SECTION 10 56 26.23 - MOTORIZED MOBILE STORAGE SHELVING

* ALL FIELDS IN [ ] MUST BE EDITED.

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Related Specifications Sections, apply to this Section.

1.2. SUMMARY

A. This section includes the following:

1. Electric carriage mounted high-density mobile storage units, support rails, fabrication and installation including leveling of support rails.

2. 4-Post shelving units, fabrication and installation on mobile carriage.

B. Related Work, Not Furnished:

1. Structural floor system capable of supporting live and dead loads required by prevailing building codes, including loads of storage units to be installed. Provide a maximum allowable sub floor deflection of [L/480] [L/360 with Automatic Brake] under specified mobile storage loads.

2. Finish floor covering and edging materials and installation on raised floors and ramps, or when on concrete with recessed rail installation.

3. Power wiring to units from adequate power supply. Final connections to units shall be provided by [installer] [electrician].

4. Fire suppression system is by others

C. Related Sections:

1. [Section 033000 – Concrete Work]

2. [Sections in Division 9 – Finishes, relating to finish floor and base materials.]

3. [Division 26 Specification Sections power wiring devices, conductors and circuit protection.]

D. Allowances:

E. Alternates

1.3. PERFORMANCE REQUIREMENTS

A. Due to the user’s preference and requirements for safety, performance, and flexibility, all following specification line items are mandatory.

B. Seismic Performance: Provide mobile carriages and shelving capable of withstanding the effects of earthquake motions as determined according to IBC 2006 and local building codes.

C. Design Requirements: All mobile carriage and shelving elevations as [per attached drawings] or [described in the specifications].

D. Color Samples: Provide sample for each exposed product and for each color required.

E. Selection Samples: For selection of colors and textures, submit manufacturer's color charts consisting of actual product samples, showing full range of colors and textures available. Vendors must provide a minimum of 12 color selections in powder coat paint finish.

F. Installer Qualifications: Engage an experienced installer who is the manufacturer's authorized and certified representative.

1. Minimum Qualifications: 1-year experience installing systems of similar size and complexity to specified project requirements

2. Manufacturer Certification: Required by manufacturer on manufacturer's letterhead required at time of bid. Certifications by sales representatives, dealers, or distributors are unacceptable. Qualification must include resume of certified installation supervisor.

3. Provide support within 24 hours for service call.

G. Warranty: Submit a written warranty, executed by contractor, installer and manufacturer, agreeing to repair or replace units that fail in materials or workmanship within the specified warranty period. This warranty shall be in addition to, not limitation of other rights the owner may have against the contractor under contract documents.

Lifetime Limited Warranty: For the lifetime of the shelving and mobile carriages ("structural frames"). For the purposes of this warranty, structural frames shall be deemed to exclude all moving parts, controls and guides that have immediate contact with any moving parts.

10-year Limited Warranty: For ten (10) years from the date written hereafter*, for all carriage drive motors. During the 10-year warranty period, all parts are included at no cost for 10 years. Labor installation is included at no cost during the first year of the 10-year warranty period.

5-year Limited Warranty: For five (5) years from the date written hereafter*, for all equipment, other than structural frames and motors. During the 5-year warranty period, all parts are included at no cost for 5 years. Labor installation is included at no cost during the first year of the 5-year warranty period.

*10-year limited warranty and 5-year limited warranty are applicable from the date of invoice. Warranty registration must be completed by the end-user at www.montel.com. As indicated on the registration form, registration constitutes the customer's written acceptance of installation.

H. Reference List: Provide a list of three (3) minimum installed mobile storage installations to be contacted or visited by owner, architect and contractor. Installation must be of similar size, scope of specified system. Visit is intended to inspect operation, quality of installation and verify the suitability of manufacturer's products and comparison with materials and products specified. Manufacturer is required to address all issues raised by owner, architect and contractor. List must include contact names, phone numbers or e-mails, size and quantity of shelving units.

I. LEED Data: Provide complete environmental data included recycled material content, VOC data, and other product related information. Describe all manufacturing processes or policies that contribute to environmental sustainability

J. Project Schedule: Provide a project achievement plan detailing all critical elements necessary to plan, manufacture, ship, and install shelving product. Include critical project milestones and risk mitigation plan.

