

SECTION 10 56 26

MOBILE STORAGE SHELVING, MOTORIZED

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Motorized mobile storage shelving units.
- B. Related Sections:
 - 1. Section 09 65 00 - Resilient Flooring: Resilient flooring on raised floors and ramps.
 - 2. Division 26 - Electrical: Power wiring to units from adequate power supply.

1.02 REFERENCE STANDARDS

- A. AISI - American Iron and Steel Institute.
- B. ASTM International:
 - 1. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens)
- C. CBC - California Building Code.
- D. UL - Underwriters Laboratory.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate mobile storage shelving with partition framing.
 - 2. Coordinate mobile storage shelving with floor covering work.
 - 3. Coordinate provision of electrical power to units.
- B. [Preinstallation Meeting:]
- C. [Sequencing:]
- D. [Scheduling:]

1.04 SYSTEM DESCRIPTION

- A. The system consists of storage units mounted on track-guided carriages to form a compact storage system. System design permits access to any single aisle by moving units until the desired aisle is opened. The carriage/rail system provides uniform carriage movement along the total length of travel, even with unbalanced loads.
- B. Carriage System Design and Features: The carriage system consists of a formed structural steel frame with hardened steel wheels riding on steel rails attached to the floor. Rails shall ensure smooth operation and self-centering of mobile storage units during travel without end play or binding. All bearings used in the drive mechanism shall be permanently shielded and lubricated.

1.05 PERFORMANCE REQUIREMENTS

- A. Design Requirements:
 - 1. Seismic Performance: Provide mobile storage units capable of withstanding the effects of earthquake movement when required by applicable building codes.
- B. The mobile system shall be UL Listed and in the United States and Canada (C-UL US).

1.06 [SUSTAINABLE CHARACTERISTICS]

- A. Section 01 35 63 - Sustainability Project Requirements: Requirements for sustainable design compliance.

- B. Materials and Resources Characteristics:

- 1. [Recycled Content Materials: Furnish materials with maximum available recycled content including:

SPEC NOTE *List materials specified in this section required to have recycled content.*

- a. [_____].

- 2. [Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles of Project site.]

SPEC NOTE *List materials specified in this section required to be regional materials.*

- a. [_____].

1.07 SUBMITTALS

- A. See Section 01 33 00 - Submittal Procedures, for submittal procedures.
- B. Product Data including installation instructions.
- C. Certifications: Submit the following certifications indicating that:
 - 1. Installer meets qualifications specified in this Section.
- D. Shop Drawings:
 - 1. Show dimensions, elevations, method of attachment, hardware, and requirements of related work.
 - 2. Show location of wiring and disconnects required for operating motorized carriage units.
- E. Samples: Manufacturer's color palette for selection; other Samples only as requested.

1.08 [SUSTAINABLE DESIGN SUBMITTALS]

- A. Section 01 35 63 - Sustainability Project Requirements: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
 - 1. Materials Resources Certificates:
 - a. Certify source and origin for [salvaged][and][reused] products.
 - b. Certify recycled material content for recycled content products.
 - c. Certify source for regional materials and distance from Project site.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
 - 1. Provide cost data for the following products:
 - a. Salvage products.
 - b. Reused products/
 - c. Products with recycled material content.

- d. Regional products.

1.09 QUALITY ASSURANCE

- A. Installer's Qualifications: Installer shall be experienced in and equipped to install and service mobile storage shelving for at least 10 years and shall be licensed or otherwise certified by the mobile storage shelving.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products in original containers with seals unbroken and labels intact until time of use.
- B. Store delivered products in clean, safe, dry area.

PART 2 PRODUCTS

2.01 MOBILE STORAGE SHELVING

- A. Description:
 - 1. Heavy-duty filing/storage system mounted on rails
 - 2. Storage shelving to be motorized
 - 3. Shelving Widths: As indicated on Drawings.
 - 4. Shelving Units: 24 inches deep (12 inches back to back).
 - 5. Shelving Height: 84 inches, unless otherwise indicated on Drawings.
 - 6. Number of Vertical Shelf Spaces: As indicated on Drawings.
 - 7. Vertical Shelf-To-Shelf Spacing: As indicated on Drawings.
- B. Product: Spacesaver Corp.'s "Eclipse Powered Mobile Storage System"; or equal.

