensions of all pipe battens and tracks shall be as shown on the drawings, or shall be 9 ft greater than the width of the proscenium opening, unless physical conditions of the structure and the building mechanical systems limit the dimensions.

B. The curtains shall be made in sections to provide convenient points for entering or leaving the stage. The sections shall lap 20 inches or more at all points of entry except at the mid-points which shall be 36 inches.

C. Curtain sections shall be furnished for the full length of all tracks or pipe battens except as indicated otherwise on the drawings, or as defined in this specification.

D. The vertical dimensions of all curtains on the stage shall be as shown on the section drawing, or shall be not less than ½ the distance from stage floor to loft blocks. Provide necessary laps at the top and sides of the opening.

E. Masking elements shall be of sufficient size to adequately mask the stage ceiling, walls, lights and tracks from the first row seats. Ceiling masking elements that are counterweighted shall be 7 ft in vertical dimension and fixed elements shall be 1/4 of the proscenium opening vertical dimension.

F. Each leg curtain shall have a finished top not less than 1/6 the length of the counterweight pipe batten.

G. This contractor shall furnish and install any miscellaneous structural metal required to support the rigging equipment, the fire stop curtain and other equipment.

H. Anchoring devices and miscellaneous metal required for proper installation shall be erected during the process of the general construction at the appropriate time to coordinate with the work of other trades.

I. All hardware and all drapery shall be trimmed, leveled, and left ready for use.

END OF SECTION