K. Manufacturer Qualifications:

1. ISO 9001:2008: Engage an experienced manufacturer who is ISO 9001:2008 certified for the design, production, installation and service of powered mobile systems. Submit manufacturer's ISO 9001:2008 quality system registration certificate.

2. ISO 14001:2004: Engage an experienced manufacturer who is ISO 14001:2004 certified. This international standard defines a process for monitoring and improving an organization's environmental performance. This process minimizes adverse impacts on the environment caused by the activities of the enterprise and helps to continually improve the environmental performance of the organization. Submit manufacturer's ISO 14001:2004 registration certificate, certifying the environmental performance of manufacturer.

3. Underwriters Laboratories Inc.: Entire powered mobile system shall be C-UL US listed certified. Manufacturer shall submit C-UL US certification with proposal.

1.4. SUBMITTALS

A. Product Data: Submit manufacturer’s product literature, schematics, testing data, and other items as described in this specification. Include data substantiating that products to be furnished comply completely with requirements of the contract documents and specifications. Include installed weight, load criteria, furnished specialties, and accessories.

B. Shop Drawings: Prepared and detailing fabrication, assembly, and installation of mobile carriages and storage shelving, as well as procedures and diagrams. Include details of layout and installation, as well as clearances, spacing, relation to adjacent construction in plan, elevation, and section, components, assemblies, connections, attachments, reinforcements, and anchorage. Furnish floor layouts, technical, and installation manuals for every unit shipment.

1.5. QUALITY ASSURANCE (Submittals due from all bidding contractors at time of bid, failure to do so shall be cause for disqualification.)

A. Manufacturer Certifications: Provide separate written certifications by manufacturer on manufacturer’s letterhead at time of bid required stating compliance with all specifications of shelving systems. Shelving certifications must confirm compliance with all shelf sizes and gauges as noted in these specifications. If bidding different manufacturers for mobile and shelving, two (2) certifications are required. Preference shall be given to one-source supplier.

1.6. PROJECT CONDITIONS

A. Field Measurements: Verify mobile carriages and shelving unit location by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating mobile carriage and shelving units without field measurements. Coordinate construction to ensure actual dimensions correspond to established dimensions.

B. Delivery, Storage, & Handling: Comply with instructions and recommendations of manufacturer for special delivery, storage and handling requirements.

C. Sequence & Scheduling: Sequence mobile carriage and storage shelving system installation with other work to minimize possibility of damage and soiling during remainder of construction period.

D. Pre-Installation Conference: Conduct conference at project site. Review methods and procedures related to installation of mobile carriage and storage units including, but not limited to, the following:

1. Inspect and discuss condition and levelness of flooring and other preparatory work performed under other contracts.

2. In addition to the Contractor and the installer, arrange for the attendance of the following:

a. Other Installers affected by the work of this section.

b. The Owner’s Representative.

c. The [Architect] [Architect/Engineer] [Engineer/Architect] [Engineer] [Designer].

d. Manufacturer’s representative.

PART 2 - PRODUCTS

2.1. MANUFACTURERS

A. General: Products are based on upon mobile shelving system products manufactured by Montel Inc. Contingent on meeting all specification requirements, other acceptable manufacturers may be included.

2.2. BASIC MATERIALS

A. Grout:

1. General: The compound shall be hydraulic type cement which, when mixed with water, will harden to produce a permanent bolt setting anchor. The compound shall conform to the following specifications, all of which are based on the performance of the test specimens at room temperature and in laboratory environment.

2. Linear Movement: It shall not shrink on setting, but shall exhibit a slight expansion of not more than .002 inch per linear inch.

3. Compression Strength: Two (2) inch cubes made in accordance with ASTM standards tested on a Balding-Southward machine of 60,000 pounds capacity shall have the following minimum average compression strengths:
Age: 1 hour - 4,500 PSI
7 days - 8,000 PSI

4. All tracks shall be grouted the entire length of each run, including all track joints. As the grout slightly expands during the cure process, it shall be in permanent contact with the grouted structural members. This provides a continuous support to the system, and optimal weight distribution on the existing floor slab.

