

CONSULTANT NARRATIVES

## FURNITURE & EQUIPMENT

APPX. A - d

**SECTION 11 06 20  
STAGE CURTAINS AND RIGGING**

**PART 1 – GENERAL**

**1.1 SUMMARY**

- A. Include GENERAL CONDITIONS and applicable parts of Division 1 as part of this Section.
- B. Examine all other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- C. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

**1.2 WORK INCLUDED**

- A. Include delivery to the building, unpacking, setting in place, leveling and attachment to structure, as required, for complete installation.
- B. This Stage Curtains and Rigging Equipment Subcontractor shall furnish and install all curtains, rigging, counterweights, frames and cables, all necessary hardware as specified herein and shown on the equipment drawings. The length of curtains and tracks shown on the drawings and specified herein shall be for bidding purposes only and the actual curtains shall be of length required to form full and continuous coverage of the platform.
- C. Remove all debris, dirt and rubbish accumulated as a result of this installation, and leave the premises clean and ready for use.
- D. Verify and confirm all building dimensions relative to equipment to be installed by taking actual field measurements at the job site prior to equipment fabrication.
- E. Become familiar with job conditions and building measurements to coordinate the planning, design, delivery and installation of equipment furnished under these specifications, with all other related trades and associated work during the term of this contract.
- F. This Stage Curtains and Rigging Equipment Subcontractor shall supply an installation of equipment that is equal to or exceeding the quality and function described in this minimum requirement Specification and shown on the Drawing.

**1.3 QUALITY CONTROL AND GUARANTEE**

- A. All equipment shall be unconditionally guaranteed for a period of one (1) calendar year from the date of accepted installation.
- B. For purposes of identification of style and level of quality of equipment desired, these specifications refer to Stage Curtains and Rigging Equipment Subcontractor as currently manufactured by companies listed under Items to be Furnished and Installed.
- C. These references are not intended to be restrictive or limiting to competitive makes and models of comparable quality and design. Colors shall be as selected by the Architect.

**1.4 SHOP DRAWINGS**

- A. One (1) complete set of shop drawing sepias and six (6) complete sets of prints and of manufacturer's cuts shall be submitted to the Architect for approval in accordance with

the requirements of this Section. The drawings shall be ½" scale and shall show the layout of all equipment specified herein.

- B. The exact location of all electrical connections shall be dimensioned for all equipment and labeled with the necessary information. This Stage Curtains and Rigging Equipment Subcontractor shall assume all responsibility in respect to same.

## **PART 2 – MANUFACTURERS AND PRODUCTS**

### **2.1 MANUFACTURER'S**

- A. Rigging equipment shall be as manufactured by J.R. Clancy, Inc., Syracuse, NY; or equal.
- B. Rigging systems shall be specialized overhead lifting systems. Due to the highly specialized nature of rigging equipment, and the safety requirements of the equipment, the rigging products provided for this work shall be the products of a single rigging manufacturer for quality, consistency and ease of integration. Accessory items such as wire rope, fittings, and curtain tracks may be from other specialty manufacturers, as identified herein.
- C. The rigging manufacturer must have the following programs in place. Approval to bid does not release the manufacturer from meeting these requirements:
1. The manufacturer must have a product testing program, including determination of recommended working loads for products based on destructive testing and review by a licensed engineer.
  2. The manufacturer of the performance equipment must have a quality management system that is registered to the ISO 9001:2008 standard.
  3. The manufacturer must carry primary product and general liability insurance of \$2,000,000 each, with excess liability coverage of \$10,000,000 and a Contractors Professional Liability policy with \$2,000,000 coverage.
- D. Requirements for Approval: Other equipment manufacturers seeking approval must submit the following information at least 2 weeks prior to the bid opening date. Approval of manufacturers will be by addenda. Failure to submit any of the required information will automatically disqualify the manufacturers from consideration of approval.
1. Evidence that the manufacturer has been in business for a minimum of ten years manufacturing stage equipment.
  2. A listing of 10 equivalent installations, including: Name, address and telephone number of Owner; Name, address and telephone number of architect; and scope of work.
  3. A brief written description of the manufacturer's operation including facilities, financial capabilities, and experience of key personnel.
  4. Written, third party evidence showing that the manufacturer has the testing, quality management and insurance programs required above in place.

### **2.2 GENERAL**

- A. Standards
1. Materials shall conform to the following ASTM and ANSI standard specifications:  
ANSI B17.1M - Keys and key seats; ANSI B18.2.1&2 - Specification for square and hex bolts and nuts; ANSI B106.1M - Design of Transmission Shafting; ANSI E1.4 - Entertainment Technology – Manual Counterweight Rigging ANSI E1.6-1 -

STAGE CURTAINS AND RIGGING

11 06 20 - 2

DRA

Entertainment Technology – Powered Hoist Systems; ANSI E1-22 - Entertainment Technology – Fire Safety Curtain System; ASTM-36 - Specification for structural steel; ASTM-48 - Specification for gray iron casting; and ASTM-120 - Specification for black and hot-dipped zinc-coated, (galvanized) steel pipe for ordinary use.

2. In order to establish minimum standards of safety, the following factors shall be used: Cables & fittings - 8:1 Safety Factor; Cable D/d ratio - Sheave tread diameter is the minimum D/d ratio per the "Wire Rope User Manual" or recommended by the wire rope manufacturer; Tread Pressures - 500 lbs. for cast iron, 900 lbs. for Nylatron, 1000 lbs. for steel; Max. fleet angle - 1-1/2 degrees; Steel - 1/5 of yield strength or per AISC Specification; Bearings Two times required load at full speed for 2000 hours; Bolts - Minimum SAE J429 Grade 5 (ISO R898 Class 8.8), zinc plated; Motors - 1.0 AGMA Service Factor; Gearboxes - 1.25 Mechanical Strength Service Factor; and Gearboxes - 1.0 Gearing Service Factor.
- B. Materials: All materials used in this project shall be new, unused and of the latest design. Re-furbished and obsolete materials are not permitted.
- C. Head Blocks: Recommended working load of head blocks shall exceed the overall load imparted on the head block.
- D. Sheaves:
1. Sheaves shall be of the following materials, as specified: ASTM A-48 Class 30 grey iron castings; Molybdenum disulphide filled or polyamide Nylon; and Steel.
  2. Groove depths shall be sufficient to fully encompass the cables and ropes. Grooves shall have sloped sides (8 degree minimum) and conform to rope and cable manufacturers' standards for groove shape and tolerance.
  3. All rope and cable grooves in a sheave shall have equal pitch diameters.
- E. Bearings
1. Bearings shall be manufactured per AFBMA/ANSI standards.
  2. Ball bearings shall be sealed precision with double seals.
  3. Pillow block bearings must be loaded into their base..
- F. Block Shafts
1. Shafts shall be machined steel, have fine screw threads, and be keyed to one side plate to prevent rotation.
  2. Shaft lengths shall be set so that the shaft bears on a side plate for full strength, not on threads.
  3. Proper adjustment of the sheave and bearings shall be accomplished by means of a fine thread, self-locking nut on the opposite end of the shaft. Each sheave shall run plumb and true without rubbing its side plates when rotated.
- G. Block Side Plates
1. Hot rolled steel.
  2. Spacers shall be used to stiffen the side plates and to prevent cables from escaping from the sheave grooves.
- H. Fabrication

1. The mechanical fabrication and workmanship shall incorporate best practices for good fit and finish. There shall be no burrs or sharp edges to cause a hazard to personnel.
  2. All moving parts shall meet specified tolerances.
  3. All equipment shall be built and installed to facilitate future maintenance and replacement.
- I. Finishes
1. Paint shall be the manufacturer's standard black finish except as noted.
  2. All turnbuckles, clips, tracks, chains and other items of incidental hardware shall be furnished plated or painted.
- J. Recommended Working Load: This specification calls for minimum recommended working loads for many hardware items. This is the maximum load which the manufacturer recommends be applied to properly installed, maintained, and operated new equipment. Manufacturer's recommended working loads shall be determined by a Licensed Professional Engineer.

### 2.3 FIRE CURTAIN SYSTEM

- A. Fire Curtain Hoist: Hoist shall consist of a cable drum, coupled to an electric gear motor. Hoist shall have a 1,100 lb lifting capacity at a rate of 25 feet per minute. The hoist shall be fully enclosed and supplied with a sturdy metal stand or wall brackets. The cable drum shall be of welded steel construction and carry 75'-0" of 5/16" diameter 7x19 galvanized utility cable. Twin guards shall keep the cable in the drum groove. The hoist (and curtain) shall be locked in position by the motor brake located within the enclosure. Releasing the fire line shall disengage the motor brake, permitting the cable drum to rotate, lowering the curtain. The brake handle shall extend through the top of the case, for easy attachment to the end of the fire line. No more than 35 lbs. of tension in the fire line shall be required to hold the full load capacity of the winch. The unit shall be equipped with an adjustable hydraulic speed governor to provide maximum control and safety in the closing of the fire curtain and to establish the travel time. All components in the hoist shall be fully enclosed. Access panels for adjustment and maintenance shall be removable without removing the hoist from service. The motor and helical/bevel gearbox shall be an integrated unit, with the first stage pinion mounted directly on the motor's armature shaft. Motors shall be totally enclosed fan cooled (TEFC). The motor shall have a minimum AGMA service factor of 1.0 for constant operation. The gear case shall be cast iron for protection against shock damage. The output shaft shall have double lip oil seals to prevent leaks. The gearing service factor shall be a minimum of 1.0 with a mechanical strength service factor of 1.25.
- B. Rotary Limit Switch: Rotary limit switch assembly shall have four independently adjustable switch/cam sets. Cams shall be driven by a geared assembly. Switches shall have snap acting contacts. Switches shall be mounted within the winch base as to allow for easy adjustment of the switch settings. Rotary limit switches shall be General Electric CR115E series or Ravasi.
- C. Fixed Speed Starter: The hoist shall be controlled by a UL 580E listed, full voltage, self-protected, reversing starter. Enclosure shall be NEMA 12 with hinged, latching cover. The interior of the starter cabinet shall be "touch safe" per IEC 204-1 "Protection against direct contact" rules. The NEMA/IEC magnetically operated, mechanically and electrically interlocked, reversing starter shall be sized to match the hoist motor horsepower and shall be rated for plugging and jogging. Units shall incorporate UL580E Type 2, non-welding, positive break contactors. Overcurrent protection shall be provided by an IEC Class 10 overload. Short circuit protection shall be provided by a circuit breaker. Starters shall be wired so that operation of the normal end of travel limit switches shall only allow

STAGE CURTAINS AND RIGGING

11 06 20 - 4

DRA

movement away from the limit switch. Operation of an over travel limit switch shall open the line contactor, and will not allow further movement in either direction. A spring return toggle switch shall be housed inside the starter cabinet to allow override of the over travel limits for resetting purposes. Control Station: Controls, consisting of up and down pushbuttons and an emergency stop switch, shall be mounted on the motor starter.

- D. Smoke Pockets: Furnish and install one pair of smoke pockets to extend from the stage floor to a point above the top of the raised curtain or to the height specified in the drawings. Pockets shall consist of a 6" or 8" deep "Z" channel formed from 1/4" steel plate and a 1/4" x 18" steel plate which shall be bolted to the channels on 2'-0" centers. Channels shall be anchored to the walls on 4' 0" centers. Provide wire rope guide cables at each side of the curtain. Cables shall be sized for a minimum 2 pound per square foot horizontal pressure differential, attached at the stage floor level and extending to the roof steel or gridiron where they shall be attached with turnbuckles, thimbles, cable clips and other fittings as required.
- E. Fire Line Release: The fire line release engages a ring that is attached to the fire line. The ring shall be held within a tube by a pin with an over-center design lever. The device shall be steel and finished in red for easy identification. The design shall ensure that the lever positively releases the ring to allow curtain closure regardless of the tension in the fire line. The enclosure shall consist of a metal case with a clear acrylic window to accommodate the Fire Line Release. The door shall be easy opening but protects the device against accidental release. The window and high contrast lettering on the cover shall provide easy identification.
- F. Round Weight Arbor and Guard: A round weight arbor shall consist of a 3/4" diameter by 18" long hot rolled bar with double nuts and a forged eye nut at the top. Two (2) five (5) pounds of cast iron or steel round weights are supplied on the arbor and shall be held by the bottom double nuts. The round weight arbor guard shall consist of a 4 foot tall sheet steel cylinder to guide the arbor and keep it from being blocked in its travel.
- G. Electrical Fire Line Release: The fire curtain shall be equipped with an electro mechanical fire line release mechanism operated by a Sure Guard® II, activated by normally open or normally closed devices including rate of rise heat detectors, smoke detectors, emergency switches, etc. (furnished and installed by others) or by release of tension in the fire line. A switch shall be mounted in the release mechanism enclosure for testing system operation. Activation of the mechanism shall release tension in the fire line which, in turn, allows the fire curtain arbor to rise and the fire curtain to close in the normal manner. The release unit shall incorporate three pulleys permitting its attachment to the fire line at any point and to help prevent accidental release. The release shall contain an integral sealed, rechargeable "Gel Pac" battery and charger to provide emergency power during power interruptions. A charged battery shall keep the curtain raised for a half hour minimum without building power. The release shall operate from a 120 VAC power source provided by others. The electrical fire line release shall be UL Listed. The fire line release system shall be the Sure-Guard® II.
- H. Rate of Rise Heat Detector: A heat detector that closes a normally open electrical contact at a fixed temperature or at a temperature rise of 15°F in one minute. Rating: 3.0A at 6 to 125 VAC, 1.0 A at 6 to 24VAC, 0.3 A 125 VDC, and 0.1 A VDC. UL/ULC rating temperature - 135°F. UL/ULC maximum temperature at ceiling - 100°F.
- I. Fire Safety Curtain: The curtain shall be fabricated from tightly woven J.R. Clancy Zetex™ 1210 ZP non wire inserted, non asbestos, non carcinogenic silica based cloth, 12 x 7 weave of .070" thickness weighing at least 40 ounces per square yard. The curtain shall be listed and approved by the State of California Fire Marshall and shall bear a certification label from a nationally recognized listing agency. 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. Top and bottom pockets shall be 6". The bottom pocket shall be equipped with a 3" yield pad filled with Zetex™.

- J. Single Line Loft Block: The sheave shall have an 8-1/2" outside diameter, and shall be an iron casting, with a machined groove. The sheave shall be equipped with a 17 mm diameter shaft and two sealed, precision ball bearings. Base angles shall be a minimum 1 1/2" x 1 1/2" x 3/16" angle punched with a universal hole pattern for easy installation. Side plates shall be a minimum of 12-gauge steel, and shall fully enclose the sheave. Side plates shall be bolted to the base angles. The block and associated mounting hardware shall have a recommended working load of at least 500 lbs. and shall be designed for use in either upright or underhung usage. Loft blocks shall be grooved for one 1/4" lift line.
- K. Multi Line Loft Block: The sheave shall have an 8-1/2" outside diameter, and shall be an iron casting, with machined grooves. The sheave shall be equipped with a 1" diameter shaft and two tapered roller bearings. Base angles shall be a minimum 1-1/2" x 1-1/2" x 3/16" angle. Side plates shall be a minimum of 10-gauge steel, and shall fully enclose the sheave. Side plates shall be bolted to the base angles. The block and associated mounting hardware shall have a recommended working load of at least 500 lbs. per line and 1,300 lbs. total, and shall be designed for use in either upright or underhung usage. Loft blocks shall be grooved for 8 – 1/4" lift lines.

## 2.4 PRODUCTS

- A. Head Block: The sheave shall be filled nylon with a 12" outer diameter. The sheave shall be equipped with a 1" diameter shaft and two tapered roller bearings. Base angles shall be a minimum 2" x 1-1/2" x 1/4" angle with the short leg turned in and notched as required. Side plates shall be a minimum of 10-gauge steel, and shall fully enclose the sheave. Side plates shall be bolted and welded to the base angles for extra strength. Double purchase blocks shall have punched angles and an additional pipe spacer properly placed to provide tie-off points for lift lines so that proper fleet angles into the arbor top sheave are maintained. The block and associated mounting hardware shall have a recommended working load of at least 2,500 lbs., or as shown on drawings. Head blocks shall be grooved for six or eight 1/4" lift lines and one 3/4" hand line.
- B. Universal Loft Blocks: The sheave shall have an 8-1/2" outside diameter, and shall be filled nylon. The sheave shall be equipped with a 17 mm diameter shaft and two sealed, precision ball bearings. Base angles shall be a minimum 1-1/2" x 1-1/2" x 3/16" angle punched with a universal hole pattern for easy installation. Side plates shall be a minimum of 12-gauge steel, and shall fully enclose the sheave. Side plates shall be bolted to the base angles. The block and associated mounting hardware shall have a recommended working load of at least 750 lbs., and shall be designed for use in either upright or underhung usage. Loft blocks shall be grooved for one 1/4" lift line. Underhung loft blocks shall include idler assemblies
1. Loft block idlers shall be provided to carry the weight of the cables and prevent rubbing against adjacent block side plates. They shall not be installed to carry line loads or to act as deflector or mule blocks.
  2. Idler assemblies shall consist of one or two 3-1/2" diameter, 3-line filled ABS idler pulleys mounted on the side of the loft block housing.
  3. The sheaves shall have 1/4" cable grooves and two sealed, precision ball bearings and shall ride on a 1/4" shaft inserted through the block housing.
  4. A 1/8" diameter bail shall mount in the housing and captivate the cables in the grooves.
  5. All nuts shall be of the nylon insert self-locking type.
- C. Hardware and Accessories: Turnbuckles shall be drop forged and galvanized, and conform to ASTM F-1145 Type 1, Grade 1 standard. Turnbuckles shall be moused after adjustment to prevent loosening. Full Pipe Clamps shall be made of two strips of 12 Ga.

by 2" hot rolled steel formed to encompass and clamp the pipe batten to prevent its rotation. Corners shall be rounded. There shall be a 3/8" x 1" hex bolt with lock nut above and below the batten. A 5/8" hole in the top of each clamp half allows the attachment of cable, chain, or other fittings. Full pipe clamps shall have a manufacturer's recommended load rating of at least 750 lbs. Pipe Battens shall be 1-1/2" nominal diameter, schedule 40 pipe in lengths as shown on the drawings or Bill of Materials. All joints shall be spliced with 18" long sleeves with 9" extending into each pipe and held by two 3/8" hex bolts and lock nuts on each side of the joint. Each end shall be covered with a bright yellow, closed end, soft vinyl safety cap at least 4" in length.