2.02 COMPONENTS

- A. Rails.
 - 1. Material: AISI type 1035 or 1045 steel, manufacturer's selection.
 - 2. Capacity: 1,000 pounds per lineal foot of carriage
 - 3. Rail shall be one-piece, cold drawn structural "T" section steel extrusion 1-1/16 inch high with a 2-1/8 inch base flange, a 5/8 inch top surface and two anti-tip grooves. Rail shall disperse the wheel point load to a minimum 4-1/4 square inch area at the base of the rail. Two piece rail with square bar stock is not permitted
- B. Floor and Ramp:
 - 1. Floor Panels: Provide plywood floor panels to raise finished floor flush to top of track. Floor shall have integrated leveling screws maximum 16 inches on center.
 - 2. Ramp:
 - a. Provide a ramp at front of assembly.
 - b. Ramp to extend ramp the full length of assembly and does not extend beyond any face panel.
 - c. Ramp to be accessible by the physically disabled people meeting requirements of CBC. Metal ramps are not permitted.
 - 3. Floor and Ramp Panels: Minimum 3/4 inch, 7-ply AC grade plywood. Particleboard sheathing materials are not permitted.
 - 4. Floor and ramp materials are to be fire retardant treated meeting requirements of CBC. Non fire-retardant materials are not permitted
- C. Wheels:

1. Materials: AISI Type 1045 solid steel with minimum load capacity per wheel of 3200 pounds.
2. Size: Minimum 5 inches outside diameter drive and guide wheels.
3. Roller Guide: Provide four roller type guide bearings per wheel channel assembly, two at the end of each wheel channel. Guide bearings shall be precision machined; cam follower type of hardened steel, permanently lubricated and adjustable to ensure proper alignment of the carriages. Maximum profile of recess adjacent to rail for guide bearings and anti-tip system: 1-1/8 inch wide by 3/4 inch deep.

D. Carriages:

1. Provide manufacturer's design movable carriages fabricated of welded steel construction. Galvanized structural components and/or riveted carriages are unacceptable. 1,000 pound per foot minimum capacity.
2. Provide fixed carriages of same construction and height as the movable carriages, anchored to rails. Setting fixed shelving directly on floors is not permitted.
3. When required, provide bolted carriage splices designed to maintain proper unit alignment and weight load distribution.
4. Design carriages to allow the shelving uprights to recess and interlock into the carriages a minimum of 3/4 inch. Top mount carriages are unacceptable.
5. Provide each carriage with two wheels per rail.

E. Drive Systems:

1. Provide drive system which prevents carriage whipping, binding and excessive wheel/rail wear under normal operation.
2. All wheels on one side of carriage shall drive.
3. Shafts: Solid steel rod or tube.
4. Shaft Connections: Secured couplings.
5. Bearing Surfaces: Provide rotating load bearing members with ball or roller bearings. Provide shafts with pillow block or flanged self-aligning type bearings.
6. Dual synchronized drive wheels on both sides of designated wheel channel assembly(s), to be 5 inch diameter and connected with a number 40 roller chain to ensure even wheel movement.
7. Multiple Synchro System assemblies shall be interconnected with a continuous drive shaft for simultaneous wheel rotation and even, parallel carriage movement.
8. All wheels to be equipped with two permanently shielded bearing assemblies. Provide spacers on both sides of wheel bearings to eliminate friction between wheels and carriage.
9. Wheels being driven on only one side of each carriage and interconnected with a single continuous shaft (line shaft) is not a considered a dual synchronized drive system and will not be permitted.