2.3. MANUFACTURED COMPONENTS – MOBILE

A. Tracks:

1. Rails shall be designed and manufactured to carry loads of 1,000 pounds per linear foot (1385kg/m) of carriage. Made of minimum cold rolled steel (CRS) rail assembly of ¾" (19mm) high x 1" (25mm) wide inserted in a corrosion resistant aluminum sub-rail treated against oxidation caused by concrete. Rail contact surface shall be minimum 1" (25mm) wide. The inserted steel rail shall be replaceable. One-piece rails with no sub-rails or corrosion barrier are not permitted.

2. Sub-rails shall be leveled with self-leveling screws above or below the walking surface. Shims shall not be accepted.

3. Sub-rails shall be designed to be anchored on top of structural concrete floor and to allow for adjustment so sub-rails can be leveled over an uneven floor.

4. In the sub-rail, the opening adjacent to rail which accommodate manufacturer’s carriages guidance system and/or anti-tip system shall not exceed 7/16" (11mm) wide x ¾" (19mm) deep.

5. All rail connections shall have interlock steel rail connectors. All sub-rail connections shall

have interlock steel sub-rail connectors. All track connections shall be designed to provide horizontal and vertical continuity between rail/sub-rail sections, to gradually transfer the concentrated wheel point load to and from adjoining sections. To insure vertical and horizontal stability, tongue-and-groove connections are not permitted.

6. Tracks shall be layered and staggered to ensure a smooth weight transfer from one track to the other. Top-to-bottom track shall be without joints to support continuously the top steel rail at the junction point and provide greater structural rigidity. One-piece rails with tongue-and-groove joints and connections are not permitted.

7. Rail shall be located and positioned properly, leveled and grouted, allowing at least ¼" (6mm) for grout under high point. Anti-slip grooves under sub-rail shall prevent track to slip when grout is poured. Grout shall infiltrate inside the grooves to anchor the sub-rail to the cement. Grout to be worked under rail, any voids completely filled and trimmed upsides and flush with rails. This allows proper weight distribution from rail to existing slab.

8. Levelness of rails: 3/32" (2mm) maximum variation from true level within any system; 1/16" (1.5mm) maximum variation between adjacent rails, perpendicular to rail direction; 1/32" (0.76mm) maximum variation in 10’ 0" (3.05m) of rail length, along any rail.

9. Rails to be verified for integrity of position and levelness, as well as anchored into structural concrete slab, using anchors in sizes and quantities as determined by manufacturer.

10. Sub-rail section shall be a minimum of 12’ foot (3.66m) each and rail section shall be provided in shorter section of 10’ foot (3.07m). Shorter sections are used to complete each individual rail assembly

11. [(Optional) Built-in anti-tip device sub-rail shall be provided to meet local building code and high height-to-width ratio.]

B. Floor/Ramp (Choose 1 or 2):

1. [Surface Mounted Floor / Ramp]:

a. Finished elevation of the raised floor shall be flush with the top of the rails.

b. The ramp shall not extend beyond the end of the carriages and shall have a maximum slope of nine (9) degrees. The vertical transition from the ramp edge to the floor shall be a maximum of 1/8". Ramps shall extend under all movable and stationary ranges except as noted differently. Ramps shall be made of 12-gauge steel.

c. Floor panels shall be constructed of a minimum [5/8" (16mm)] or [¾" (19mm)] thick, underlayment grade plywood. Floor panels must be provided between all rails the full-width of systems, except under stationary platforms.

d. Floor panels shall be provided with built-in floor anchor to provide a continuous leveled floor surface.

e. The floor and ramp shall be constructed in a manner preventing any warping or deformation of the floor panels in a normal operating environment.

f. Floor covering is to be installed and supplied by [the Owner] [others].

2. [Recessed]:

a. Finished elevation of the raised floor shall be flush with the top of the rails.

b. Track shall be protected with steel covers during the pouring process.

c. Concrete topping shall be poured in order to fill the gap between existing slab and top of the track (NIC).