## 2.5 AUTOMATED RIGGING - ZERO FLEET PACKAGED HOIST

- A. General: The PowerLift hoist shall be specifically designed for lifting loads in theatres and other places of public assembly. It shall have a compact design with all required components integrated into its structure. All components shall be designed to properly support the required loads. The hoist shall incorporate a sturdy frame and adjustable mounting clips for easy mounting, either horizontally or vertically, on beams with up to 12'-0" centers. No external strengthening members shall be required. Characteristics: The hoist shall have the following characteristics: Speed and lifting capacity as listed in 1.01.P below; Travel: 62 feet; Lift Lines: 7 at 3/16" diameter, 7x19 galvanized utility cable; and Units shall be available for 208, 230, or 460 VAC 60 Hz power, without the need for transformers. The hoist shall use a moving drum to minimize hoist size and wire rope wear. The drum shall move along its axis as it rotates, keeping the cable takeoff points on the drum aligned with the head block sheaves incorporated in the hoist (zero fleet angle design). This shall be accomplished by the drum sliding on its axle. Electrical components, such as motors and brakes, shall not move relative to the fixed frame of the hoist, in order to prevent premature failure of wiring, connections and other components. Covers shall be provided for hoists per UL 1340 unless the hoists are not readily accessible to a user or are more than 7'-0" from gridiron or gallery floors. Hoists shall not be used to lift humans.
- B. Gearmotor and Primary Brake: The motor, primary brake and gearbox shall be an integrated unit from a single manufacturer. For enhanced reliability, a continuous shaft shall link the brake, motor armature, and the first stage pinion gear without the use of couplings. Motors shall be totally enclosed fan cooled (TEFC) per NEMA MG1. Motors shall have a minimum service factor of 1.0. The gear reducer shall employ helical gearing. The gear case shall be cast iron, aluminum is not allowed, for protection against shock damage and to provide noise reduction. The output shaft shall have triple lip oil seals to prevent leaks. The integral electro-magnetic brake shall be spring applied and electrically released, with a minimum retarding torque of 200% of motor full load torque. Brakes with a lower retarding torque shall not be permitted. Fixed speed hoists shall incorporate a cast iron flywheel fan for soft starts and stops. For added security, a spring applied and electrically released electro-magnetic load brake shall be located between the output shaft of the gearbox and the drum. The brake controller shall apply the brake if the speed exceeds the commanded speed, the maximum speed, or if it detects a failure in the integrity of the shafting and gearbox. The brake shall be SureBrake® II as provided by J.R. Clancy.
- C. Drum: The drum shall be helically grooved to accept a single layer of cable accommodating the entire travel distance plus three dead wraps per cable. Drums that do not provide a minimum of three dead wraps will not be allowed. The hoist drum diameter shall not change along its long axis. Cables shall be retained by a copper Nicopress® stop sleeve inside the drum. The cable retention system shall allow replacement of lift lines in situ. Cables shall be factory installed on the drum and color coded for ease of field installation. Preloaded chase rollers shall be provided to retain lift lines in their grooves. The pitch diameter of all drums shall meet or exceed the wire rope manufacturer's minimum recommended D/d ratio. Load bearing wire rope groove profiles shall meet the recommendations of the "Wire Rope Technical Board". The drum shall be positively driven to move along its axle to maintain a zero fleet angle with the grooves in



the drum and the head block sheaves. The drum and axle shall be permanently lubricated. The drum shall be molybdenum disulphide filled nylon.

- D. Sheaves: All load bearing sheaves, both internal and external, shall have a minimum 26:1 D:d ratio to meet the wire rope manufacturer's recommendations. Sheave grooves shall be deeper than the cable diameter for cable protection. The sheave shall be equipped with a minimum 12 mm diameter machined steel shaft and two sealed, precision ball bearings. Spacers shall positively retain the cable.
- E. Head Block: Head block sheaves shall be mounted between 12-gauge steel (minimum) side plates that fully enclose the sheaves. The block shall have an additional mounting location for one sheave to allow one cable to exit the hoist in the opposite direction. The block shall be located so all cables have a zero degree fleet angle relative to the pitch of the drum groove. The block shall be mounted to permit the attachment of dual state load cells for load monitoring
- F. Loft Blocks: Loft blocks shall have 12-gauge steel (minimum) side plates that shall fully enclose the sheave. Base angles shall be a minimum 1-1/2" x 1-1/2" x 3/16" angle punched with a universal hole pattern for easy installation. The block and associated mounting hardware shall have a recommended working load of at least 500 lbs. and shall be designed for upright or underhung use. External loft blocks shall be provided with idlers to support ongoing lift lines with an individual groove for each lift line to prevent tangling. The use of ungrooved idler drums is known to cause tangling and jams, and is not allowed. In double purchased applications, the double purchase loft block side plates shall be attached to the batten with two steel pipe clamps
- G. Limit Switches: Hoists shall have positively actuated limit switches for normal end of travel indication. These switches shall open the control circuit in the drive or starter to stop any further movement in the direction of travel. Positively actuated limit switches shall be provided for over travel indication. These shall use a separate circuit that is redundant to the normal end of travel switches, and positively disconnects power from the hoist, using a UL580E Type 2, non-welding, positive break contactor. An override mechanism to allow resetting of the overtravel limits shall be included. Limit switches shall be set to match actual site conditions. Computer controlled systems shall also have software limits utilizing solid state encoders, in addition to the two levels of mechanically actuated limit switches.
- H. Motor Controller: For fire and electrical safety, motor controllers shall conform to the NEC (NFPA 70), be built in accordance with UL Standard 508E, and be "touch safe" per IEC 60204-1 "Protection against direct contact" rules. Variable speed controllers shall be solid state flux vector drives designed for hoisting duty. Each controller shall incorporate closed loop feedback using a solid state position encoder mounted on the motor shaft to provide the greatest accuracy and performance. The controller shall provide an essentially infinite speed range, including the ability to produce full torque at zero speed. The use of open loop drives is prohibited. Power wiring between vector drives and motors shall be shielded to reduce electrical noise. Dynamic braking resistors are provided to dissipate heat during stopping. Fixed speed hoists shall be controlled by a UL508E full voltage, self-protected, reversing starter. The NEMA/IEC mechanically and electrically interlocked, reversing starter shall be sized to match the hoist motor horsepower and shall be rated for plugging and jogging. Units shall incorporate UL508E, Type 2, non-welding, positive break contactors. Overcurrent protection shall be provided by an IEC Class 10 overload. Short circuit protection shall be provided by a circuit breaker. Controllers shall provide over current, overload, and phase loss protection. Operation of the system key switch shall disconnect power to all starters and drives. A maintenance pendant shall be provided for direct control of the hoists during setup and for maintenance. It shall contain Up and Down pushbuttons, an Overtravel Bypass switch, and a key operated On/Off switch.
- I. Emergency Stop System: The emergency stop system shall meet NFPA-79 (Electrical Standards for Industrial Machinery) and directly remove power by means of

electromechanical components, using a UL508E Type 2, non-welding, positive break contactors.

The emergency stop circuit shall be a normally closed circuit or a supervised circuit that provides the same or greater level of reliability and security. Its operation shall not depend on software or semiconductors. Resetting the emergency stop circuit shall not initiate motion. For hoists running at more than 50 feet per minute, a Category 1 controlled stop per NFPA-79 (Electrical Standards for Industrial Machinery) shall be provided. This provides a rapid ramp to a stop, and then removes power to reduce shock loading.

- J. Power & Control Wiring: Integral power and control cables shall be provided with each PowerLift hoist. Cables shall be eight feet long, with one end directly connected to the hoist assembly. Power cables shall be a properly rated SO cable, with a NEMA L series locking connector. Control cables shall have a connector with a steel body and a positive locking lever. Power and control raceways or boxes (configured as determined by the hoist manufacturer) shall be provided, complete with connectors that mate with those provided on the cables.
- K. Battens: Battens shall have the ability to accept standard lighting fixture clamps, scenery chains, and pipe clamps. All battens shall be 1-1/2" nominal diameter, schedule 40 steel pipe in lengths as shown on the drawings or Bill of Materials. All joints shall be spliced with 18" long sleeves with 9" extending into each pipe and held by two 3/8" hex bolts and lock nuts on each side of the joint. Each end shall be covered with a bright yellow, closed end, soft vinyl safety cap at least 4" in length. Lift line termination at the battens shall fully encompass the batten, and have a manufacturer's recommended working load rating of at least 500 lbs. Acceptable terminations include a 1/4" plated, grade 30 Proof Coil chain with forged shackle or a load rated full pipe clamp.
- L. Hoists shall be UL or ETL marked as meeting "UL 1340 Standard for Hoists." Installation supervision and commissioning of the motorized rigging system shall be performed by a factory authorized and trained technician. Provide the following models of hoists, with the speeds and gross hoist capacities listed.

Model	Power	Speed	Capacity	Qty.
Variable Speed, 62 Feet Travel, Maximum 7 Lines				
018-P1212VE	5.0 Hp. (4.0 kw)	0-120 fpm	1,200 lbs.	12
Fixed Speed, 62 Feet Travel, Maximum 7 Lines				
018-P02220	1.5 Hp (1.1kw)	20 fpm	2,000 lbs.	4

**2.6 RIGGING CONTROL SYSTEM: J.R. CLANCY SCENE CONTROL #5200; OR EQUAL.**

- A. General-Architecture: Communications between all Operator Interface devices shall be performed over an Ethernet based system. Communications between Operator Interface devices and controllers shall be performed over a commercially available network protocol such as Ethernet, DeviceNet, ProfiNet, etc. The exception to (a) and (b) above being local control pendants/push buttons that are hard wired to discreet inputs and outputs
- B. Multiple Consoles: The System shall be able to accept multiple consoles on the same network and have a file management system that supports such architecture. All consoles in a system shall utilize the same operator interface software. Where multiple consoles are employed on the same network and controlling a single system of controllers a Network Storage device shall be employed to centralize file storage and backup.

**NORTHEAST METROPOLITAN REGIONAL VOCATIONAL TECHNICAL HIGH SCHOOL**  
WAKEFIELD, MA

- C. Offsite Monitoring: The manufacturer shall have the ability to connect to the system remotely via a secure network appliance as specified and approved by the owner's IT department.
- D. Operating Surface - Operator Push Buttons: At minimum the operator must have push buttons available for the following functions that are not part of any touch screen functions: (A) GO; (B) STOP; (C) RESET. All push buttons must be illuminated: GO button must be GREEN; STOP button must be RED; Other functions shall be BLUE. When a button is pressed and the press signal has been seen and acknowledged by the desktop processor the operator must be informed of the recognition of the press by flashing the lamp illuminating the button OFF and back ON once. Multiple presses: The console software shall prevent an operator from making simultaneous multiple button presses. Should the operator press more than one button concurrently the console software shall ignore both presses, fault and automatically reset. The log files shall then record what buttons were pressed, the console fault and console reset
- E. Macro Buttons and Signals: All macro features used for cueing shall be presented on the touch screen.
- F. Hold-To-Run Handle (a.k.a. Deadman or Enabling Switch): The Hold-To-Run (HTR) shall operate as a deadman signaling the software and hardware systems that the handle is held in place. The HTR shall be comfortably held by the operator in the active ON position by the weight of the one hand when it rests upon the console desktop surface in such a position as to allow the operator to reach the GO and STOP buttons with their fingertips - The handle should be large enough that it may also be held by the operator's free hand should they choose to do so. Switches used on the HTR shall have three position functionality (OFF-ON-OFF). The button shall have three positions: Position 1: TOP – DEACTIVATED; Pressure released; Position 2: CENTRE – ACTIVATED; Held in place by operator; Position 3: BOTTOM – DEACTIVATED; and Over travel pressure causing circuit to break. The Position operating force: Position 1 to 2 – within  $\pm 5\%$  of 3N (approx. 0.67lbs); Position 2 to 3 – within  $\pm 5\%$  of 15N (approx. 3.3lbs). Circuit opening force from position 2 – 3 shall be 30N (approx. 7lbs). The handle shall be illuminated to provide visual feedback to the operator that the signal is active. Illumination signals shall be attached to the following functions: ACTIVE (ready to run state) – BLUE; DEACTIVATED (not ready to run) – AMBER; E-STOPPED – RED. Standards: Positive action contacts ON (position 2) to OFF (position 3) ensure no contact welding per EN60947-5-1 / IEC60947-5-1; Contacts will not close when released from OFF (position 3) to OFF (position 1) per IEC60204-1; 9.2.5.8).
- G. Monitors: One (1) each minimum 10.1", 1080p capacitive touch screen.
- H. Alarm Annunciation Devices: Configuration - Alarms shall be configurable in the console and/or motion control software; Visual annunciation - at minimum display visual alarms on screen using pop-up windows, screen buttons or signals; Audible - at minimum an audible alarm shall be present on the operator console in such a place as making it difficult to mechanically disable without the use of tools to open the console case or access a mechanically protected section of the console structure; Audible alarms shall not sound by default but instead be a programmable feature managed by the operator and Administrator to signal System Alarms; and External devices - the console may also incorporate external alarm devices (such as klaxon alarms or flashing lights). Where these are employed they must be installed in tamper resistant boxes and be monitored for tampering, power loss and disconnect (being unplugged)
- I. Other Features: Hard Drives - All hard drives used within the console shall: be reliable and robust; provide at least 32GB of free storage space excluding the space used by the operating system, and have a minimum operating temperature range between 32 degrees F to 140 degrees F.; Backup features provide external USB ports for copying files for offsite backup; and User Work Light provide two each LED gooseneck lamps with a dimming device.

- J. Stage Machinery Software: The System shall be able to accept multiple consoles on the same network and have a file management system that supports such architecture. The Software shall have the ability to: Start/Stop an Axis multiple times within a cue based on programmed sequential timing; Send an Axis to multiple targets, possibly changing directions without engaging the brake within a single cue; Start an Axis that ran in a cue, in a following cue, where the previous cue is still running but that Axis is not; Run more than one cue at a time without the use of sub-masters; Run repetitive motion loops; Send an axis that is in a repetitive motion loop to a new position without a transition cue or setting the brake; Stop an axis or axes in a controlled cued manner (stop command); Stop all axes in motion using the console STOP button; PAUSE and RESUME all axes in motion; Change the speed of an axis in motion. The change of speed may be triggered by the position of the axis or by an input changing state/value; Change the speed of an axis or a group of axes in motion through the use of a feed rate wheel or joystick command on the console; Trigger I/O effects - as an example: locking pin motors, signaling lamps, kabuki drops; Create motion profiles based on time or velocity; and Sequential cues or auto follow cues based on user identified criteria.
- K. Operating System: The OS of the system shall be MS Windows embedded based.
- L. User Administration: All access to the Control System Software shall be via a User ID and Password; Administrators shall have the ability to limit the user's access to: Specific views, Specific actions, Operation of machinery by restricting permission to run hoists which the operator has either not been trained to use or are out of the scope of the operator's technical function, and Limit speed of operation of all or specific hoists. Where a system incorporates multiple consoles all consoles shall utilize a common user database. Administrators shall only need to edit this one file to update all consoles with a user's settings, passwords and permissions.
- M. User Levels: There shall be a minimum of four (4) basic user levels: Vendor Administrator - accessible only by manufacturer; User Administrator – Setup by manufacturer but may be edited after setup by owner; User Operator Level 1 – Default settings allow Operator to perform all tasks but Administrative control setup tasks. May be edited or altered by user Administrator; User Operator Level 2 – Default settings do not allow Operator to edit cue or programming changes. May be edited or altered by user Administrator; and All users may be restricted from having permission to access and / or operate any of the axes in the axes list. This setting is adjusted by the User Administrator.
- N. Controller/File Setup Security: All access to the controller or file setup shall be protected by the Administrator password. The administrator may access the protected setup windows without being logged in. A pop-up window will ask for the administrative password before opening the requested window. Once closed the window will not reopen unless the password is once again provided. Password text must be hidden or represented by an asterisk
- O. Graphic Interface: The Stage Machinery Control Software shall have a user friendly graphic interface that utilizes multiple Windows to display information clearly and concisely. Cue data shall be displayed in a spreadsheet format. Cues shall be displayed in a Tree Format. The Cue Tree shall have the ability to be organized into scene groups to allow the operator to quickly and easily find cues.
- P. Administrative Windows: Controller Setup: The Administrator shall have the ability to open controller setup windows to create or edit controllers. Application Options: The Administrator shall have the ability to setup the basic look of the system software and the display of axis details. User Manager: The Administrator shall be able to add, delete and edit users and configure their level of system access and what and how they may control axes.
- Q. Software Faults and Errors: Should a fault and or error occur with the operation of the motion control software or the computer operating system all controllers in the system will

initiate an immediate controlled E-Stop deceleration to bring all motion to a complete stop. Should a fault and or error occur on the communications network between the motion control software and the controllers in the system, the controllers will initiate an Immediate controlled E-Stop deceleration to bring all motion to a complete stop.