- F. Movement Controls: Movement .Controls: Provide a carriage control panel on the accessible (open) end of each moveable carriage, located 44 inches above the base, centered on the face panel. Minimum controls shall include directional control buttons, STOP/RESET push-button and a red reset light

SPEC NOTE *Determine whether to require sequential or block operation, revise following paragraph accordingly, suggest reviewing with manufacturer.*

1. System controls shall start motors on each movable carriage ["sequentially" to minimize power demands]~~--or--~~["block" to start all at once] and shall provide dynamic braking to provide smooth operation. No additional hardware shall be required to change between "sequential" and "block" movement. Maximum running speed shall be limited to 3.3 inches per second.
2. Provide solid state controls and indicator lights for a visual indication of safety system operation. Provide each aisle with a programmable distance sensor to ensure proper timing for start/stop operation.

SPEC NOTE *Determine whether to require manual or automatic reset, revise following paragraph accordingly, suggest reviewing with manufacturer.*

3. Pushing the directional control button on any moveable carriage adjacent to the desired aisle location in the direction away from the desired aisle location opens the system at the desired aisle. The selected aisle shall open automatically regardless of the position of the carriages. [Manual Reset: The carriage control head will display a flashing red reset light at the newly opened aisle indicating that the aisle is locked open and requires resetting before another aisle can be opened. Provide for automatic lockout and manual reset of controls if selected aisle is not moved within a preset period of time]--or--[Automatic Reset: The carriage control heads will display a constant green light at all carriages indicating that the system is ready for the next aisle access. Provide for automatic reset if system is equipped with optional Zero Force Sensor (ZFS) system safety feature, or other redundant safeties.]

G. Safety Features:

1. Visual indicators shall provide verification that carriages are in the locked or unlocked mode.
2. One safety sweep shall be provided in each aisle. A full-length infrared photoelectric safety sweep shall be provided to stop carriage movement if the sweep contacts an obstruction while in motion. Sweep must be equipped with OSHA approved safety demarcation tape.

SPEC NOTE *Determine whether to use Zero Force Sensor System or Aisle Entry System, suggest reviewing with manufacturer.*

3. Zero Force Sensor System:
 - a. All aisles shall be protected with a microprocessor controlled infrared photoelectric sensor system consisting of the following components:
 - 1) Cross-aisle sensors shall be located on the face of the carriage profile on 6 inches centers along the first 30 inches entry/exit zone of each carriage and the last 30 inches of each carriage in a dual entry system at every potential moveable aisle. The remaining cross-aisle sensors between the entry/exit zone shall be located at the face on the carriage profile typically on 12 inches centers.
 - 2) Two direction sensing quadratures shall be located at each potential aisle entrance location, near the top of the carriage profile
 - 3) An infrared photoelectric safety sweep shall be mounted on the carriage 3/4 inch above the floor and scan the entire length of the aisle.
 - 4) All components shall be completely solid state for maximum reliability.
 - b. The microprocessor shall have a computer logic tracking system which combines the infrared photoelectric detectors providing the following operation modes:
 - 1) System shall be passively activated so that when a person, wheelchair, cart, etc. is present in the open aisle, the aisle automatically locks in its full open position. All face panel controls will display a red LED.
 - 2) When personnel, wheelchairs, carts, etc. have exited the aisle, the system automatically resets and the red LED indicator will change to green.
 - 3) Should a person enter an opening aisle, carriage movement for that aisle will continue until the aisle is fully open. The safeties will remain activated until the aisle is clear.
 - 4) Should the aisle be closing when someone enters it, the carriage movement at that aisle stops immediately. All other carriages will come to a controlled, ramped stop. The LED indicator on the carriage adjacent to the closing aisle will flash red one time per second, while the LED indicators on all other carriages, remain steady red. The aisle must be cleared and the reset button must be depressed on the control head with the flashing LED.