C. Carriages:

1. All carriages shall be riveted-bonding construction for flexibility and potential reconfiguration. Welded carriages or carriages with formed lips are unacceptable. Carriages and stationary platforms shall be constructed of a full “C” shape profiles 1 ½" (38mm) deep x 5" (127mm) high, minimum 12-gauge steel, with 1,000 pounds (1385kg/m) per linear foot maximum capacity. Wheel support sections shall be minimum 12-gauge steel and shall be riveted between the main support face sections, one per aisle assembly. Support sections shall be embossed to eliminate the need of filler plates between the shelving/cabinet and the C shape supports.

2. Stationary carriages, as shown on the drawings, shall be of same construction and height as the mobile carriages and anchored to rails. Setting of shelving on floor at ends of mobile runs is unacceptable.

3. Necessary carriage splices shall be bolted type designed to maintain proper unit alignment and weight load distribution.

4. Carriage face sections shall provide a smooth, clean appearance without any assembly holes or protruding hardware.

5. Carriage straightness shall have no more than ¼" (6.35mm) maximum deviation from a true straight line. There shall be no permanent set or slippage in any spliced or welded joint when exposed to forces encountered in normal operating circumstances.

6. Carriage construction shall be designed to allow the shelving uprights to be secured to the carriage frame with two assembly kits per upright of vibration-proof graded 5" bolt, nut, and clamp anchor assemblies and so that there is no visible hardware on carriage face. Recess design carriages are not permitted. Self-drilling screw attachment is not acceptable method of attachment shelving units to the carriage. No shelving or cabinet attachment hardware shall be visible on exterior face of carriages

7. Each carriage shall have two wheels per rail.

8. Carriages shall have powder coat (1.5 mil) finish on all surfaces. Color selection by the [Owner] [Architect] [Architect/Engineer] [Engineer/Architect] [Engineer] [Designer] to match shelving. Powder coat paint finish is required for finish durability and elimination of any off gassing. Finish shall be inert, with no volatiles present in finished product. Visible galvanized steel structural carriage components are unacceptable.

D. Drive/Guide System:

1. Direct-Drive System: Provide with full-length drive shaft which prevents carriage whipping, binding and excessive wheel and rail wear under normal operation. All wheels shall be direct-driven at every rail location on one side of carriage. Synchronized drive with multiple chains, trolleys, and drive shafts are not acceptable.

2. Torque-Resistant Tubular Drive Shaft: Minimum of 1 5/16" (33mm) outside diameter by maximum 1 1/8" (29mm) inside diameter. Solid steel rod is not acceptable.

3. Dual-Flange Wheels: Provide positive guidance and tracking. Guidance requiring cam followers and ball bearings running on either side of the rail is unacceptable.

4. Narrow Guidance Channels: Provide a maximum 3/8" (9.5mm) between sub-rail and rail sections to reduce tripping hazards, allow carts to easily roll over, prevent debris

accumulation, and facilitate cleaning.

5. Module shall operate on 115 Volts 50/60 Hertz, 15 or 30 Amp dedicated circuit, depending on the quantity of carriages.

6. Obstruction-Free Aisle: Provide ground embedded wire track including the following:

   a. Electrical system shall include two conduits made of 6063-T5 aluminum extrusions integrated in the sub-floor underneath the carriages. Conduits shall be located next to a rail and run the full-length of the module. Extrusions shall be leveled and interconnected to the aluminum sub-rail by means of anchor bolts to ensure proper integrity. Overhead scissor arm pantographs are not permitted.

   b. All the wiring carrying the 12V communication cables and the 120V power cables between the carriages shall run into the aluminum conduits.

   c. Communication cables shall be RJ45 retractable type and shall run in the ¾" (19mm) diameter circular aluminum conduit.

   d. Cables shall run through a protective pipe that shall be anchored to the structure of the moveable carriage.

   e. Flexible sealing strips shall close the openings to protect the wires during and after the carriage movement

E. Wheels:

1. Wheels shall be constructed of solid minimum 1045 cold rolled steel (CRS) for smooth operation. Minimum load capacity per wheel 3,200 pounds (1,452kg) Wheels shall be precision ground, balanced. All bearings shall be permanently shielded and lubricated

2. All wheels shall be minimum 5" (127mm) diameter (outside dimension). They shall be dual-flanged and sloped to insure efficient guidance. Load wheels shall have spherical surface to reduce friction and facilitate ease of use; drive wheels shall be flat. Single center flanged wheels are not acceptable.