- R. Localization of Language: The software shall be switchable between English and two other languages as mutually agreed at the time of contract award. The software shall support Unicode character sets to allow for the input and display of Western, Russian, Asian and Arabic characters. Reports, printouts or files used for factory technical support shall remain in English.
- S. Operation Windows/Modes: Show Mode: When in Show Mode the Operator cannot make or edit any changes to the showfile of cue data. Show Mode can be selected by any authorized operator. Edit Mode: When in Edit Mode the operator can set, program, create or record cues and edit show file data. Edit Mode can be selected by any authorized operator. Manual Move to Target: This mode is intended to be a temporary cue screen. Cues are not saved but position and axis profile data can be copied into a cue. Manual Move to the Start of a Cue: When this mode is selected a cue is automatically created by the software to move all axes to the positions that they would be in at the beginning of the selected cue. Hoists that are required to move shall be automatically selected. The operator may then choose to deselect hoists as desired in order to execute motion in any manner of their choosing. The intention is to automate the cue writing process in order to speed up moves between cues during the rehearsal process; Out of sequence moves shall be highlighted in RED; E-Stop Reset Mode: To prevent an operator from erroneously moving a hoist that may have been involved in an incident at potentially dangerous high speed, the software shall have a default E-Stop Reset Mode, This mode shall automatically reduce the maximum speed of ALL MACHINERY in the system to no greater than 50% of maximum; Entering E-Stop Reset Mode: When an Emergency Stop button is pressed the software shall by default enter the E-Stop Reset Mode; Exiting E-Stop Reset Mode: The operator may choose to exit this screen upon command. Choosing to exit shall be met with a confirmation window reiterating that the operator has chosen to exit E-STOP MODE. The operator's choice shall be time stamped and logged; Configuring E-Stop Reset Mode: E-Stop Reset Mode shall be configurable by the System Administrator and turned on or off as per the choice of the Administrator, When E-Stop Reset Mode is enabled the log files shall record the state of this setting when the program is opened; Views (Windows) - Cue Data Shall be presented in a clear and concise manner, When a cue is chosen the cue name shall appear at the top of the user screen; Signal Views can be displayed on bitmaps; Bars/ Buttons/Graphs may be adjusted to any size or color, and Position of Bars/Buttons/Graphs may be adjusted and customized; Control Desk View provides details on Console Macros; E-stop View: provides details on the location of depressed Emergency Stop buttons; Section View: A section view visual representation of the position of the axes within the system in relation to one another. Status and position data may be displayed near a graphic representation of the axis; Plan View: A plan view visually represents the location of axes in horizontal section. Status and position data may be displayed near a graphic representation of the axis; Combined View: Combination of macro and signal view; Integrated 3D View: At minimum the operator shall be provided with an accurately proportioned 3D wire frame view of the venue with wire frame objects that move in respects to the location of the actual elements in the system. This view may be used when the system is online or offline, and operators may select axes from this view by clicking with a pointing device; and Sequence View consisting of a dedicated screen of functions that correspond with the lock sequence feature in Cueing below. Sequential buttons are displayed to the operator wherein buttons are only active once the preceding function has been executed.
- T. Hold-To-Run (HTR): All consoles operating the Stage Machinery System must have a handle that is comfortable to hold in order for the system to be in an operable state (a.k.a. Dead-man). The HTR shall be held at all times to allow machinery to RUN. Releasing the HTR shall initiate an EMERGENCY Deceleration (HTR Fault Stop) of all machinery in motion and bring all machinery to a safe stop. The Stage Machinery Software shall have

a timer that recognizes when the HTR is held and prevents an operator for defeating the action of the device: The timer shall automatically initiate a HTR Fault Stop if it is not cycled within the prescribed amount of time; A cycle shall be a press ON followed by timer initiation and a release to the OFF position; The timer's time value shall be adjustable by the System Administrator. All changes to the timer shall be logged in the system logs; The timer may be extended by direct action of the operator, pressing a HTR TIME EXTENSION button on console or on screen with the pointing device. A press of the TIME EXTENSION button shall provide the operator with an additional 60 seconds for each press of the button. This will allow the operator to extend the HTR timer for as long as needed. The switch managing the HTR system shall have 3 positions, OFF-ON-OFF: Top Position (OFF) – Triggered when NO pressure is applied, Mid Position (ON) – Active when pressure is applied. This is the ACTIVATED Operating Position, Bottom Position (OFF) – Triggered when pressure greater than the Mid Position Requirement is applied. Contacts shall NOT close when released from the Bottom Position. Switch MUST be fully released to reset. Position operating force: Position 1 to 2 – within  $\pm 5\%$  of 3N (approx. 0.67l bs); Position 2 to 3 – within  $\pm 5\%$  of 15N (approx. 3.3lbs). Circuit opening force from position 2 – 3 shall be 30N (approx. 7lbs). Status of the HTR shall be displayed at all times on the Operator Screen, and all actions of the HTR, HTR timer and HTR TIME EXTENSION shall be time stamped and stored in the LOG FILES

- U. Cueing: Cue Command Data shall be presented in measured units (feet, decimal feet, inches, meters, seconds, measurement value/sec<sup>2</sup>) or as a percentage; and shall include: Axis Name, Axis Start position, Axis Target position, Axis Velocity, Axis Acceleration, Axis Deceleration, Axis Cue Time, and Axis Cue Start Delay. Autofollow Cues: Time Based Trigger where the daughter cue follows the parent cue after a specific time period has passed from the point of the press of the GO button to execute the parent cue, Position Based Trigger where the daughter cue is triggered when the specified axis reaches the trigger position, Input based where a digital input triggers a cue event, and Timeout To prevent accident execution of an autofollow cue in the event of the parent cue being stopped, the Stage Machinery Control Systems Software shall have the ability for the operator to enter a timeout period wherein the daughter cue is prevented to execute after the passage of the timeout period. Variable Speed Machinery: When cueing variable speed machines the operator shall have the ability to set values for velocity, time, acceleration and deceleration. Fixed Speed Machinery: When cueing variable fixed machines the operator shall have the ability to set values for time, stop distance and slow zones (where applicable) to ensure accurate targeting regardless of changing loads. Machinery Without Position Control: Where a machine does not have any position feedback the operator shall have the ability to set values for time; The Controller responsible for controlling such machinery shall stop the equipment on limit switch triggers; Where multiple limit switches are utilized the software shall have the ability to react to the additional limit inputs and execute an appropriate command (e.g. STOP). Machinery/Effects via I/O - See Section A.11.e above. Locked Sequences: The software shall have the ability to provide locked sequences that can only be edited or unlocked by the system administrator once created by the operator and locked by the System Administrator. Copy/Paste: Cues may be copied and pasted as new cues; Profiles from one axis may be copied and pasted as profiles of other axes. The technical parameters of the target axis may not be exceeded should the source axis have greater capabilities.
- V. Presets/Named Positions: The software shall have the ability to create named position targets on a global basis; The software shall have the ability to override the named global position targets on an axis by axis basis; and the software shall have the ability to create named target positions for each axis
- W. Jogging: The jog function must be enabled by the operator selecting a specific axis or group; and once selected the operator may take control using the joystick to control the speed of the axis
- X. Feed Rate/Speed Scaling: The motion control software shall incorporate the ability to change the speed of any quantity of axes in motion by selecting the axes and changing a proportional speed value. Speed scaling shall be programmable on a cue-to-cue basis

allowing the operator to set a scaling value of less than 100% so as to allow the speeding up of a machine in motion on command. Machinery may not be sped up to a value exceeding 100% of the device's designed maximum speed.

- Y. Special Functions: Complex Profiles provide the ability to program multiple speed changes, direction changes and acceleration/deceleration changes with the body of a single cue. Repetitive Motion Profiles provide the ability to program repetitive motion of an axis where it moves between two or more positions reversing direction or pausing at a specific position, without setting the brake, the feature shall be able to loop the sequence indefinitely by checking a selection box, and executing a new cue to send the axes in the looped sequence to a new target shall end the looped sequence. Grouping: The software shall be capable of grouping any number of hoists into a control group for the purpose of simplifying cueing, and any fault within this group shall fault the others in the group bringing all hoists to a safe stop, The software shall be able to synchronize any number of hoists into a control group and force the hoists to maintain a constant position tolerance between one another. Should any one of the hoists in this group get out of position to a value greater than the programmed value the entire group shall fault and come to a safe stop. Any fault within this group shall fault the others in the group bringing all hoists to a safe stop. Pause and Resume: If the STOP button is pressed the Software shall have the ability to enter into a PAUSE mode where all axes are stopped but can be sent back on their current cue path by pressing GO, When the STOP button is pressed a dialog box shall pop up providing the operator with the ability to select what axes they wish to continue OR to press the STOP button again and cancel the PAUSE, The default will be to select all AXES that were in motion when the STOP button was pressed for RESUME, and This feature shall be part of the Applications Options and can be enabled or disabled by the System Administrator. Constraints: Provide the ability to constrain the motion of a specific axis based on: The position of any axis controlled by the software; A limit switch or input trigger from any axis or controller included with or controlled by the software. Input devices: The software shall accommodate various input devices including but not limited to: Multiple encoders –Incremental, Absolute. Multiple load cells and strain gauges, and Multiple switches and triggering devices. Actions from these input devices shall include: Error checking, Faults within or exceeding user programmed tolerance levels, Motion prevention, and Motion readiness. GUI devices shall include Touch screens, Keyboards/keypads, Pointing devices, and USB multi-axis joysticks. Conditional Moves: The software shall have the ability to inhibit/fault, disable, restrict the motion or restrict the motion range of an axis based on specific criteria, such as: the position of a single axis or group of axes - As an example: Axis-1 cannot move unless axis-2 and axis-3 are at a position greater than 'x'; An analog signal - A hoist that is being used to tension a cable cannot exceed a specified tension as read by a strain gauge who's signal is fed back into the system, and A digital signal - A limit switch or other digital device is monitored by the control software and restricts a hoist from lifting its load any higher.
- Z. Macros: The Console must include at minimum 10 programmable macro buttons as well as hard coded macro buttons that are preset to provide access to commonly used commands such as reset, mode select etc. The software shall have the ability to create an unlimited set of macros on a separate MACRO view Window. These macros are executed via a click with the pointing device that is provided with the console. Programmable macro features should include but not be limited to: Speed set, Target set, Time set, Reset of group or axis, Cue select, Cue execute, Axis STOP, Output Activation, and Additional macros as the supplier sees appropriate.
- AA. Search Feature: The Stage Machinery Control Software shall provide the ability to search for specific cues or groups of cues based on name or axis inclusions.
- BB. Additional Databases: The software shall have the ability to utilize a database for specific search functions. An example would be a database of lighting circuits in a large studio that locates the batten on which a requested lighting circuit resides. The search may also automatically highlight or select the hoist(s) that move that batten in preparation for another operator function. This function MUST NOT automatically initiate ANY motion.

- CC. Restoring Positions: The software shall have the ability to save and store the last known position of all axes on demand of the operator. All position information shall be backed up by each individual motion controller but should there be data loss the operator can then recall this stored position data and load it into the controller. Resetting of the data requires the operator's full attention and as such there must be a confirmation from the operator that the data being restored is true and correct. The action of the restoration of this data shall be logged in the log files.
- DD. Warnings: The Software shall provide the following warnings: Where an axis is not in the normal position for the start of a cue; Where faults occur; and Timeout of the HTR handle. The software shall provide the operator with the ability to create text boxes that illuminate in various colors and can be sized by the operator to demonstrate the state of an input or output that must be monitored for safety or other purpose.
- EE. Fault Reporting: The software shall report a fault status to the operator in the cue information window. The software shall have a separate window that allows the operator to view the specific status of faults in one complete view.
- FF. Logging of System and Operator Activity: The software shall have the ability to record data of use and store it in a file with time stamping on a per action basis. The files shall be created and saved automatically and be of a size that makes them easily emailed or transferred electronically. The files must be protected from tampering so as to present an honest and true representation of the actions. The software shall record all systems critical actions from a performance. The log files shall record the user name and show file names that are opened and used Log files shall have a viewer that allows the operator to search specific files to locate specific actions, faults or changes. The Operator shall have the ability to select certain input activities to be logged. Such as a limit switch.
- GG. File Storage: Files shall be stored in a root directory and accessible to the Operator for the purpose of creating backups.
- HH. File Backups: The software shall automatically save all necessary show related files on a regular basis. A minimum of 5 rotating auto backups shall be saved. The operator may restore their show file from any of these auto-saved files. When exiting the program the operator shall be asked if they wish to save the show file. If they click "NO" the software will automatically save and store the last file and rename it as a backup while not affecting the user's current file. The Operator shall use common Windows functions to copy files onto a USB memory stick from the software directory. Where a network attached storage (NAS) or server device is required in a system automated backups shall be stored on this device as well. The system should also be capable of being pointed to an offsite storage server via a secure connection.
- II. Computer Hardware Redundancy: The software shall have the ability to configure a live tracking backup of the show file on a second computer. All files must be copied and saved to this backup computer in order to keep a carbon copy ready for use. The operator may be required to open the motion control program on the backup computer to activate the backup option. The motion control software must prevent both computers from simultaneously communicating and attempting to command controllers within the system so as to reduce the possibility of a communications error. During normal operation the backup computer's show file shall follow along with the operator's actions on the main computer. In the event of a computer hardware failure the backup computer must be in the same cue as selected by the operator at the time of failure. Files shall be automatically copied to the hard drive of the backup computer during normal operation.
- JJ. External Command Manager: The software shall have the ability to send and receive commands from 3<sup>rd</sup> party software. The software shall have the ability to send and receive data from a lighting console or other Stage Machinery Control Systems for external triggering or to transmit triggers to the 3<sup>rd</sup> party software.



- KK. Offline Visualization (Pre-Visualization): The software shall be capable of connecting to a third party Pre-Visualization program such as WYSIWYG or ZOOM for the visualization of the motion of any axis or scenic element in an offline virtual presentation. Files shall be able to be shared with any other connected system with licensing permissions.
- LL. Inter-Connectivity Between Other Systems: The software shall be capable of connecting to a third party program that shares pre-described information via a discrete network such as CAST Software's BLACK BOX. Connection to this network must not affect the primary function of the motion control software. The motion control software shall be able to transmit and received data from the interpreter portion of the inter-connectivity system. The intent is to provide data such as position information to the interpreter in order to provide automated tracking of objects moved by the motion control software.
- MM. Performer Flying: The Supplier must have a policy for safe practices specific to the action of performer flying. Systems with pre-visualization of the Performer's flight path are preferred. Flight paths may be pre-programmed by plotting a path within the pre-visualization system or within the software. Flight paths may be 'taught' to the software through: The use of a joystick device that provides control over the 3D axes, and the use of a CAST Software BLACKTRAX programming/tracking wand. Error checking must be done by all hardware in the System to ensure the safety of the Performer and to provide safe stopping in the event of an error. All hoisting equipment must be controlled with closed loop control features that incorporate feedback loops to the drive as well as the motion controllers that are part of the Stage Machinery Control System. In the event of an encoder signal loss or corrupted encoder signal the hoist shall not run uncontrolled but instead the motor controller shall initiate a fault and safe stop. The editing of any flight path shall be performed within the motion control software. All paths may be moved, shifted or scaled via simple keyboard commands or drag and drop. Algorithms for the coordinated movement of multiple hoists shall accept any quantity of hoists.
- NN. Safety: The software shall perform safety checks when transmitting data to the controllers to ensure clean delivery of all motion profile information. Where safety is a concern the system must have the ability to employ external warning devices to alert personnel of potential hazards.
- OO. Documents and Reports: The software shall have the ability to export reports including but not limited to: Cue Data Sheets, Controller Setup Information, Axis Details.
- PP. Power Management: The software shall have the ability to manage power constraints of the building's infrastructure. Calculations to determine a potential overload of the system mains power will be performed at the time of cue execution. A warning window shall pop up indicating that the operator has programmed a cue or sequence that exceeds the FLA rating of the system. The system shall be able to determine if the mains current is being exceeded at three levels: The local MCC cabinet mains; The power distribution cabinet; and the mains assigned to the stage automation system. Software shall calculate demand based on total kW rating of the machinery at Full Load. Errors and responses shall be noted, time stamped and logged.
- QQ. Multiple Control Consoles: The software shall incorporate the ability to share common files. A process of locking and unlocking or linking and unlinking of specific axes to a console shall be incorporated to prevent two separate operators from attempting to operate a single axis. An operator must first lock/link an axis to the console they are operating before they can move the machinery. Should another operator wish to access an axis they must first request the permission from the console that the axis is locked to. A process of inter-console messaging shall be used to send these messages between consoles.
- RR. Travel Restrictions and Collision Prevention: Orchestra shell manager software shall incorporate a method of informing the system that an orchestra shell has been stored or deployed. Once the system knows the tilt angle of the orchestra shell the software will prevent or alarm any action that may cause a collision between the shell and itself.

- SS. Scenery Offset: There shall be a provision within the axis settings that allows the operator to input the dimension (along the travel axis) of a scenic element. This will allow the software to correctly identify travel restrictions and prevent a stage machine from driving its load into an obstruction. As an example, a scenic back drop is loaded onto a line set, raised to a height where the lower edge of the drop brushes the stage floor. The operator then enters the position data in one of the manners as described below. Inserting the dimension may be done by manually entering the data with an input device or by using a function key to enter the current position of a hoist.
- TT. Axis Profile Transfer: Profiles that have been entered into cues may be moved from one axis to another. A search tool shall search the cue database for all profiles entered for a specified axis and move them to another axis. Error checking must be employed to ensure that the profiles moved do not exceed the maximum motion parameters of the target axis. An option to leave a copy of the profiles on the source axis shall be made available to the operator but must be confirmed via a pop-up window that the "leave copy" function has been selected.
- UU. User Programmable Alarms: The software shall have the capability of accepting user entered programmable alarms. These alarms may be based on a variety of criteria, including but not limited to: Time, Digital inputs, Operator actions, Axis location/position/proximities. Alarms may be annunciated via visual and / or audible means. Annunciation shall be user selectable. Audible alarms shall have a progressive volume feature. At minimum an audible alarm shall be present on the operator console in such a place as making it difficult to mechanically disable without the use of tools to open the console case or access a mechanically protected section of the console structure. At minimum visual alarms must be presented to the operator on one of their console displays (monitor screen). Visual alarms may also be presented to the operator via external lighting. A window within the software shall display the following user input information: The alarm, description of the alarm, Description of the action required, and relevant importance of the action required. Alarms shall only be silenced by direct action of the operator. All alarms, actions taken and acknowledgements shall be time stamped, logged and recorded.
- VV. Audible and Visual Warning Devices: The software shall be able to initiate audible and visual warning devices as required. All warning devices shall be capable of being switched off during performances on a cue-to-cue basis by direct, logged and recorded action of the operator. When a device is turned off it must automatically reset to the active position and annunciate should the annunciation parameters be met at a later time. Under no circumstances shall an annunciator be permanently disabled, they may ONLY be temporarily turned off. Additional alarms may be employed on the operator's screen or console using visual methods of flashing lights, progressive volume buzzers or on screen indicators. Where the system employs these types of alarms all alarm annunciation devices shall include tamper resistant mechanical designs. Devices shall also be monitored for tampering by the motion control software
- WW. Load Sensing: The software shall accept information from multiple load cells. Load sensing and monitoring shall be used to prevent overloads and under loads. When an overload or under load is detected the software shall fault the overloaded machine and any other machine within the group to bring all motion to a safe and controlled stop. In consideration that the load applied to a machine may change over the duration of a motion profile; the software may be "taught" a load profile in order to maintain an accurate minimum tolerance of the overload and under load monitoring feature. Load sensing must also take into account grouping of load cells to calculate total loads applied or carried by a machine or structure. Grouping of load cells must then fault on actions outside of the programmed trigger parameters of the group or of an individual within the group.