SPEC NOTE *Select option a or b below, suggest reviewing with manufacturer.*

- 5) Should an aisle lock open with no person or object in the aisle, the system may be reset only by:

- a) Pressing the “RESET” button on the managerial key remote control unit.
- b) Pressing the “RESET” button at the affected aisle.
- 6) The infrared photoelectric safety detection system shall operate on all the carriages moving in the direction of the closing aisle. When a beam is interrupted during a closing carriage/aisle movement, the system shall come to a full stop. The LED indicator on the carriage adjacent to the closing aisle will flash red one time per second, while the LED indicators on all other carriages remain steady red. This safety activation shall be based on presence rather than weight. There shall be no mechanical switches, hinges, or base plates present in the aisle. To reset the system, push the reset button at the affected aisle.
 - a) If all photo beams are clear and functioning properly, the system shall reset and the LED indicator will turn steady green.
 - b) If a photo beam is obstructed, i.e., a box is in its path, the only command the system will accept is to move the carriage away from the obstructed aisle.
- 7) System shall be fully passive and fail-safe in design. Should a component of the safety system fail, carriage movement will be safely locked out.

SPEC NOTE *Determine whether to use Zero Force Sensor System or Aisle Entry Sensor System, suggest reviewing with manufacturer.*

4. Aisle Entry Sensor system:
 - a. Each potential aisle shall have an infrared photo beam mounted 20 inches from the base of the face panel which transmits across the open aisle. If the beam is blocked or interrupted when an aisle is closing, the system shall stop carriage movement.
 - b. Should a user enter an opening aisle, carriage movement for that aisle will continue until the aisle is fully opened.
 - c. The safety then activates, preventing further carriage movement until the open aisle is reset. Should a user enter an aisle that has been reset, the system shall activate, preventing carriage movement.
 - d. Should the aisle be closing when someone enters it, the carriage movement at that aisle stops immediately.
 - e. All other carriages will come to a controlled, ramped stop.
 - f. The LED indicator on the carriage adjacent to the closing aisle will flash red one time per second, while the LED indicators on all other carriages remain steady red.
 - g. The aisle must be cleared and the “RESET” button must be depressed on the control head with the flashing red LED indicator. The aisle entry sensor system shall be wired in a failsafe configuration and be totally solid state construction.

H. Shelving:

1. Design: Four post wedge-locking design consisting of three basic parts; uprights, shelves, and shelf supports, which are assembled without fasteners or clips of any kind and without sway braces or gussets. There shall be no holes on any exposed surfaces. Front and back flanges shall be flush with outside faces of posts. Design shall permit individual shelf adjustment and/or removal anywhere along the entire height of uprights.
2. Load Carrying Capabilities: Provide shelf units capable of supporting 40 pounds per lineal foot with maximum deflection of L/140. Shelves shall exhibit no permanent deflection under fully loaded conditions.
3. Materials: Fabricate units from Class 1, cold-rolled steel sheet. with all bends sharp and true and no exposed “knife” edges.
4. Uprights: Formed from steel sheet to a hollow “tee” shape for intermediate supports and formed angles for end supports. Uprights shall have keyhole slots on inner wall only. Provide with sheet steel panels full height and depth of end uprights. Provide intermediate “tee” uprights between adjacent units. Open upright are unacceptable.
5. Shelves:

- a. Form from sheet steel with flanges on all sides and return hem on front and back flanges. Ends shall be formed to clear inside of upright offset panels. Shelves shall be independently adjustable. Provide all shelves with slots for file dividers.
- b. Vertical Adjustment Increment of Shelves: 1-1/2 inches along entire height of upright posts.
6. Canopy Tops: Same construction as shelf units.
7. Shelf Supports: Form from heavy gauge steel sheet with four solid steel shoulder rivets, two per ear, that interlock with inner wall of uprights.
8. [Accessories: Provide [] file dividers per shelf.]
9. Workmanship:
 - a. Make all bends sharp and true and no exposed “knife” edges.
 - b. All units shall be free of burrs, sharp edges and projecting hardware with smooth, non-abrasive surfaces and edges.
 - c. After fabrication, shelving shall exhibit no dents, “oil canning”, buckling or other surface irregularities.
- I. Face Panels:
 1. Covered with a high-pressure laminate in a color to match the shelving. Finished with a rubber molding on the edges to resist damage.
 2. Installed to cover the full height and width of the front of the carriage and/or platform.
 3. Installed on the exposed face of every carriage and platform.
 4. Securely attached to the shelving and carriage.
 5. Supported by the carriage, not the shelving.
 6. Equipped with two 3 by 5 inch cardholders, one per side, for identifying shelf contents.