3. Due to carriage length and shelving heights, guide wheels shall be at all wheel locations.

F. Motors:

1. Each carriage shall be equipped with a minimum of one (1) 90 VDC current limited, fractional horsepower gear motor.

2. Gear motor shall be connected to a full-length shaft at all rail locations to avoid potential distorsion.

G. Face Panels:

1. Materials: All exposed face panels shall be steel. Face panels shall be located on all operating ends of ranges as shown on drawings.

2. Finishes: [Selected from manufacturer’s standard available colors and patterns.] [(Optional) Selected by the [Architect] [Architect/Engineer] [Engineer] [Designer].

3. Face panels must cover the full height and width of shelving.

H. Control Boards:

1. Control boards shall offer capability to be upgraded with new generations of software.

2. TCP/IP protocol connectivity shall be provided with control boards

I. Movement Controls:

1. [Simple LCD Controls and a PIN-Code Module Access Control: Provide a Simple Control with LCD display on the accessible (open) end of each mobile carriage. Provide one 10-digit PIN-Code Keypad Control for each powered module.

   a. Simple Controls with LCD Display shall include two arrow shaped OPEN backlit buttons, and a STOP backlit button. Provide a 32-character display for module status and additional safety. Display shall be permanently backlit. The multilingual LCD display messages shall be available in at least 3 languages (English, Spanish, French).

   b. The PIN-code control shall have a 32-character permanently backlit LCD Display, and digits from 0 to 9. The 32-character display shall provide status of the module at any time. 4-digit PIN access code can be programmed and reprogrammed by the user. The multilingual LCD display messages shall be available in at least 3 languages (English, Spanish, French). The PIN-Code Control shall display date and time (available).

2. [PIN-Code Aisle Access Controls: Provide a 10-digit keypad control at each secured carriage.

   a. The PIN-code access control shall have a 32-character permanently backlit LCD Display, and digits from 0 to 9. The 32-character display shall provide status of the mobiles at any time. 4-digit PIN access code can be programmed and reprogrammed by the user. The multilingual LCD display messages shall be available in (English, Spanish, French). PIN-code aisle access controls shall display date and time (available).

   b. Simple Controls with LCD Display shall include two arrow shaped OPEN backlit buttons, and a STOP backlit button. Provide a 32-character display for mobile status and additional safety. Display shall be permanently backlit. The multilingual LCD display messages shall be available in at least 3 languages (English, Spanish, French). (Remote System Monitoring Software mandatory.)

   c. Simple Controls shall include two arrow shaped OPEN backlit buttons, and a STOP backlit button. (Remote System Monitoring Software mandatory.)

   d. The PIN-code aisle access controls shall have a 32-character permanently backlit LCD Display, and digits from 0 to 9. The 32-character display shall provide status of the module at any time. 4-digit PIN access code can be programmed and reprogrammed by the user. The multilingual LCD display messages shall be available in (English, Spanish, French). PIN-Code Module Access Control shall display date and time (available).

3. Each carriage shall have a control centered on the face panel and located at 41'' (1041mm) (from the base of the carriage to the base of the control).

4. All controls and indicator lights shall be solid state and shall provide visual indication of safety module operation. Controls shall offer illuminated feature on the stop and the arrow buttons for additional feedback to the user, and allow easy visual status from across the room. Only the safe and available operational functional shall be the illuminated functional options for the user. Controls shall feature a module error backlit indicator light in case of any abnormality.

5. The control’s housing shall be zinc and impact-resistant

6. Sealed membrane control technology to ensure maximum life duration of controls.

Mechanical push button controls or membrane activating mechanical push button controls are not acceptable. Membrane controls shall be sealed for water and dust penetration, as well as chemical-resistant.