**NORTHEAST METROPOLITAN REGIONAL VOCATIONAL TECHNICAL HIGH SCHOOL**  
WAKEFIELD, MA

2.7 ITEMS TO BE FURNISHED AND INSTALLED

SR-01 FIRE PROTECTION CURTAIN ONE (1) REQUIRED

SR-02 MAIN VALANCE CURTAIN ONE (1) REQUIRED

SR-03 MAIN DRAW CURTAINS – ELECTRIC DRAW OPERATION ONE (1) SET REQUIRED

SR-04 BORDER LIGHT PIPE BATTEN #1 ONE (1) REQUIRED

SR-05 MOVIE PROJECTION SCREEN–ELECTRICALLY OPERATED ONE (1) REQUIRED

SR-06 BORDER CURTAIN #1 ONE (1) REQUIRED

SR-07 LEG CURTAIN SET #1 ONE (1) REQUIRED

SR-08 SPARE PIPE BATTEN #1 ONE (1) REQUIRED

Location: Stage #B132 (1) (EQ-2)  
Dimensions: 54'-0" Long.  
Description: Refer to Item SR-19 for Automated Rigging System Schedule.

SR-09 BORDER LIGHT PIPE BATTEN #2 ONE (1) REQUIRED

SR-10 OLIO DRAW CURTAINS (ELECTRIC DRAW OPERATION) ONE (1) REQUIRED

SR-11 SPARE PIPE BATTEN #2 ONE (1) REQUIRED

SR-12 BORDER CURTAIN #2 ONE (1) REQUIRED

SR-13 LEG CURTAIN SET #2 ONE (1) REQUIRED

SR-14 BORDER LIGHT PIPE BATTEN #3 ONE (1) REQUIRED

SR-15 SPARE PIPE BATTEN #3 ONE (1) REQUIRED

SR-16 BORDER CURTAIN #3 ONE (1) REQUIRED

SR-17 REAR DRAW CURTAINS (MANUAL DRAW OPERATION) ONE (1) REQUIRED

SR-18 BORDER LIGHT PIPE BATTEN #4 ONE (1) REQUIRED

STAGE CURTAINS AND RIGGING

11 06 20 - 18  
DRA

SR-19 MOTORIZED SETS

SIXTEEN (16) REQUIRED

**PART 3 – EXECUTION**

**3.1 INSTALLATION**

- A. Equipment shall be installed by fully trained superintendents and workmen. The Rigging Contractor shall employ Entertainment Technician Certification Program (ETCP) Certified theatre Riggers. Certified Riggers shall, at a minimum, be used as the project manager and site foreman and be responsible for the overall project including the layout, inspection, and onsite user training.
- B. Equipment shall be installed per plans and specifications. Equipment shall be aligned, adjusted, and trimmed for the most efficient operation, the greatest safety and for the best visual appearance.
- C. Standards: Installation practices shall be in accordance with OSHA Safety and Health Standards and all local codes. All welding must be performed in full compliance with the latest edition of the Structural Welding Code (ANSI/AWS D1.1).
- D. Alignment: Mule blocks, cable rollers and guides shall be installed, as required, to provide proper alignment, to maintain specified fleet angles, and to prevent contact with other surfaces.
- E. Attachments: All equipment shall be securely attached to the building structure.

**3.2 INSPECTION AND TESTING**

- A. Inspection: During the installation of equipment the Rigging Contractor shall arrange for access as necessary for inspection of equipment by the Owner's representatives.
- B. System Pre-Testing By Rigging Contractor: On completion of installation the Rigging Contractor shall conduct a complete test of the system to ensure it is working properly and in conformance with this specification.
- C. Completion Testing: Upon completing the installation, the Rigging Contractor shall notify the Owner or Owner's Representative, who will schedule inspection and testing of the full rigging system. At the time of testing, the Rigging Contractor shall furnish sufficient workers to operate all equipment and to perform such adjustments and tests as may be required by the Owner's representative. All testing equipment and personnel shall be at the Rigging Contractor's expense. Any equipment, which fails to meet with approval, shall be repaired or replaced with suitable equipment and the inspection shall be re-scheduled under the same conditions as previously specified. At the time of these inspections, no other work shall be performed in the auditorium and stage areas. All temporary bracing, scaffolding, etc. shall be removed to permit full operation of, and access to, all equipment. Final approval will be withheld until all systems have been thoroughly tested and found to be in full working order and meets requirements herein.
  - 1. Manual counterweight rigging shall be tested in accordance with ANSI E1.4 "Entertainment Technology Manual Counterweight Rigging Systems."
  - 2. Powered rigging shall be tested. Each hoist shall be operated over five full continuous cycles at 1.25 times its full working load at full speed and travel distance. The emergency stop function shall be tested at 100% WLL in both the ascending and descending directions.

3. Demonstrate that all overtravel limit switches have been correctly set for the actual field conditions of the specific project.
  4. If it applies to the project, demonstrate that all position encoders have been correctly set for the actual field conditions of the specific project.
  5. Provide written recommendations to the Owner for necessary repairs or changes not included in the warranty. Provide a copy to the rigging equipment Manufacturer and in the Operations Manual.
- D. The Owner or Owner's Representative shall witness and sign off on the inspection. A copy of the certificate shall be included in the permanent log turned over to the owner.

### 3.3 INSTRUCTION

- A. Upon completion of the work, the Rigging Contractor shall submit 3 copies of a comprehensive Operating and Maintenance Manual including as-built shop drawings, equipment descriptions, and parts lists. The Rigging Contractor shall provide a safety and instruction class with personnel designated by the owner to demonstrate and explain the operation and maintenance of the systems.
- B. Signage with basic operating instructions and warnings shall be posted in the area where the equipment will be operated. Signage shall be in conformance with ANSI-Z535.

### 3.4 FOLLOW-UP INSPECTION

- A. One year after the completion of installation the Rigging Contractor shall return to the site, and provide the following services at Owner's expense:
- B. Perform a complete inspection of the rigging system in accordance with OSHA 29 CFR 1926.550 Cranes and Derricks, 1926.550(a)(6)
- C. Make all required adjustments.

### 3.5 CORRECT ALL WARRANTY ITEMS AND PROVIDE A WRITTEN REPORT TO THE OWNER AND MANUFACTURER

- A. Provide written recommendations to the Owner for necessary repairs or changes not included in the warranty. Provide a copy to the rigging equipment Manufacturer.
- B. Conduct a 1 hour rigging operation and safety class.
- C. Provide a written proposal for the next year's maintenance visit.

### **END OF SECTION**

\*\*\*

**SECTION 11 40 00**  
**FOOD SERVICE EQUIPMENT**

1.1 SUMMARY

- A. Provide all labor, materials, equipment, services and transportation required to install complete and ready for continuous operation all food service equipment as shown on Drawings, as specified herein, or both.
- B. Furnish and install all equipment, complete, ready for connections by others. All equipment shall be complete with standard fittings, valves, switches and accessories specified or normally required for standard operation.
- C. See Drawings for locations and details.
- D. This Food Service Equipment Subcontractor shall cooperate and coordinate with others engaged in the work in order that work will progress on schedule.
- E. This Food Service Equipment Subcontractor is required to install all materials furnished by him under this Section of the Specification, other than materials which are expressly noted for installation by others. All such installation work shall be performed by workmen compatible with those existent on the project site. All equipment shall be of the latest design, new and unused, complete with all standard parts for normal operations and including such accessories or materials as may be required to comply with these Specifications.
- F. This Specification is to further describe and supplement the applicable Drawings. What is called for by either the Drawings and/or these Specifications shall be furnished and installed as part of this work. Any questions relative to discrepancies or omissions shall be submitted to the Architect for correction by Addenda.
- G. Work in this Section of the Specifications shall include but shall not be limited to the following:
  - 1. Catalog items of equipment.
  - 2. Fabricated equipment other than catalog items.
  - 3. Plumbing trim and mechanical system components as required for standard operation of equipment items such as faucets and waste outlets. Vacuum breakers shall be furnished for all equipment where water is introduced less than 2" above flood level.
  - 4. Electrical equipment forming an integral part of equipment items such as electric motors, heating elements, controls, switches, starters, temperature regulators, and internal wiring to a control panel or switch, if mounted on the equipment.

1.2 MATERIALS AND FINISHES

- A. General
  - 1. Metals shall be free from defects impairing strength, durability of appearance, made of new materials with structural properties to withstand strains and stresses to which normally subjected.
  - 2. Stock materials, patterns, products and methods of fabrication shall be approved provided that they conform to the requirements specified under Item Specifications.

3. Metal gauges for steel, galvanized steel and stainless steel shall be manufacturer's standard Gauge, (USS Gauge Revised); and for aluminum, B & S Gauge. Minimum gauges shall be as specified under Item Specifications.

B. Stainless Steel

1. All stainless steel shall be non-magnetic corrosion resistant chromium-nickel steel, Type 302 or 304 (18-8 alloy), polished to a Number 4 finish where exposed, unless otherwise noted. Gauges shall be as specified under Item Specifications.

C. Galvanized Steel

1. All galvanized steel shall be commercial quality with not less than 1.25 ounces per square foot hot dipped galvanized coating. Gauges shall be as specified under Item Specifications. All galvanized framing parts of counterwork shall be degreased, given one coat of varnish and two coats of grey hammerloid paint unless specified otherwise.

1.3 CONSTRUCTION

A. General

1. It is required under this Section that all flat metal work items of equipment, such as tables, sinks, or countertops, and other non-catalog items described under Item Specifications by a food service equipment fabricator who has the plant, personnel and engineering facilities to properly design, detail and manufacture high quality food service equipment. The equipment fabricator shall be subject to the approval of the Architect and Owner.
2. All work shall be standard unit assembly, manufactured by one manufacturer, of uniform design, material and finish.
3. Equipment shall conform to the applicable requirements of current Federal, State and Local Codes and Regulations.

B. Box Type Construction

1. Fabricated cabinet bases shall be box type construction of sheet metal, without general interior framing so that structural strength is achieved by the gauge of the material and by integrally formed single angle or channel edges and corners. Vertical sections shall be closed. Design and gauge of each piece of equipment shall be as specified, 18 gauge minimum.
2. Fabricate intermediate shelves of all welded 16 gauge galvanized sheet steel with rear, side and ends (for reach-in fixtures) flanged up 1-1/2 inches high. The front edge of shelves shall be turned down 1-1/2" around an 18 gauge hat channel so that shelves may be securely welded (if not specified removable) inside cabinet fixture. Reinforce as necessary.
3. Fabricate bottom shelf of 16 gauge galvanized sheet steel similar to intermediate shelf. Where fixture is mounted on stainless steel legs, the bottom channels shall have welded closed boxed-in edges and be of adequate width to accept welded leg gussets, all per details on drawings.
4. Cabinet doors and drawer heads shall be of not less than 3/4" thick double wall welded construction having 18 gauge outer head panel tack welded to 20 gauge inner pans including 3/4" rigid fiberglass insulation and having hat channel reinforcing where required to maintain rigidity. Sliding doors shall be operated on concealed top mounted Klein #550 track sets with lower welded channel guides at bottom. Hinged doors shall be installed with chrome plated, tight-pin semi-concealed, institutional

type hinges, Klein #7874LD or equal. Door pulls to be flush mounted stainless steel type Klein #12002.

5. Cabinet legs to be threaded adjustable type of corrosion resistant metal as described in the Item Specifications.

C. Welding

1. The words "weld," "welded," or "welding" as used in this Section of the Specification shall mean that metal joints shall be continuously welded and the exposed parts ground smooth and polished to match adjoining surfaces as specified below.
2. Where spot welding is specified, the welds shall be a maximum spacing of 3" O.C.
3. Where tack welding is specified, the pieces welded shall have 1/2" minimum lengths of welding material at 4" O.C. maximum spacing.

D. Grinding, Polishing and Finishing

1. All exposed welding joints shall be ground flush with the adjoining material and neatly finished to harmonize therewith. Wherever material has been depressed or sunken-in by a welding operation, such depressions shall be suitably hammered and peened flush with the adjoining surfaces and, if necessary, again welded and ground to low spots. All ground surfaces shall be polished or buffed to a degree consistent with good workmanship.
2. Care shall be exercised in all grinding operations to avoid excessive heating of metal and discoloration. Abrasives, wheels, and belts used in grinding shall be iron free and shall have not been used on carbon steel. The texture of the final polishing operation shall be uniform and smooth.
3. The general finish of all equipment shall be consistent throughout the job. Brake ends shall be free of open texture or orange peel appearance, and where brake work mars the uniform finish of the material, the marks shall be removed by grinding and polishing, and finishing. Sheared edges shall be free of burrs, projections or fins to eliminate all danger of laceration. An exposed surface shall include an inside surface which is exposed to view when a swing or sliding door is opened. Underside of shelves need not be finished unless otherwise specified.

1.4 COMPONENTS

- A. Casters shall be 4" or 5" diameter per Item Specifications, and shall be constructed of plated and steel construction with ball bearings in the swivel and axle. The caster shall be N.S.F. approved and shall have a 1-1/8" threaded urethane tired wheel and a minimum load capacity of 200 pounds each. Mounting adaptors shall be either plated or stem expander type, to suit the applications.

B. Counters and Drainboards

1. All stainless steel counters, drainboards, and table tops shall be 14 gauge stainless steel, of N.S.F. construction, with edges per Item Specifications. Counters, table tops and drainboards shall be reinforced with 1-1/2" x 1-1/2" x 3/16" steel angle frame with cross members not over 30" O.C. This perimeter framing shall be secured to top with 1/4"-20 threaded welded studs, 2'-0" O.C. maximum with three minimum studs on any single face of a table. All field joints shall be welded to 14 gauge stainless steel reinforcing backer plates, and shall be seamless in appearance. Angle frames shall be of galvanized stock and shall be painted with two coats of aluminum lacquer after fabrication and degreasing. Exposed frame shall be all 3/16" stainless steel angle.



**NORTHEAST METROPOLITAN REGIONAL VOCATIONAL TECHNICAL HIGH SCHOOL**  
WAKEFIELD, MA

2. All metal tops shall appear as one piece with all field and shop joints reinforced and welded, ground and polished. Metal tops shall be made of the largest pieces available. Short pieces of metal will not be acceptable.
3. Counter bends shall be not less than 1/8" radius.
4. Wherever a fixture has a waste or drain outlet, the surface shall pitch towards the outlet. Where necessary, drainboards shall be creased and grooved to pitch towards the sink. Where a table top adjoins a sink, the top shall pitch towards the sink. Attain pitch by cutting or grinding a bevel into the adjoining sink face to form a depression.

**C. Crossrails**

1. Crossrails shall be 1'-0" O.C. 16 gauge stainless steel tubing welded, ground, and polished to a Number 4 finish. Crossrails shall be securely welded to legs at a height of 10" above finished floor, and shall extend from left to right between rear legs, unless otherwise specified, front to back between all legs. Delete crossrails between affected legs if undershelf exists.

**D. Faucets**

1. Faucet sets shall consist of a chrome plated cast bronze body with removable cartridges which contain all moving parts and seats, and shall have lever handles.
2. Splash mounted faucet sets shall be of the mixing type, with body as specified above, and shall be complete with a 12" long swing nozzle and aerator tip. Body shall have 1/2" I.P.S. flanged eccentric female inlets 8" on center.
3. Deck mounted faucet sets shall be of the mixing type, with body as specified above, and shall be complete with a swivel gooseneck and aerator tip. Gooseneck shall be 11-3/4" high above counter. Body shall have 1/2" I.P.S. flanged eccentric female inlets 8" on center.
4. Faucets specified for pot washing sink application shall consist of chrome plated cast bronze mixing type body with removable seats and four-prong handles. Units shall be splash mounted and shall include a 12" swing nozzle, female 3/4" I.P.S. Model LL street el inlets 8" on center, and locknuts. Passages throughout faucet shall be 3/4" inside dimension.

**E. Nuts**

1. Nuts used to secure angle framing to underside of counters with the welded studs shall be cast metal acorn type with a lock washer. Capped "Pal Nuts" shall not be acceptable.
2. Wherever bolts or screws are welded to the underside of trim or tops, neatly finish the reverse side of the weld uniform with the adjoining surface of the trim or top. Depressions at these points will not be acceptable. Raise dimples and depressing by peening or heating and shrinking and grind and polish to present a flat surface.

**F. Sinks and Sink Inserts**

1. Unless otherwise specified, all sinks including sink inserts built into tops of fixtures, shall be made of 14 gauge stainless steel with all vertical and horizontal corners rounded to a radius of approximately 3/4" and the intersections shall meet in a spherical section. Sinks shall be integrally welded to fixture tops. Sinks with two or more compartments shall have partitions full height. Partitions shall consist of two pieces of stainless steel back-to-back so fabricated that each compartment will be a deep bowl with coved corners. Partitions shall be welded in place to the bottom, front and back of the sink with smooth rounded coved corners. Top edges of partitions shall be continuously welded. The front of the sinks shall consist of a stainless steel

**NORTHEAST METROPOLITAN REGIONAL VOCATIONAL TECHNICAL HIGH SCHOOL**  
WAKEFIELD, MA

flush apron, same gauge as the sinks. Sink dimensions contained in Item Specifications are inside dimensions.