SPEC NOTE *Determine which of the following accessories are required, suggest reviewing with manufacturer.*

2.03 ACCESSORIES

SPEC NOTE *Use following accessory in lieu of standard or touchpad controls.*

- A. [Infrared Capable Controls and Infrared Remote Controls: Provide infrared capable control panel at end of each motorized carriage and [one]--or--[two] [additional] handheld infrared remote control user key(s).]

SPEC NOTE *Use following accessory is used in lieu of standard or infrared capable controls.*

- B. [Individual Touchpad Aisle Access Controls: Provide a 10 digit push button keypad at each secured carriage. 4 digit PIN access code can be programmed and reprogrammed by the user, as needs dictate.]
- C. [Dual Controls: Provide additional control panel at end of each motorized carriage.]
- D. [Programmable Aisle: Provide the ability to create more than one aisle per mobile storage module.]

SPEC NOTE *Automatic Battery Backup includes the Plug-In-The-Wall Power option.*

- E. [Automatic Battery Backup: Provide an integrated uninterruptible power supply for emergency operations in case of primary power failure.]
- F. [Power Pack Override: Provide [one]--or--[two] handheld rechargeable battery pack units to operate modules in case of main power failure.]

- G. [Automatic Aisle Lighting: Provide top-mounted fluorescent light fixtures.]
- H. [Stationary Aisle Lock: Provide key switch to make a movable carriage into a stationary carriage.]
- I. [Automatic Brake: Provide an automatic security brake on each motorized carriage.]
- J. [Auto Move Interface: Provide the capability for the motorized mobile storage shelving system to move automatically depending upon University's requirements. Select [System Auto Cycle]~~--or--~~[System Priority Aisle]~~--or--~~[System Closed Park]~~--or--~~[System Ventilation Park].
- K. [Building Management Interface: Provide the capability for the motorized mobile storage shelving system to interface with the building's fire alarm system or building management

2.04 RELATED MATERIALS

- A. Grout: Provide non-shrinking, non-staining hydraulic cement compound conforming following requirements, based on the performance of the test specimens at room temperature and in laboratory air, as stated by the grout manufacturer.
 - 1. Linear Movement: No shrinkage while setting; maximum expansion limited to .002 inches per linear inch.
 - 2. Compressive Strength: Based on ASTM C109/C109M, meet or exceed the following
 - a. Age: 1 hour ---- 4,500 psi.
 - 7 days ---- 8,000 psi.

2.05 FINISHES

- A. Fabricated Metal Components and Assemblies: Manufacturer's standard powder coat paint finish.
- B. End Panels: Plastic laminate, manufacturer's standard available textures and patterns.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine receiving areas and verify that:
 - 1. Locations and dimensions are correct.
 - 2. Floor surfaces are in compliance with requirements for installation tolerances and other conditions affecting performance of mobile storage units.
 - 3. Building structural system is adequate for installing mobile storage units at locations indicated on reviewed Shop Drawings
 - 4. Conditions are otherwise satisfactory for proper installation.
 - 5. Electrical service is adequate and properly located.
- B. Do not start work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install motorized storage shelving In accordance with manufacturer's instructions.
- B. Installation of steel rail shall be level to plus or minus 1 millimeter both horizontally and vertically.

- C. Once rails are leveled, install grout completely filling any voids under the entire length of all rails including rail connectors. Shims are not permitted.
- D. Completed system to plumb and level.

3.03 ADJUSTING

- A. After installation, adjust motorized storage shelving as required for proper operation.

3.04 CLEANING

- A. Thoroughly clean surfaces in accordance with Section 01 74 00 - Cleaning.

3.05 PROTECTION

- A. Protect work from damage to surface, profile, and shape.
- B. Replace any defective or damaged items not acceptable to University's Representative.

3.06 DEMONSTRATION

- A. Demonstrate operations and required maintenance procedures to University's designated personnel in accordance with Section 01 79 00 - Demonstration and Training.

END OF SECTION