2. Sinks shall be provided with integral 14 gauge stainless steel drainboards when specified. Drainboards and sink basins shall be pitched toward waste outlets and shall be self-draining. The underside of all sink basins shall be covered with a sound deadening material, applied in a manner that no dirt or debris will collect or adhere thereto, and the surface shall be non-absorbent and easily cleanable.

**G. Wall Brackets**

1. All dish tables, sinks and counters with sinks shall be securely anchored 3" off the face of the wall unless specified otherwise. Brackets shall be "Z" shaped and fabricated of 14 gauge stainless steel. Brackets shall be secured to equipment and the wall with appropriate fasteners. Counters that are specified tight-to-wall shall be secured in a hidden manner with steel clips, and the wall fixture joint shall be sealed with a translucent silicone sealant.

**H. Waste Outlets**

1. Waste outlets shall be nickel plated cast brass body lever type. All outlets shall be complete with stainless steel snap-out strainer, stainless steel rod handle with molded plastic finial and a 2" I.P.S. outlet unless otherwise noted. Provide gasket and stainless steel face plate and internal spanner notches.

**1.5. ITEMS TO BE FURNISHED AND INSTALLED – FOOD SERVICE EQUIPMENT**

<u>FS-01 DUNNAGE RACK</u>	<u>ONE (1) REQUIRED</u>
<u>FS-02 LOT-STORAGE SHELVING</u>	<u>ONE (1) REQUIRED</u>
<u>FS-03 CLOTHES WASHER</u>	<u>ONE (1) REQUIRED</u>
<u>FS-04 CLOTHES DRYER</u>	<u>ONE (1) REQUIRED</u>
<u>FS-05 WALK-IN COOLER (+35°F.)</u>	<u>ONE (1) REQUIRED</u>
<u>FS-06 WALK-IN FREEZER (-10°F.)</u>	<u>ONE (1) REQUIRED</u>
<u>FS-07 LOT-STORAGE SHELVING - (COOLER)</u>	<u>ONE (1) REQUIRED</u>
<u>FS-08 LOT-STORAGE SHELVING - (FREEZER)</u>	<u>ONE (1) REQUIRED</u>
<u>FS-09 ICE MAKER</u>	<u>ONE (1) REQUIRED</u>
<u>FS-10 POT &amp; PAN RACK – FOUR TIER</u>	<u>ONE (1) REQUIRED</u>
<u>FS-11 HAND SINK</u>	<u>FIVE (5) REQUIRED</u>
<u>FS-12 WORKTABLE W/OVERSHELF – 6'-0"x30"</u>	<u>THREE (3) REQUIRED</u>
<u>FS-13 PAN RACK</u>	<u>SEVEN (7) REQUIRED</u>
<u>FS-14 CLEANED DISHTABLE</u>	<u>ONE (1) REQUIRED</u>
<u>FS-15 HOT WATER BOOSTER</u>	<u>ONE (1) REQUIRED</u>

**NORTHEAST METROPOLITAN REGIONAL VOCATIONAL TECHNICAL HIGH SCHOOL**  
WAKEFIELD, MA

<u>FS-16 EXHAUST HOOD</u>	<u>ONE (1) REQUIRED</u>
<u>FS-17 DISHWASHING MACHINE</u>	<u>ONE (1) REQUIRED</u>
<u>FS-18 WALL SHELF</u>	<u>ONE (1) REQUIRED</u>
<u>FS-19 HOSE REEL ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>FS-20 POT &amp; PAN SINK WASHING ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>FS-21 DISPOSER</u>	<u>TWO (2) REQUIRED</u>
<u>FS-22 HOT FOOD CABINET</u>	<u>FOUR (4) REQUIRED</u>
<u>FS-23 COLD FOOD CABINET</u>	<u>THREE (3) REQUIRED</u>
<u>FS-24 BAKER'S TABLE</u>	<u>ONE (1) REQUIRED</u>
<u>FS-25 INGREDIENT BIN</u>	<u>THREE (3) REQUIRED</u>
<u>FS-26 WORKTABLE W/SINK</u>	<u>ONE (1) REQUIRED</u>
<u>FS-27 MIXER – 30 QUART</u>	<u>ONE (1) REQUIRED</u>
<u>FS-28 VEGETABLE PREP SINK</u>	<u>ONE (1) REQUIRED</u>
<u>FS-29 AUTOMATIC SLICER</u>	<u>ONE (1) REQUIRED</u>
<u>FS-30 WORKTABLE</u>	<u>ONE (1) REQUIRED</u>
<u>FS-31 WORKTABLE W/POT &amp; PAN RACK</u>	<u>ONE (1) REQUIRED</u>
<u>FS-32 GRILLE W/STAND</u>	<u>ONE (1) REQUIRED</u>
<u>FS-33 FOUR-BURNER RANGE W/OVEN BASE</u>	<u>ONE (1) REQUIRED</u>
<u>FS-34 DOUBLE CONVECTION OVEN</u>	<u>TWO (2) REQUIRED</u>
<u>FS-35 COMBINATION OVEN/STEAMER</u>	<u>ONE (1) REQUIRED</u>
<u>FS-36 TWO-COMPARTMENT STEAMER W/BOILER</u>	<u>ONE (1) REQUIRED</u>
<u>FS-37 DOUBLE-DECK OVEN</u>	<u>ONE (1) REQUIRED</u>
<u>FS-38 EXHAUST VENTILATION HOOD</u>	<u>ONE (1) REQUIRED</u>
<u>FS-39 FIRE SUPPRESSION SYSTEM</u>	<u>ONE (1) REQUIRED</u>
<u>FS-40 S/S PIPE ENCLOSURE</u>	<u>ONE (1) REQUIRED</u>
<u>FS-41 S/S TOP CAP</u>	<u>TWO (2) REQUIRED</u>
<u>FS-42 S/S COUNTER W/PASS-THRU</u>	<u>ONE (1) REQUIRED</u>

**NORTHEAST METROPOLITAN REGIONAL VOCATIONAL TECHNICAL HIGH SCHOOL**  
WAKEFIELD, MA

<u>FS-43 STORAGE CABINET</u>	<u>ONE (1) REQUIRED</u>
<u>FS-44 REFRIGERATOR – TWO COMPARTMENT</u>	<u>ONE (1) REQUIRED</u>
<u>FS-45 COUNTER W/SINK</u>	<u>ONE (1) REQUIRED</u>

1.6. ITEMS TO BE FURNISHED AND INSTALLED – CULINARY ARTS EQUIPMENT

<u>CA-01 COUNTER W/SINK</u>	<u>ONE (1) REQUIRED</u>
<u>CA-02 SOILED DISHTABLE W/PRE-RINSE SINK &amp; SLOPED SHELF - "L" SHAPED</u>	<u>ONE (1) REQUIRED</u>
<u>CA-03 HOSE REEL ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>CA-04 DISPOSER</u>	<u>ONE (1) REQUIRED</u>
<u>CA-05 DISHWASHER W/EXTENDED HEIGHT</u>	<u>ONE (1) REQUIRED</u>
<u>CA-06 EXHAUST HOOD</u>	<u>ONE (1) REQUIRED</u>
<u>CA-07 HOT WATER BOOSTER</u>	<u>ONE (1) REQUIRED</u>
<u>CA-08 CLEAN DISHTABLE – "L" SHAPED</u>	<u>ONE (1) REQUIRED</u>
<u>CA-09 POT &amp; PAN RACK – FOUR TIER</u>	<u>TWO (2) REQUIRED</u>
<u>CA-10 HAND SINK</u>	<u>SEVEN (7) REQUIRED</u>
<u>CA-11 WALL CABINET</u>	<u>ONE (1) REQUIRED</u>
<u>CA-12 WORK COUNTER W/SINK</u>	<u>ONE (1) REQUIRED</u>
<u>CA-13 DEMO TABLE</u>	<u>ONE (1) REQUIRED</u>
<u>CA-14 DUAL INDUCTION BURNER</u>	<u>ONE (1) REQUIRED</u>
<u>CA-15 COUNTER TOP GRIDDLE</u>	<u>ONE (1) REQUIRED</u>
<u>CA-16 REFRIGERATED WORK TABLE</u>	<u>ONE (1) REQUIRED</u>
<u>CA-17 COUNTERTOP FRYER</u>	<u>ONE (1) REQUIRED</u>
<u>CA-18 EXHAUST HOOD ASSEMBLY (DOUBLE-SIDED)</u>	<u>ONE (1) REQUIRED</u>
<u>CA-19 FIRE SUPPRESSION SYSTEM</u>	<u>ONE (1) REQUIRED</u>
<u>CA-20 WORKTABLE – S/S</u>	<u>EIGHT (8) REQUIRED</u>
<u>CA-21 LOT – STORAGE SHELVING</u>	<u>ONE (1) LOT REQUIRED</u>
<u>CA-22 WALK-IN COOLER (+35°F.)</u>	<u>ONE (1) REQUIRED</u>
<u>CA-23 WALK-IN FREEZER</u>	<u>ONE (1) REQUIRED</u>

**NORTHEAST METROPOLITAN REGIONAL VOCATIONAL TECHNICAL HIGH SCHOOL**  
WAKEFIELD, MA

<u>CA-24 LOT – STORAGE SHELVING (COOLER)</u>	<u>ONE (1) LOT REQUIRED</u>
<u>CA-25 LOT – MOBILE SHELVING (FREEZER)</u>	<u>ONE (1) LOT REQUIRED</u>
<u>CA-26 REFRIGERATOR – TWO COMPARTMENT</u>	<u>ONE (1) REQUIRED</u>
<u>CA-27 WALL SHELF</u>	<u>FOUR (4) REQUIRED</u>
<u>CA-28 COUNTER W/SINK</u>	<u>ONE (1) REQUIRED</u>
<u>CA-29 CHEF'S COUNTER ASSEMBLY – "L" SHAPED</u>	<u>ONE (1) REQUIRED</u>
<u>CA-30 HOT WELL UNIT</u>	<u>ONE (1) REQUIRED</u>
<u>CA-31 MICROWAVE OVEN</u>	<u>ONE (1) REQUIRED</u>
<u>CA-32 HEATED DRAWER ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>CA-33 REFRIGERATED COLD PAN</u>	<u>ONE (1) REQUIRED</u>
<u>CA-34 CONVEYOR TOASTER</u>	<u>ONE (1) REQUIRED</u>
<u>CA-35 UNDERCOUNTER REFRIGERATOR</u>	<u>ONE (1) REQUIRED</u>
<u>CA-36 FOOD WARMER</u>	<u>ONE (1) REQUIRED</u>
<u>CA-37 DISH CARTS</u>	<u>TWO (2) REQUIRED</u>
<u>CA-38 ICE CUBER</u>	<u>ONE (1) REQUIRED</u>
<u>CA-39 POT &amp; PAN RACK</u>	<u>ONE (1) REQUIRED</u>
<u>CA-40 DISPOSER</u>	<u>ONE (1) REQUIRED</u>
<u>CA-41 POT &amp; PAN WASHING SINK ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>CA-42 HOSE REEL ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>CA-43 WALL SHELF</u>	<u>ONE (1) REQUIRED</u>
<u>CA-44 EXHAUST HOOD ASSEMBLY (SINGLE-SIDED)</u>	<u>ONE (1) REQUIRED</u>
<u>CA-45 DONUT FRYER</u>	<u>ONE (1) REQUIRED</u>
<u>CA-46 DOUBLE CONVECTION OVEN</u>	<u>FOUR (4) REQUIRED</u>
<u>CA-47 SIX-BURNER RANGE W/OVEN</u>	<u>FOUR (4) REQUIRED</u>
<u>CA-48 TILTING SKILLET – 12 GALLONS W/STAND</u>	<u>ONE (1) REQUIRED</u>
<u>CA-49 TWO-COMPARTMENT STEAMER W/BOILER</u>	<u>TWO (2) REQUIRED</u>
<u>CA-50 COMBINATION OVEN/STEAMER</u>	<u>ONE (1) REQUIRED</u>
<u>CA-51 CHAR-BROILER</u>	<u>ONE (1) REQUIRED</u>

**NORTHEAST METROPOLITAN REGIONAL VOCATIONAL TECHNICAL HIGH SCHOOL**  
WAKEFIELD, MA

<u>CA-52 SALAMANDER BROILER</u>	<u>ONE (1) REQUIRED</u>
<u>CA-53 SIX-BURNER RANGE W/OVEN</u>	<u>ONE (1) REQUIRED</u>
<u>CA-54 FRYER ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>CA-55 EXHAUST HOOD ASSEMBLY (DOUBLE-SIDED)</u>	<u>ONE (1) REQUIRED</u>
<u>CA-56 REVOLVING OVEN</u>	<u>ONE (1) REQUIRED</u>
<u>CA-57 TWO-SECTION ROLL-IN PROOFER</u>	<u>ONE (1) REQUIRED</u>
<u>CA-58 BAKER'S SCALE</u>	<u>FOURTEEN (14) REQUIRED</u>
<u>CA-59 REFRIGERATED STAINLESS-STEEL TOP TABLE</u>	<u>FOURTEEN (14) REQUIRED</u>
<u>CA-60 COUNTER-TOP MIXER – 8 QUART</u>	<u>FOURTEEN (14) REQUIRED</u>
<u>CA-61 PAN RACK</u>	<u>SIX (6) REQUIRED</u>
<u>CA-62 INSULATED HEATED CABINET</u>	<u>TWO (2) REQUIRED</u>
<u>CA-63 COUNTER W/SINK</u>	<u>ONE (1) REQUIRED</u>
<u>CA-64 INGREDIENT BIN</u>	<u>EIGHT (8) REQUIRED</u>
<u>CA-65 ICE CREAM CABINET</u>	<u>ONE (1) REQUIRED</u>
<u>CA-66 COFFEE MAKER</u>	<u>ONE (1) REQUIRED</u>
<u>CA-67 COUNTER – S/S</u>	<u>ONE (1) REQUIRED</u>
<u>CA-68 REACH-IN REFRIGERATOR</u>	<u>ONE (1) REQUIRED</u>
<u>CA-69 HOT PLATE – SINGLE BURNER</u>	<u>EIGHT (8) REQUIRED</u>

**END OF SECTION**

\*\*\*

**SECTION 11 48 40  
BASKETBALL BACKSTOPS**

**1.1 SUMMARY**

- A. Furnish basketball backstops listed in this Specification and/or shown on the Equipment Drawing. Include delivery to the building, unpacking, setting in place, leveling and attachment to structure, as required for complete installation.
- B. Remove all debris, dirt and rubbish accumulated as a result of this installation, and leave the premises clean and ready for use.
- C. Verify and confirm all building dimensions relative to equipment to be furnished and installed by taking actual field measurements at the job site prior to equipment fabrication.
- D. Become familiar with job conditions and building measurements to coordinate the planning, design, delivery and installation of equipment furnished under these specifications, with all other related trades and associated work during the term of this contract.
- E. This Basketball Backstops Equipment Subcontractor shall supply an installation of equipment that is equal to or exceeding the quality and function described in this minimum requirement Specification and shown on the Drawing.
- F. Furnish power operated basketball backstops complete with motors, ready for operation and final electrical connection by the Electrical Subcontractor.

**1.2 MATERIALS**

**A. Main Court Backstops**

- 1. Main Court Backstops: Provide overhead supported backstop vertical frame assembly to consist of a main vertical support of 6-5/8" O.D. heavy wall structural tube with a rear diagonal brace of 1-7/8" O.D. structural pipe. Top horizontal mast hinge spreader to be of a heavy wall 3-1/2" O.D. tubing to form a rigid triangular design. Backstop shall be supported from 3-1/2" O.D. pipe anchored to overhead framing members by means of heavy formed steel support fittings. Superstructure pipes shall be reinforced with bridging or bracing when truss centers exceed spans of 14'-0". All pipe ends when exposed shall be capped.
- 2. Goal shall mount directly through backboard and into a heavy structural steel weldment which shall be clamped to the vertical 6-5/8" O.D. center support to eliminate any strain should a player hang on the front mounted goal. This direct mount feature shall conform to the N.C.A.A. recommendation which states that the design of the unit shall transfer the load on the goal directly to the backboard support ("Center-Strut") so as to minimize stress to the backboard.
- 3. Vertical frame assembly shall be suspended by adjustable hangers (with 2" adjustment) to provide for precise plumbing of frame during installation. Backstop to operate with a 1-7/8" O.D. side brace assembly for proper adjustment during installation. Knee joint locks backboard in playing position by means of a torsion spring within the hinge assembly and is easily disengaged by upward force of the hoist cable.

**B. Side Court Backstops**

- 1. Side Court Backstops: Provide backward fold overhead supported backstop with a fully welded vertical front frame assembly which shall consist of a main center mast of 6-5/8" O.D. heavy wall structural steel tube with diagonal side sway braces of 2-1/2" x

1-1/2" structural tube. Top horizontal mast hinge spreader shall be made of a heavy 4" structural channel to form a rigid back to back triangle design. Backstop shall be supported from 3-1/2" O.D. pipe anchored to overhead framing members by means of heavy-formed steel support fittings. Superstructure pipes shall be reinforced with bridging or bracing when truss centers exceed spans of 14'-0". All pipe ends when exposed shall be capped. Goal shall mount directly through backboard and into a heavy structural steel weldment ("Center-Strut"). The center-strut shall be clamped to the vertical 6-5/8" O.D. center support to eliminate any strain on backboard. This direct mount feature shall conform to the N.C.A.A. unit design recommendation minimizing stress on the backboard.

2. The main frame assembly shall be suspended by adjustable hangers (with 2" of vertical adjustment) to provide for precise plumbing of frame during installation. Support hangers shall be offset 2" from center line of main center mast to properly weight lock unit in playing position.
3. Back brace to operate with double, 1-7/8" O.D. back brace assembly with a folding knee joint. Knee joint shall lock backboard in playing position, by means of a torsion spring within the hinge assembly. Hoist cable shall disengage knee joint, allowing brace to fold easily.

C. Backboards: Main Court and Side Courts

1. Provide each main court backstop and each side court backstop with a rectangular backboard 1/2" thick 72" x 42", tempered plate glass cushioned in unitized steel tubing frame with glare free aluminum perimeter. Standard white borders and target area shall be fired permanently into the glass. Provide limited lifetime warranty against breakage.
2. Backboard shall have bolt-on safety padding installed according to manufacturer's specifications.

D. Winches

1. Each backstop shall be provided with heavy duty electric winch, designed to hold units at any position when raising or lowering. Units shall be individually operated by 3/4 H.P. (13 Amp.) capacitor type, 60 Hz, 115 VAC single phase electric motor with automatic thermal overload protection manufactured to NEMA specifications. Winch shall include a fully enclosed gear set. Gear set shall be set in an oil bath and sealed at factory to eliminate the need for lubrication. The gear shaft shall connect directly to the drum hoist without the use of a chain. Electric winch shall incorporate a special rotary limit switch and a flush wall mounted dual key (separate up and down keys) switch to prevent improper operation of system.
2. Key switches which operate basketball backstops and gym dividers shall be furnished identical. Provide hoist cable of sufficient length and 1/4" diameter, galvanized aircraft type (minimum of 7,000 pounds, ultimate).

E. Goals

1. Provide for each rectangular-glass backboard with steel frame and goal incorporating a positive lock, pressure release mechanism to automatically release and pivot downward when a static force of 230 pounds is placed on the top of the ring at the point most distant from the backboard to meet the latest NBA, NCAA, NFHS, and FIBA specifications for movable goals. Goal shall be spring loaded to automatically and instantaneously return to the playing position. The pressure release mechanism shall be preset at the factory with a capability for field adjustment to comply with the NCAA recommendation to test goals for rebound elasticity. Pressure release adjustment shall be accomplished without removing the mechanism cover.



**NORTHEAST METROPOLITAN REGIONAL VOCATIONAL TECHNICAL HIGH SCHOOL**  
WAKEFIELD, MA

Breakaway goals with plastic pivot bearings shall not be approved as equal. Rim shall be rigidly braced by means of a 3/16" thick steel formed and die cut steel brace welded in position on the underside of the rim for maximum support. Rim shall be provided with a unique "tube-tie" net attachment system to eliminate the conventional wire-formed type net locks. Goal shall be finished in a durable oven cured epoxy finish. Durable, anti-whip type net and attachment hardware shall be included with the goal.

2. This rim shall attach directly to "Center-Strut" or backstop. Any goal relying on the backboard alone for support will not be considered equal.

F. Safety-Strap

1. Provide for each with a safety-strap lock. Lock shall be inertia sensitive to automatically lock a basketball backstop in position at any time in storage or during the raising or lowering cycle due to a sudden surge of speed created by a possible malfunction of the hoisting apparatus. Unit shall incorporate a fully automatic reset requiring no poles, ropes, levers or buttons.

1.3 ITEMS TO BE FURNISHED AND INSTALLED

<u>BB-01 SIDE-FOLD BACKSTOP (MAIN COURT)</u>	<u>TWO (2) REQUIRED</u>
--	-------------------------

<u>BB-02 SIDE-FOLD BACKSTOP (SIDE COURT)</u>	<u>FOUR (4) REQUIRED</u>
--	--------------------------

**END OF SECTION**

\*\*\*

**SECTION 11 48 60**  
**GYM DIVIDER CURTAIN**

**1.1 SUMMARY**

- A. Furnish roll-up curtain listed in this Specification and/or shown on the Equipment Drawing. Include delivery to the building, unpacking, setting in place, leveling and attachment to structure, as required for complete installation.
- B. Remove all debris, dirt and rubbish accumulated as a result of this installation, and leave the premises clean and ready for use.
- C. Verify and confirm all building dimensions relative to equipment to be furnished and installed by taking actual field measurements at the job site prior to equipment fabrication.
- D. Become familiar with job conditions and building measurements to coordinate the planning, design, delivery and installation of equipment furnished under these specifications, with all other related trades and associated work during the term of this contract.
- E. This Gym Divider Curtain Equipment Subcontractor shall supply an installation of equipment that is equal to or exceeding the quality and function described in this minimum requirement Specification and shown on the Drawing.
- F. Furnish power operated roll-up curtain complete with motor, ready for operation and final electrical connection by the Electrical Subcontractor.

**1.2 MATERIALS**

- A. Lower 8'-0" section of curtain shall be polyester reinforced solid vinyl fabric 19 oz. per square yard and contains anti-bacterial and fungi-resistant treatment to prevent mildew and rot. All seams, outer edge hems and bottom pocket containing 2/0 coil proof chain shall be electronically welded with 1" full contact weld. Material shall conform to all State and Local Fire Code Regulations. All hems and pockets on curtain shall be double needle lock stitched seams.
- B. Upper section of curtain shall be VCP mesh; woven vinyl encapsulated polyester yarns with a 80% plus open grid weave for air circulation. The curtain shall be electronically welded to size from 5' wide horizontal panels using 1.5" lap welds. Solid vinyl fabric shall be welded to the top edge of the VCP mesh to form a pocket hem to accommodate a 1-5/8" diameter tube batten for curtain support. Material shall conform to all State and Local Fire Code Regulations.
- C. Top Tube Batten supporting curtain shall be suspended from each drive pipe support assembly with adjustable 2/0 chain.
- D. Curtain to be hoisted by 1/8" diameter steel aircraft cable. Spacing shall not exceed 10'-0" of the curtain width. Each hoist line shall be attached to the 1-5/8" diameter steel tube batten in the bottom hem of curtain; run through grommets vertically spaced 18" on center to the top of the curtain and terminate at the individual drum formed on the 2-3/8" diameter drive pipe shaft above the curtain. Suspension of curtain in stored position shall not rely on one cable for support.
- E. Electrical operation of the drive shaft shall consist of a compensating type power unit with a 3/4" H.P., 115 volt, single phase reversible motor with built-in thermal overload protection. Speed reduction to be through load holding worm and worm gears. Remote control operation to include integral limit switch to control the upper and lower limit of curtain travel. A security key lock, three position momentary contact wall switch shall be furnished with flush type cover plate. Key switch to be located so that operator has full view of the curtain while it is being operated.

**NORTHEAST METROPOLITAN REGIONAL VOCATIONAL TECHNICAL HIGH SCHOOL  
WAKEFIELD, MA**

- F. Winch: Winch shall be 1500 pound capacity specifically designed for roll-up dividing curtains. Gear ratio shall be 30 to 1, capable of holding curtain in any position. Winch shall be of an open drum design, self-lubricating, with drum support roller bearings centered directly under pull point from maximum torsional strength and optimum alignment. Drum shall be 4" diameter and 1-1/4" end flanges. Worm drive shall be hardened and ground steel with the worm gear bronze alloy. Input shaft shall accommodate key-operated electric operation.
- G. Electric Motor: Motor shall be 3/4 H.P., 110V/60C/1 phase. Motor shall be operated by means of key-operated switch with up, down and neutral positions. Switch shall be provided by the Gym Divider Curtain Equipment Subcontractor and installed at a designated remote location by the Electrical Subcontractor. Winch shall be prewired with a 54" long flex conduit with twist lock grounded type plug attached. Matching flange type receptacle shall be mounted in 4" square box cover (box by the Electrical Subcontractor).
- H. Hardware: The Gym Divider Curtain Equipment Subcontractor shall furnish all necessary attaching hardware, pipes, pulleys, pulley supports, winch, electric motor and mounting frames to provide gymnasium roll-up curtain ready for operation and final connections by the Electrical Subcontractor.

1.3 ITEMS TO BE FURNISHED AND INSTALLED

<u>GC-01 GYMNASIUM CURTAIN</u>	<u>ONE (1) REQUIRED</u>
<u>GC-02 GYMNASIUM CURTAIN</u>	<u>ONE (1) REQUIRED</u>

**END OF SECTION**

\*\*\*

**SECTION 11 60 00**  
**FIXED CASEWORK AND EQUIPMENT**

**1.1 SUMMARY**

- A. Furnish all items of equipment listed in this Section and/or shown on the equipment drawings. Include delivery to the building, unpacking, setting in place, leveling and scribing panels to walls, soffits, and floors as required.
- B. Furnish plumbing fixtures, including nipples and locknuts, required for mounting in or on the equipment. Furnish all fixtures unattached and unassembled to the Plumbing Subcontractor properly tagged and identified with installation information.
- C. Furnish sinks, including overflows, plugs, strainers and tailpieces which occur above the floor and required for mounting in the equipment. Furnish sink basins installed in the cabinet work. Furnish fittings unattached and unassembled to the Plumbing Subcontractor properly tagged and identified with installation information.
- D. Furnish electrical service fixtures, including nipples, required for mounting in or on equipment. Furnish all fixtures unattached and unassembled to the Electrical Subcontractor properly tagged and identified with installation information.
- E. Furnish light fixtures including switches, integral convenience receptacles and other components, as required, for installation in or on the equipment. Fixtures and fittings that are a functional integral part of the equipment shall be factory installed and prewired.
- F. Furnish all items requiring air exhaust, such as vented storage cabinets, with duct connection stub 1-1/2" high.
- G. Furnish and provide all materials and services as may be additional and/or separately described under other sections of this Specification.
- H. Remove all debris, dirt and rubbish accumulated as a result of this installation, and leave the premises clean and ready for use. This shall include cleaning equipment interiors, exteriors, and worktops.
- I. Verify and confirm all building dimensions relative to equipment to be furnished and installed by taking actual field measurements at the job site prior to equipment fabrication.
- J. Become familiar with job conditions and building measurements to coordinate the planning, design, connections, delivery and installation of equipment furnished under these specifications, with all other related trades and associated work during the term of this contract.
- K. Supply an installation of equipment that is equal to or exceeding the quality and function described in this minimum specification and shown on the drawings.

**1.2 MANUFACTURERS**

- A. All casework component construction provided under this Section shall be equal to, or exceed, the construction specified herein as manufactured by the following companies and provided to the specific referenced projects listed:

Wood-Metal Industries, Inc.: Windham WT-1094 Design.  
Kewaunee Mfg. Co.: Arlington #9922 Design.  
Campbell-Rhea Co.: Somerville #5001 Design.  
Fisher Hamilton Scientific: Andover #B2389 Design.  
Sheldon Laboratory Systems

Materials, hardware and accessories shall be as specified herein.

### 1.3 HARDWARE AND TRIM

- A. **Drawer and Door Pulls:** Drawer and door pulls shall be of clean, modern wire pull design offering a comfortable hand grip. Pulls shall attach to drawer or door panel with machine screws 4" on center. Pulls shall be of extruded aluminum measuring 5/16" in diameter. Provide pulls with brushed finish, and in color to be selected by Architect. Pulls on drawer fronts shall be installed in horizontal positions, and pulls on door panels shall be installed in vertical positions parallel to door edges.
- B. **Hinges:** Hinges shall be steel, of 2-1/2", five-knuckle, wrap-around institutional type heavy-duty with offset wings designed to locate hinged side door at 7/16" from cabinet end. Hinges shall be mounted to door and case with nine (9) #7 flat head screws per hinge. Doors 48" in height and over shall be fitted with three (3) hinges per door. Finish shall be as selected by Architect.
- C. **Locks:** Locks shall be applied to all doors and drawers as shown on the drawing or called for in the equipment list. All locks, for the purpose of coordinating keying systems, shall be Illinois or equal, offering two (2) sets of four (4) tumblers locking in opposite splines. Positive tumbler operations shall be accomplished by cam action without the aid of springs. The lock system shall guarantee security which restricts the duplicating of keys to registered locksmiths. Exposed surface of locks shall match other cabinet trim. Furnish two (2) keys with each lock plus master keys. Proposed keying systems shall be determined by the Architect and approved by the Owner. Such keying systems shall offer multiple master-keyed series. In general, all teacher wardrobe units (TW) shall be within a series, keyed differently and master-keyed; all locks within a room, except for teacher's wardrobe units and any individual type storage component, shall be keyed the same and different than all other rooms; and individual storage components specified with locks shall be keyed differently and different than all other locks. The number and groupings of keying series shall be as determined by the Architect and approved by the Owner.
- D. **Magnetic Latches:** Magnetic latches shall be used on all swinging doors. Latches shall be enclosed in a plastic case and shall operate on a plated steel strike plate screwed to door. Double doors shall use latches on both doors, and full height cases shall also have a latch at bottom of right-hand door. Latches shall be heavy-duty with 15-pound pull.
- E. **Catches:** Elbow catches and strike plates shall be used on left-hand doors of double door cases where locks are used, and are to be steel, cadmium plated.
- F. **Drawer Slides:** Drawer slides shall be Grant Model #335 or equal, of cold rolled steel, zinc plated, clear chromate. Each slide shall be in two (2) sections with a load capacity of 100 pounds per pair. Slides shall provide a positive closing position, and positive stop in extended position.
- G. **Leg Shoes:** Leg shoes shall be provided on all counter legs unless otherwise specified, to conceal shims or fastening devices. Shoes are to be 4" high and of chemical rubber or vinyl, and coved at bottom. Color to be selected by Architect.
- H. **Base Moulding:** Base moulding shall be of a pliable, chemical rubber material or vinyl, 4" high, coved at bottom, and shall be cemented tightly against cabinet work with waterproof adhesive. Interior and exterior corners shall be neatly mitered. Color to be selected by Architect. Provide all exterior corners with stainless-steel angle protection.
- I. **Glides:** Floor glides where specified for movable open-leg tables shall be non-marring material at least 1-1/2" diameter to prevent indenting composition flooring and have at least 1" adjustment.

**NORTHEAST METROPOLITAN REGIONAL VOCATIONAL TECHNICAL HIGH SCHOOL**  
WAKEFIELD, MA

- J. Shelf Standards: Shelf standards and shelf support clips shall be mounted on interior of case to provide shelf adjustment on 1/2" centers. Shelves longer than 3' shall be supported at the center by an additional standard and a full width bracket.
- K. Tote Trays: Tote trays where specified shall be molded one-piece plastic high impact polystyrene with all top edges turned down. Trays shall be furnished with label holders and in the sizes specified. Trays shall be as manufactured by Fabri-Form of Indiana.
- L. Rectangular Wire Management Grommets: Grommets where specified shall be equal to Outwater Plastic Industries consisting of one (1) bushing #134 with 1-1/4" insert leg and one (1) cap #4.

**1.4 SINKS AND MECHANICAL SERVICE FIXTURES**

- A. Epoxy Resin Sinks and Drain Fittings: Epoxy resin sinks and drain fittings shall be non-glaring, and black in color. Sinks shall be molded to one degree dishing to outlet in bottom and have a minimum of 1/2" thick side walls and 5/8" thick bottoms. Materials shall be heat resistant up to 350 degrees F., water absorption of 0.05 in 24 hours, tensile strength of 12,700 P.S.I., and a density of 1.90 GR/CC and a Rockwell-M-Hardness rating of 114. Sinks and drain fittings, specified herein, shall be equal to that manufactured by the Durcon Company, Dayton, Ohio. Refer to drawings for sink schedule.
- B. Stainless Steel Sink and Tops: Stainless steel sinks and tops shall be welded, ground and polished of #18 gauge nickel bearing #18-8 Type 302 stainless steel. Exposed surfaces to be 180 grit-No. 4 uniform satin finish. Interior corners of sink shall be rounded to minimum of 1-3/4" radius. Sound dampening shall be applied to underside of all sink basins and tops. Stainless steel sinks in stainless steel tops shall be welded integrally into counter. Counters shall have 4" high integral backsplashes where called for in equipment list. Stainless steel sinks in other than stainless steel tops shall be self-rimmed and shall have a raised edge of 7/16". Stainless steel sinks, specified herein, shall be equal to that manufactured by Elkay Mfg. Company. Refer to drawings for sink schedule. All handicap-accessible sinks shall be 6"D and provided with rear drain outlets.
- C. Plumbing Fixtures: Plumbing fixtures shall be of modern design and materials specifically designed for laboratory use equal to Chicago Faucet Company, T & S Brass Company, or Water Saver Faucet Company, with chrome laboratory type finish, unless otherwise noted. All resin sinks shall be furnished with 1-1/2" I.P.S. outlets, overflows, tailpiece, and bead adaptor of black epoxy resin. All water fixtures of the gooseneck type and any others normally furnished or so specified with laboratory serrated hose nozzles shall be furnished with integral vacuum breakers. Fixtures shall be all from one manufacturer. Refer to drawings for fixtures schedule. All faucets shall be provided with 0.3 GPM flow regulators. All gas fixtures shall be provided with integral check valves. All plumbing fixtures shall conform to State and Local Plumbing Regulations.
- D. Electrical Fixtures: Electrical fixtures shall be furnished with required holes or cut-outs where indicated on all cabinetwork or table tops. Pedestal boxes shall be cast aluminum type. Plates shall be polished stainless steel. Receptacles shall be equal to Arrow-Hart #GF-5342, duplex, 20.0 amp./120V GFI protected type; unless otherwise specified. Light fixtures shall be furnished complete per these specifications mounted in place with switch and lamps. Refer to drawings for fixtures schedule.

**1.5 COUNTERTOPS**

- A. Countertops shall be 1" thick with 4" high backsplash, unless otherwise indicated, and of material and construction the same or equal to that specified below. Laboratory tops shall be in as large pieces as possible, complete with drip grooves machined into underside of perimeter edges. Joints shall be sealed with a catalytic epoxy resin cement in all laboratory or wet areas.

- B. Molded Epoxy Resin Tops (Type-C): Molded resin tops shall be molded from a modified epoxy resin that has been compounded and cured to provide the optimum physical and chemical resistance properties required for laboratory use. Top shall be of a uniform mixture throughout their full thickness and shall be black in color. All exposed sides shall have a 1/4" radius at all edges and corners.
- C. Plastic Laminated Tops with Maple Edging (Type-D): Plastic laminated tops shall be factory fabricated of best grade 0.05" thick, horizontal grade, high-pressure plastic laminate equal to Formica, Nevamar, or Wilsonart sheets bonded with semi-rigid (PVAC) contact adhesive, or rigid (ureas, recorcinol) adhesives to 45 pound density particleboard core. Overall finished thickness of tops shall be 1-1/4". Underside of tops shall be laminated with a suitable balancing sheet equal to Formica Corp. -91/BLS or -92BGS backing sheet to minimize warpage. All cutouts shall have radiused (1/8" minimum) inside corner to avoid stress cracking. All exposed top edges shall be provided with a 3mm PVC edging. Plastic finish, pattern and colors shall be as selected by the Architect from a full range of Formica, Nevamar, or Wilsonart colors available from the laminate manufacturer. Assembled tops shall meet the Standards of DLPA (Decorative Laminate Products Association); ANSI #A-161.2-1979; and Architectural Woodwork Quality Standards.

## 1.6 CONSTRUCTION

- A. In general, all cabinets and cases shall be completely framed with a top and bottom four-sided horizontal structural frame blind mortised and tenoned into sides and front framing. All cabinets shall be self-supporting, modular units to permit efficient handling and possible rearrangement in the future. The casework shall be square, flush overlap construction with plastic laminated faced door and drawer fronts. Plastic for door and drawer fronts shall be of best grade 0.03" thick, vertical grade, high pressure plastic laminate as manufactured by Formica, Nevamar, or Wilsonart. Plastic finish pattern and colors shall be as selected by the Architect from the full range of Formica, Nevamar, or Wilsonart colors available from the laminate manufacturer.
- B. All casework component construction provided under this Section shall be equal to, or exceed, the construction specified herein as manufactured by the following companies and provided to the specific referenced projects listed:

Wood-Metal Industries, Inc.: Windham WT-1094 Design.  
Kewaunee Mfg. Co.: Arlington #9922 Design.  
Campbell-Rhea Co.: Somerville #5001 Design.  
Fisher Hamilton Scientific: Andover #B2389 Design.  
Sheldon Laboratory Systems

Materials, hardware and accessories shall be as specified herein.

- C. Base Cabinets: Base cabinets shall have solid ends and backs, flush overlap doors and drawers, and fully-enclosed top space, protecting all interiors against dust and vermin. Cabinet end panels shall be 3/4" Maple plywood (exposed), 3/4" Birch plywood (unexposed) with all panels faced with 1" x 3/4" Solid Maple. All end panels shall be glued to top and bottom horizontal frames, as well as any intermediate frames through blind mortise and tenon joints, and further secured with countersunk screws. All backs shall be 1/4" Birch plywood. Cupboard bottoms shall be 1/4" welded fiber and shall be easily removable for replacement purpose. Lock shelf panel on all base cabinets for which locks are being provided shall be 3/16" black welded fiber. Base cabinet shelves shall be full-width adjustable, and made up of 3/4" Birch plywood with 1" x 3/4" solid Maple facing. All toe spaces shall be 2-1/2" deep x 4" high, fully enclosed and an integral part of the cabinet. Frame sizes shall be as follows:

Top Horizontal:	Front Member 2-1/8" x 1-1/4" Maple
	Side and Rear 1-5/8" x 1-1/4" Maple
	Center Mullion 2-1/2" x 1-1/4" Maple

**NORTHEAST METROPOLITAN REGIONAL VOCATIONAL TECHNICAL HIGH SCHOOL**  
WAKEFIELD, MA

Intermediate Horizontal: Front Member 1-3/4" x 3/4" Maple  
Side and Rear 1-3/4" x 3/4" Hardwood  
Center Mullion 2-1/2" x 3/4" Maple

Bottom Horizontal:	Front Member	3-3/4" x 3/4" Maple
	Side and Rear	1-3/4" x 3/4" Hardwood
	Center Mullion	2-1/2" x 3/4" Maple

- D. Drawers: All drawers shall have applied drawer fronts 3/4" thick with 45 pound density particle board core, overlapping openings on four sides to assure dustproofing of cabinet interior. Drawer box sides and front shall be solid hardwood, 1/2" thick, with sides multiple dovetailed and glued to drawer fronts. Drawer backs shall be 1/2" thick. Drawer bottoms shall be 1/4" thick welded fiber set into 1/4" deep grooves on four (4) sides. Drawers shall be of box construction as described herein with plastic laminated front securely screwed to wood front. Front panel edges shall be edged with 3 MM impact-resistant PVC edging with matching colors to surface. Drawer boxes shall be full-height, width and depth of opening allowing minimal clearances to assure for proper operation.
- E. Doors: Doors shall be 3/4" thick and shall be of balanced plastic laminated construction with both interior and exterior faces of matching plastic. Doors shall be edged with 3 MM impact-resistant PVC edging with matching colors to surface. Core materials shall be of 45 pound density particleboard. Doors shall be guaranteed against warping, sagging and binding.
- F. Full Height Cases: Full height cases shall be integrally constructed to provide a fully enclosed cabinet, and designed to insure dust proofing. All exposed woods shall be Maple, exposed end panels-3/4" Maple plywood, unexposed end panels - 3/4" Birch plywood, both faced with 3/4" x 3 15/16" wide Solid Maple end facing. Top and bottom front rails shall be grooved and tenoned into end facing, and secured by gluing and countersunk screws. Glue blocks, 3" long, shall be used to assure further support at corner joints. Cases 18" wide and over shall have 2-1/2" x 4 high toe space same as base cabinets. Case bottoms shall be 1/4" Maple plywood where exposed, and 1/4" Birch plywood where unexposed, rabbeted, glued, and securely fastened to case members. All shelves shall be 3/4" thick Maple plywood, faced with 1" x 3/4" Solid Maple where exposed to view, and 3/4" Birch plywood with Solid Maple facing where unexposed. Center shelf shall be 1" thick tenoned into grooved end panels, and securely glued. All other shelves are to be adjustable on applied shelf standards and supports. Doors shall be 3/4" thick and shall be of balanced plastic laminated construction with both interior and exterior faces of matching plastic, as described in Paragraph 2.3E, herein. Hinged doors shall overlap case on four (4) sides. Frame sizes shall be as follows:
- |              |   |
|--------------|---|
| End Panel:   | 3/4" Maple plywood with Maple facing (exposed).   |
| End Facing:  | 3/4" Birch plywood with Maple facing (unexposed)  |
| Top Rail:    | 1" x 3-15/16" Solid Maple.                        |
| Base Rail:   | 1-5/8" x 3-7/16" Solid Maple.                     |
| Base Rail:   | 3/4" x 3-1/2" Solid Maple (with toe space).       |
| Bottom Rail: | 1-1/16" x 4-1/4" Solid Maple (without toe space). |
| Bottom Rail: | 3/4" x 3-15/16" Solid Maple (with toe space).     |
| Bottom Rail: | 3/4" x 3-7/16" Solid Maple (without toe space).   |
- G. Wall Cabinets: Construction and materials shall be the same as for full height cases with the following exceptions: The base rail shall be 1-1/16" x 2-1/2" high with a 1/4" Maple plywood soffit rabbeted into bottom front rail and ends, set flush and secured, wherever case bottoms are exposed. Doors and adjustable shelves shall be as described in Paragraphs 2.5E and 2.5F, herein.



- H. Open Frame Tables and Counters: Legs shall be 4-piece construction, 2-1/2" square with all corners radiused 1/4". Legs shall be secured to apron frame by heavy-duty corner bolt and a 14 gauge metal corner brace. Brace shall be locked into apron frames by accurately located grooves and securely fastened with screws. All apron frames shall be 3/4" thick x 5" high Maple hardwood (unless otherwise noted) with bottom edge radiused 1/4" and top edge grooved for securing top fasteners. Leg stretchers, 1-5/16" x 2-1/2", are to be provided secured to legs through a heavy-mortise and tenoned joint as well as 4" long chromium plated bolts. All open frame counters shall be securely fastened to wall and floors utilizing concealed fastening methods. Movable tables, where identified as such, shall be provided with floor leveling glides. Fixed legs shall be provided with leg shoes, and shall be fastened to floor.
- I. Fume Hoods: Fume hood superstructures shall be double wall type with a flush interior lining of 1/4" thick acid resistant composition stone. Interior of fume hood shall contain a removable baffle with adjustable upper and lower exhaust slots for removal of lighter-than-air and heavier-than-air gases and fumes. No metal parts except stainless steel, shall be exposed to hood interior. The screws used to assemble the lining and baffle panels shall be stainless steel truss head screws, which are not to be counter sunk, to provide maximum strength to the screwed joints. Stainless steel collars for attachment of ductwork shall be furnished. A fluorescent light fixture, with bulbs included, shall be located in the front panel of the upper chamber and vapor-sealed from the hood interior. Access to light shall be through a removable exterior panel. Vertical sliding sash shall be suspended on woven stainless steel cables running over pulleys with "Oilite" bearings located in the sash posts and accurately counter-balanced by weight concealed in the sash posts. The sash shall be 1/4" thick combination safety glass sealed into a cold-rolled steel frame by an extruded vinyl channel around all edges, and held in place by a rigid vinyl extrusion which shall interlock with the outer member. Sash shall operate in stainless steel tracks formed integrally into a stainless steel facing attached to the sash posts. Exterior of hoods shall be fabricated of cold-rolled steel and finished as specified.

## 1.7 FINISHES

- A. Wood Finish: Cabinet surfaces shall be smoothly sanded, removing loose fiber, scratch marks and abrasions with all dust thoroughly removed with compressed air. Any metal parts shall be completely degreased.
- B. Application: Finishes are to be applied in a dust-free area under ideal atmospheric conditions, and cured after application in a modern humidified oven at 140 degrees F. and 30% relative humidity.
- C. Case and Cabinets (Exteriors): Case and cabinet exposed exterior surfaces, including interiors of glazed cases and open shelving, shall be finished in an acid, alkali, solvent, water and abrasion-resistant finish. Surfaces shall be stainless with a non-fiber lifting stain, except where wiping stain or toner must be used to secure desired color. The color coat shall be thoroughly dried. A wash coat of Poly-vinyl Butyral Resin shall then be applied, thoroughly dried, sanded and carefully dusted with tack rags. Mineral filler of proper color shall next be applied, carefully wiped across grain and thoroughly dried. Next a sealer coat shall be applied, thoroughly dried, sanded and carefully dusted with tack rags. Finally, a double pass coat of chemical resistant synthetic varnish shall be applied and thoroughly dried, providing a semi-gloss finish.
- D. Case and Cabinets (Interiors): Interior surfaces and unexposed exteriors shall receive a double-pass coat of resinous wood sealer.
- E. Performance Tests: Chemical spot test shall be made by applying 10 drops (approximately 1/2 cc) of each reagent to the surface at 77 degrees F. - three degrees and covered with an upright Fisher number 2-892 wide mouth bottle, 2 oz. capacity, to regard evaporation. Spot tests of volatile solvents marked with an \* shall be tested as follows: A one inch diameter ball of cotton shall be saturated with the solvent and placed on the surface to be tested and covered with an inverted Fisher Number 2-892 wide mouth bottle, 2 oz. capacity, to regard

**NORTHEAST METROPOLITAN REGIONAL VOCATIONAL TECHNICAL HIGH SCHOOL**  
WAKEFIELD, MA

evaporation and keep the surface wet with solvent for duration of tests. All reagents shall remain on the surface for a period of one hour. At the end of the test, bottles are removed, excess solvents swabbed with cotton ball, and entire test surface rinsed thoroughly, dried carefully and examined. There shall be no effect other than slight discoloration, change of gloss, or temporary slight softening of the film.

Reagents Used

Hydrochloric Acid, 37%	Methyl Alcohol*
Sulfuric Acid, 70%	Ethyl Alcohol*
Nitric Acid, 30%	Ethyl Acetate*
Acetic Acid, Glacial	Acetone*
Phosphoric Acid, 75%	Methyl Ethyl Ketone*
Ammonium Hydroxide, 28%	Benzene*
Sodium Hydroxide, 10%	Toluene*
Gasoline*	Chloroform*
Naptha*	Carbon Tetrachloride*

Heat Resistance: Hot water (190 degrees-205 degrees) shall be allowed to trickle onto the surface, which shall be set at an angle of 45 degrees from horizontal for a period of 5 minutes. After cooling and wiping dry, the finish shall show no visible effect from the hot water.

Moisture Resistance: A cellulose sponge (2" x 3" x 1") shall be soaked with water and placed on the surface of the finish for a period of 100 hours. The sponge shall be maintained in a wet condition throughout duration of tests. At the end of the test, the surface shall be dried and upon examination, shall show no blushing or whitening of the finish.

Impact Resistance: A one pound steel ball (approximately 2" in diameter) shall be dropped for a distance of one foot onto the finished surface of a 1/4" thick plywood panel supported underneath by solid surface. There shall be no evidence of cracks or checks in the finish due to impact upon close examination.

- F. Metal Finish: After units have been completely welded together and before finishing, they shall be given a pre-paint treatment to provide excellent adhesion of the finish system to the metal and to aid in the prevention of corrosion. Physical and chemical cleaning of the metal shall be accomplished by washing with a hot alkaline cleaner followed by thorough rinsing. The clean metal shall then be treated with a complex metallic phosphate solution followed by a thorough water rinse and a chromic acid rinse to set the phosphate surface. The resulting uniform fine grained, crystalline phosphate surface shall provide excellent bond for the finish coats and provide increased protection against humidity and corrosion. Immediately following the complete five-step phosphate treatment, a corrosion-resistant synthetic resin primer shall be applied to all surfaces and baked at a high temperature. Primed units shall then be cooled, inspected, and sanded where necessary, prior to the application of the durable finish coat of the color selected. A specially formulated, high-bake, synthetic resin finish coat shall be applied over the primed surfaces and baked at the required high temperature schedule to produce optimum coating properties.
- G. Black Acid Resistant Finish: Black acid resistant finish for countertops A and B specified herein, shall be same or equal to the following:

The finish shall be applied in a minimum of three coats with sanding and baking between each coat; resulting in a smooth satin glass surface resistant in accordance with the following tests:

One cc puddle of each reagent covered with watchglass to be left on the surface up to 24 hours and then washed off with soap and water, then cleaned with naptha and wiped dry for inspection. Tops to show only slight loss of lustre and discoloration, but no change of

**NORTHEAST METROPOLITAN REGIONAL VOCATIONAL TECHNICAL HIGH SCHOOL**  
WAKEFIELD, MA

original stability and reagent resistance when subject to the foregoing tests by the following reagents:

ACIDS	ALKALIES
77% Sulphuric	28% Ammonium Hydroxide Flake
90% Formic	Caustic Soda
60% Chromic	Calcium Hypochlorite
37% Hydrochloric	Sat. Sodium Carbonate
98% Acetic	Sat. Zinc Chloride
83% Phosphoric	Sat. Sodium Chloride
48% Hydrofluoric	
33% Sulphuric	
SOLVENTS	
88% Phenol	Benzine
Acetone	Gasoline
Cresol	Kerosene
Ether	Toluene
Ethyl Acetate	Xylene
Ethyl Acetate	Mineral Oil
Butyl Alcohol	Chloroform
Ethyl Alcohol	Carbon Tetrachloride
Methyl Alcohol	Formaldehyde
Mon-Chlor Benzine	Dioxane
Trichlorethylene	Cotton Seed Oil

Nitric Acid 20% or 30% will show moderate color change and spotting, but shall not result in film failure.

Sodium Hydroxide 10%, 20%, or 40% saturated Sulfide and Furfural shall cause very slight color change, but no less of reagent resistance.

Thermal Shock Test: Finish shall be unaffected by thermal shocks of minus 15 degrees to 80 degrees F.

- H. All finish and color selections shall be made by the Architect from a full range of wood finishes; and high pressure plastic laminates manufactured by Formica, Nevamar, or Wilsonart. The Architect shall not be limited to the Fixed Casework and Equipment Subcontractor's standards.

**1.8 COMPONENT UNIT DESCRIPTION**

**1.9 ITEMS TO BE FURNISHED AND INSTALLED**

**A. SCIENCE CASEWORK**

<u>SC-01 SAFETY &amp; GOGGLE CABINETS</u>	<u>SIX (6) REQUIRED</u>
<u>SC-02 SAFETY &amp; GOGGLE CABINETS</u>	<u>SIX (6) REQUIRED</u>
<u>SC-03 FULL-HEIGHT ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>SC-04 FULL-HEIGHT, COUNTER &amp; SINK ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>

**NORTHEAST METROPOLITAN REGIONAL VOCATIONAL TECHNICAL HIGH SCHOOL**  
WAKEFIELD, MA

<u>SC-05 FULL-HEIGHT ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>SC-06 FOUR-STUDENT WORKTABLE</u>	<u>TWELVE (12) REQUIRED</u>
<u>SC-07 COUNTER, SINK &amp; WALL ASSEMBLY – “L” SHAPED</u>	<u>FOUR (4) REQUIRED</u>
<u>SC-08 FULL-HEIGHT, COUNTER &amp; SINK ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>SC-09 FULL-HEIGHT ASSEMBLY</u>	<u>FIVE (5) REQUIRED</u>
<u>SC-10 TWO-STUDENT TABLE</u>	<u>ONE-HUNDRED (100) REQUIRED</u>
<u>SC-11 MOBILE STUDENT TABLE</u>	<u>TWENTY (20) REQUIRED</u>
<u>SC-12 MOBILE DEMO TABLE</u>	<u>TEN (10) REQUIRED</u>
<u>SC-13 FULL-HEIGHT ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>SC-14 FULL-HEIGHT, COUNTER &amp; SINK ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>SC-15 FULL-HEIGHT ASSEMBLY</u>	<u>FIVE (5) REQUIRED</u>
<u>SC-16 COUNTER, SINK &amp; WALL ASSEMBLY – “L” SHAPED</u>	<u>FOUR (4) REQUIRED</u>
<u>SC-17 FULL-HEIGHT, COUNTER &amp; SINK ASSEMBLY</u>	<u>FIVE (5) REQUIRED</u>
<u>SC-18 FULL-HEIGHT, COUNTER, SINK &amp; WALL ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>SC-19 FULL-HEIGHT ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>SC-20 FULL-HEIGHT, COUNTER &amp; SINK ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>SC-21 FULL-HEIGHT, COUNTER &amp; SINK ASSEMBLY</u>	<u>FOUR (4) REQUIRED</u>
<u>SC-22 FULL-HEIGHT, COUNTER, SINK &amp; WALL ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>SC-22A FULL-HEIGHT ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>SC-23 FULL-HEIGHT, COUNTER, SINK &amp; WALL ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>SC-24 FULL-HEIGHT ASSEMBLY</u>	<u>THREE (3) REQUIRED</u>
<u>SC-25 FULL-HEIGHT, COUNTER, SINK &amp; WALL ASSEMBLY</u>	<u>TWO (2) REQUIRED</u>
<u>SC-26 FULL-HEIGHT ASSEMBLY</u>	<u>THREE (3) REQUIRED</u>
<u>SC-27 COUNTER, SINK &amp; WALL ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>SC-27A FULL-HEIGHT ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>SC-28 FULL-HEIGHT, COUNTER, SINK &amp; WALL ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>SC-29 FULL-HEIGHT, COUNTER, SINK &amp; WALL ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>

NORTHEAST METROPOLITAN REGIONAL VOCATIONAL TECHNICAL HIGH SCHOOL  
WAKEFIELD, MA

<u>SC-30 COUNTER, SINK &amp; WALL ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>SC-31 COUNTER, SINK &amp; WALL ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>SC-32 COUNTER, SINK &amp; WALL ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>SC-33 COUNTER, SINK &amp; WALL ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>SC-34 FULL-HEIGHT ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>SC-35 COUNTER &amp; SINK ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>SC-36 FULL-HEIGHT, COUNTER, SINK &amp; WALL ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>SC-37 REFRIGERATOR-FREEZER</u>	<u>FOUR (4) REQUIRED</u>

B. ARTS & CRAFTS CASEWORK

<u>AC-01 FULL-HEIGHT ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>AC-02 ELECTRIC KILN</u>	<u>ONE (1) REQUIRED</u>
<u>AC-03 FULL-HEIGHT, COUNTER, SINK &amp; WALL ASSEMBLY- "L" SHAPED</u>	<u>ONE (1) REQUIRED</u>
<u>AC-04 FULL-HEIGHT, COUNTER, SINK &amp; WALL ASSEMBLY- "L" SHAPED</u>	<u>ONE (1) REQUIRED</u>
<u>AC-05 FULL-HEIGHT ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>AC-06 ENLARGER COUNTER ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>AC-07 ENLARGER COUNTER ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>AC-08 DEVELOPING SINK ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>AC-09 FULL-HEIGHT, COUNTER, SINK &amp; WALL ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>AC-10 FOUR-STUDENT WORKTABLE</u>	<u>THIRTEEN (13) REQUIRED</u>
<u>AC-11 DEMO TABLE</u>	<u>TWO (2) REQUIRED</u>

C. MISCELLANEOUS CASEWORK

<u>MC-01 FULL-HEIGHT ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>MC-02 FULL-HEIGHT ASSEMBLY</u>	<u>TWENTY-ONE (21) REQUIRED</u>
<u>MC-03 FULL-HEIGHT ASSEMBLY</u>	<u>SIX (6) REQUIRED</u>
<u>MC-04 FULL-HEIGHT ASSEMBLY</u>	<u>SIX (6) REQUIRED</u>

**NORTHEAST METROPOLITAN REGIONAL VOCATIONAL TECHNICAL HIGH SCHOOL**  
WAKEFIELD, MA

<u>MC-05 FULL-HEIGHT ASSEMBLY</u>	<u>FOURTEEN (14) REQUIRED</u>
<u>MC-06 FULL-HEIGHT, COUNTER , SINK &amp; WALL ASSEMBLY</u>	<u>THREE (3) REQUIRED</u>
<u>MC-07 COUNTER &amp; WALL ASSEMBLY</u>	<u>THREE (3) REQUIRED</u>
<u>MC-08 COUNTER &amp; WALL ASSEMBLY</u>	<u>THREE (3) REQUIRED</u>
<u>MC-09 FULL-HEIGHT ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>MC-10 COUNTER &amp; WALL ASSEMBLY</u>	<u>THREE (3) REQUIRED</u>
<u>MC-11 COUNTER &amp; WALL ASSEMBLY</u>	<u>THREE (3) REQUIRED</u>
<u>MC-12 FULL-HEIGHT, COUNTER , SINK &amp; WALL ASSEMBLY</u>	<u>THREE (3) REQUIRED</u>
<u>MC-13 FULL-HEIGHT ASSEMBLY</u>	<u>THREE (3) REQUIRED</u>
<u>MC-14 COUNTER, SINK &amp; WALL ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>MC-15 COUNTER, SINK &amp; WALL ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>MC-16 COUNTER, SINK &amp; WALL ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>MC-17 COUNTER, SINK &amp; WALL ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>MC-18 FULL-HEIGHT, COUNTER , SINK &amp; WALL ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>MC-19 COUNTER &amp; SINK ASSEMBLY – “L” SHAPED</u>	<u>ONE (1) REQUIRED</u>
<u>MC-20 COUNTER &amp; SINK ASSEMBLY – “L” SHAPED</u>	<u>ONE (1) REQUIRED</u>
<u>MC-21 WASHER/DRYER ASSEMBLY</u>	<u>TWO (2) REQUIRED</u>
<u>MC-22 COUNTER, SINK &amp; WALL ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>MC-23 INSTRUMENT STORAGE ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>MC-24 INSTRUMENT STORAGE ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>MC-25 INSTRUMENT STORAGE ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>MC-26 COUNTER, SINK &amp; WALL ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>MC-27 COUNTER &amp; SINK ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>MC-28 COUNTER ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>MC-29 COUNTER ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>MC-29A FULL-HEIGHT ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>

**NORTHEAST METROPOLITAN REGIONAL VOCATIONAL TECHNICAL HIGH SCHOOL**  
WAKEFIELD, MA

<u>MC-30 COUNTER ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>MC-30A FULL-HEIGHT ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>MC-31 COUNTER, SINK &amp; WALL ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>MC-32 COUNTER, SINK &amp; WALL ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>MC-33 FULL-HEIGHT ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>MC-34 FULL-HEIGHT ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>MC-35 FULL-HEIGHT ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>MC-36 COUNTER &amp; SINK ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>MC-37 FULL-HEIGHT ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>MC-38 COUNTER &amp; SINK ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>MC-39 FULL-HEIGHT ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>MC-39A FULL-HEIGHT ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>MC-40 FULL-HEIGHT ASSEMBLY</u>	<u>SIX (6) REQUIRED</u>
<u>MC-41 FULL-HEIGHT ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>MC-42 OPEN SHELVING ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>MC-43 MAILBOX ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>
<u>MC-44 MAILBOX ASSEMBLY</u>	<u>ONE (1) REQUIRED</u>

**END OF SECTION**

\*\*\*

**SECTION 12 66 13  
TELESCOPING BLEACHERS**

**1.1 SUMMARY**

- A. Furnish telescoping bleachers listed in this Specification and/or shown on the Equipment Drawing. Include delivery to the building, unpacking, setting in place, leveling and attachment to structure, as required for complete installation.
- B. Remove all debris, dirt and rubbish accumulated as a result of this installation, and leave the premises clean and ready for use.
- C. Verify and confirm all building dimensions relative to equipment to be furnished and installed by taking actual field measurements at the job site prior to equipment fabrication.
- D. Become familiar with job conditions and building measurements to coordinate the planning, design, delivery and installation of equipment furnished under these specifications, with all other related trades and associated work during the term of this contract.
- E. This Telescoping Gym Bleachers Equipment Subcontractor shall supply an installation of equipment that is equal to or exceeding the quality and function described in this minimum requirement Specification and shown on the Drawing.
- F. To provide all interconnecting wiring from junction boxes, of bleacher components and pendant control shall be by the Telescoping Gym Bleachers Equipment Subcontractor.

**1.2 CONSTRUCTION AND MATERIALS**

- A. Wheels shall be of soft face non-marring rubber 4" diameter x 1" face. Three (3) wheels shall be located directly under each moving column with a fourth wheel (located forward of the column) to act in a stabilizing as well as load bearing capacity.
- B. Steel columns shall be formed "boxed" channels of high tensile steel fitted with appropriate steel braces to meet design conditions.
- C. Continuous "floating" interlock alignment shall be provided at the top and base of every moving column.
- D. Seat system shall consist of individual, 18" long x 10" wide, comfort curved seats, of high-density polyurethane modules, with cantilevered attachment to provide minimum 5-1/2" toe space, with internal reinforcement ribs, and no external ribs. Provide seats with matching end caps.
- E. Decking shall be fabricated from 5/8" (nominal) plywood, interior type with exterior glue, 5 ply, all plies Group I plugged crossband under face, produced in conformance with PS-1-74, as promulgated by the National Bureau of Standards of the U.S. Department of Commerce.
- F. Formed high tensile steel "Z" supports shall be provided for full perimeter, intermediate transverse stiffening and connection of decking.
- G. Cantilevered seat supports shall be taper formed high tensile steel to provide optimum foot room beneath the seats.
- H. Decking and "Z" supports shall form a rigid "closed deck" structure providing positive containment for personal articles such as clothing, rubbers, eyeglasses, radios, purses, etc. Deck structure shall be designed to the maximum of personal privacy and safety,



**NORTHEAST METROPOLITAN REGIONAL VOCATIONAL TECHNICAL HIGH SCHOOL  
WAKEFIELD, MA**

leaving no opening that could pass a major human extremity either accidentally or deliberately.

**I. Finish**

1. Steel: Understructure shall be abraded, cleaned, and finished with best quality (Fed. Spec. #TT-E-508) "Sable Brown" low gloss enamel. Steel riders shall be finished with a highly corrosion resistant "Silver Gray" matte finish zinc alloy plating.
2. Lumber: All lumber to have exposed edges, end and corners eased or rounded with all "use" surfaces triple sanded to a smooth finish. All surfaces shall receive a moisture repellent sealer coat with all "use" surfaces to receive two (2) coats of "American Natural" clear polyurethane finish.
3. Decking/Paneling: Shall be sanded smooth. "Use" surfaces shall receive two (2) coats of "Strawflower Yellow" polyurethane stipple finish.
4. Aluminum: All corners and edges to be rounded and smoothed and receive an 0.7 mil thick anodic, clear, hard coating.

**J. Components**

1. Integral Power Operation: Furnish and install "Pow-R-Trac" an integral automatic electro-mechanical propulsion system, to open and close telescopic seating. Operating shall assure full visual control of the seating bank. Operation shall be by removable pendant control unit which plugs into seating bank. Each "Pow-R-Trac" unit shall be a continuous trackage bearing thirteen (13) 8" x 1-1/2" pure molded gum rubber pads fastened to dual, sprocket driven, roller chains. Gear driven motors shall provide an average operating speed of 30 R.P.M. Motors shall be adjustable for floor variations. Motors shall be installed under the first moving row. Seating manufacturer will provide all wiring within the seating bank including pendant control.
2. End Panels: End panels shall be full height contoured "stack" closure panel constructed of 1/2" high density "Parcore" with one inch thick built-up edges.
3. Aisle Rails: Rails shall be steel demountable type, 42"H, with tubular supports.
4. Scorer's Table: Shall be 8'-0"L x 15"W and consist of birch grain high pressure plastic laminate surface on a 5/8" balanced veneer core with cushion edge moulding. Provide table with perimeter steel frame with tubular steel legs permanently attached to top with screws. Mounting sockets provided shall be attached to bleacher.

**2.2 ITEMS TO BE FURNISHED AND INSTALLED**

<u>GB-01 GYMNASIUM BLEACHERS-FOLDING</u>	<u>ONE (1) REQUIRED</u>
<u>GB-02 GYMNASIUM BLEACHERS-FOLDING</u>	<u>ONE (1) REQUIRED</u>
<u>GB-03 GYMNASIUM BLEACHERS-FOLDING</u>	<u>ONE (1) REQUIRED</u>
<u>GB-04 GYMNASIUM BLEACHERS-FOLDING</u>	<u>ONE (1) REQUIRED</u>
<u>TB-01 TELESCOPING SEATING</u>	<u>THREE (3) REQUIRED</u>

**END OF SECTION**

\*\*\*

**SECTION 12 71 00  
TELESCOPING GYM BLEACHERS**

**1.1 SUMMARY**

- A. Furnish telescoping bleachers listed in this Specification and/or shown on the Equipment Drawing. Include delivery to the building, unpacking, setting in place, leveling and attachment to structure, as required for complete installation.
- B. Remove all debris, dirt and rubbish accumulated as a result of this installation, and leave the premises clean and ready for use.
- C. Verify and confirm all building dimensions relative to equipment to be furnished and installed by taking actual field measurements at the job site prior to equipment fabrication.
- D. Become familiar with job conditions and building measurements to coordinate the planning, design, delivery and installation of equipment furnished under these specifications, with all other related trades and associated work during the term of this contract.
- E. This Telescoping Gym Bleachers Equipment Subcontractor shall supply an installation of equipment that is equal to or exceeding the quality and function described in this minimum requirement Specification and shown on the Drawing.
- F. To provide all interconnecting wiring from junction boxes, of bleacher components and pendant control shall be by the Telescoping Gym Bleachers Equipment Subcontractor.

**1.2 CONSTRUCTION AND MATERIALS**

- A. Wheels shall be of soft face non-marring rubber 4" diameter x 1" face. Three (3) wheels shall be located directly under each moving column with a fourth wheel (located forward of the column) to act in a stabilizing as well as load bearing capacity.
- B. Steel columns shall be formed "boxed" channels of high tensile steel fitted with appropriate steel braces to meet design conditions.
- C. Continuous "floating" interlock alignment shall be provided at the top and base of every moving column.
- D. Seat system shall consist of individual, 18" long x 10" wide, comfort curved seats, of high-density polyurethane modules, with cantilevered attachment to provide minimum 5-1/2" toe space, with internal reinforcement ribs, and no external ribs. Provide seats with matching end caps.
- E. Decking shall be fabricated from 5/8" (nominal) plywood, interior type with exterior glue, 5 ply, all plies Group I plugged crossband under face, produced in conformance with PS-1-74, as promulgated by the National Bureau of Standards of the U.S. Department of Commerce.
- F. Formed high tensile steel "Z" supports shall be provided for full perimeter, intermediate transverse stiffening and connection of decking.
- G. Cantilevered seat supports shall be taper formed high tensile steel to provide optimum foot room beneath the seats.
- H. Decking and "Z" supports shall form a rigid "closed deck" structure providing positive containment for personal articles such as clothing, rubbers, eyeglasses, radios, purses, etc. Deck structure shall be designed to the maximum of personal privacy and safety,

**NORTHEAST METROPOLITAN REGIONAL VOCATIONAL TECHNICAL HIGH SCHOOL**  
**WAKEFIELD, MA**

leaving no opening that could pass a major human extremity either accidentally or deliberately.

**I. Finish**

1. Steel: Understructure shall be abraded, cleaned, and finished with best quality (Fed. Spec. #TT-E-508) "Sable Brown" low gloss enamel. Steel riders shall be finished with a highly corrosion resistant "Silver Gray" matte finish zinc alloy plating.
2. Lumber: All lumber to have exposed edges, end and corners eased or rounded with all "use" surfaces triple sanded to a smooth finish. All surfaces shall receive a moisture repellent sealer coat with all "use" surfaces to receive two (2) coats of "American Natural" clear polyurethane finish.
3. Decking/Paneling: Shall be sanded smooth. "Use" surfaces shall receive two (2) coats of "Strawflower Yellow" polyurethane stipple finish.
4. Aluminum: All corners and edges to be rounded and smoothed and receive an 0.7 mil thick anodic, clear, hard coating.

**J. Components**

1. Integral Power Operation: Furnish and install "Pow-R-Trac" an integral automatic electro-mechanical propulsion system, to open and close telescopic seating. Operating shall assure full visual control of the seating bank. Operation shall be by removable pendant control unit which plugs into seating bank. Each "Pow-R-Trac" unit shall be a continuous trackage bearing thirteen (13) 8" x 1-1/2" pure molded gum rubber pads fastened to dual, sprocket driven, roller chains. Gear driven motors shall provide an average operating speed of 30 R.P.M. Motors shall be adjustable for floor variations. Motors shall be installed under the first moving row. Seating manufacturer will provide all wiring within the seating bank including pendant control.
2. End Panels: End panels shall be full height contoured "stack" closure panel constructed of 1/2" high density "Parcore" with one inch thick built-up edges.
3. Aisle Rails: Rails shall be steel demountable type, 42"H, with tubular supports.
4. Scorer's Table: Shall be 8'-0"L x 15"W and consist of birch grain high pressure plastic laminate surface on a 5/8" balanced veneer core with cushion edge moulding. Provide table with perimeter steel frame with tubular steel legs permanently attached to top with screws. Mounting sockets provided shall be attached to bleacher.

**2.2 ITEMS TO BE FURNISHED AND INSTALLED**

<u>GB-01 GYMNASIUM BLEACHERS-FOLDING</u>	<u>ONE (1) REQUIRED</u>
<u>GB-02 GYMNASIUM BLEACHERS-FOLDING</u>	<u>ONE (1) REQUIRED</u>
<u>GB-03 GYMNASIUM BLEACHERS-FOLDING</u>	<u>ONE (1) REQUIRED</u>
<u>GB-04 GYMNASIUM BLEACHERS-FOLDING</u>	<u>ONE (1) REQUIRED</u>

**END OF SECTION**

\*\*\*