7. Automatic Aisle Reset: Upon confirmation there are no users or objects in the aisle, the module shall reset automatically and the LED-friendly backlit arrows on the control panel shall display a constant blue indicating the available aisle. Systems requiring manual reset shall not be acceptable.

8. Infrared Distance Measuring Sensors: Provide each aisle with a distance sensor programmable with the PIN-code controls main menu [and] [(Optional) remote monitoring software]. Proximity sensors shall be provided to easily adjust aisle spacing between closed carriages and adjust individual carriages to provide necessary clearance to accommodate, and protect objects that are overhanging the shelves. Mechanical plungers are not acceptable, as well as manual adjustment of proximity sensors or the necessity of a computer connected to a control board to adjust aisle spacing

9. [(Optional) The control housing shall be available in [one] [two] other additional colors provided by the manufacturer.] (In lieu of standard black.)

10. [(Optional) Smartphone Wi-Fi Remote Control: Provide Smartphone mobile device to operate the powered system.] (Only specific Smartphone can be utilized.)

J. Safety Features:

1. LED Guard Technology (LGT) safety system covering the whole aisle surface shall be present in each aisle. Safety system shall be provided to prevent any carriage movement if the system detects users or objects anywhere in the open aisle. Safety system shall provide complete aisle-detection. Technology housing made of zinc shall be impact-resistant. Safety system shall be totally passive requiring no conscious effort to activate the safety system. Safety systems not covering the entire floor surface of an aisle are not acceptable. Active safety systems requiring conscious effort and/or a foot to stop moving carriages are unacceptable. Demarcation safety tape shall not be required/permitted on carriage face members to provide a clean and neat appearance.

2. Low Safety Activation Height: Safety system shall detect objects as small as 1½" (38mm) high located anywhere in the aisle. Safety device on the carriage side member shall not be mounted higher than 1½" (38mm).

3. Safety Lock Out: Red STOP indicator shall signal occupation on each side of the aisle and prevent selection of a new aisle until open aisle is cleared. LED-friendly visual directional arrows shall provide verification that carriages are in locked or unlocked mode, and display only the safe available choices for carriage movement. There shall be no Reset or Stop/Reset to override the safety system. Controls with a RESET or STOP/RESET button are unacceptable.

4. Multilingual Audio Feedback: Provide additional safety when pressing any button on the control and shall confirm a command has been received (i.e. “Ready to Use” or “Moving” or “Aisle in Use”). Sound volume shall be adjustable or off. Audio feedback shall be multilingual and available in [English] [Spanish] [French] [Specify Language]. Sound volume shall be adjustable or off.

5. Fail-Safe Technology: Safety system shall be fail-safe design and prevent any carriage movement should the system fail.

6. Electronic Overload Protection: Shall shut off power to the motor when excessive pressure is applied against a carriage. [(Optional) Pressure sensitivity shall be programmable and adjustable with [PIN-Code Control] [Remote Monitoring Software].

7. Aisle-Entry People Counter: Shall monitor users entering and exiting an aisle. Data shall

interface with remote monitoring and configuration software.

8. [(Optional) Automatic Lock/Relock Timer Active Safety: Shall be programmed for a predetermined period to automatically lock or relock the module if inactive for more than the determined period.]

9. [(Optional) Remote System Monitoring Software: Provide PC-based diagnostic system for monitoring and configuring all mobile system's safety, power, and functionality processes. Monitoring system shall automatically notify specified service personnel of abnormalities with system operation or safety systems.]

K. Security Features:

1. [(Optional) PIN-Code Control Controlled Access: HIPAA compliant PIN-code controlled access shall provide security for confidential documents or materials. Each carriage can be easily locked simply by using PIN-code control, not requiring the utilization of a computer. Different PIN codes can be allocated, allowing access to specific modules only. The PIN-code control shall have digits from 0 to 9. 4-digit PIN controlled access code can be programmed and reprogrammed by the user. PIN-code control shall feature a padlock backlit indicator light indicating locked aisle or locked module. LCD display shall indicate to "ENTER PIN".]

2. [(Optional) Magnetic Card Access Reader Capability: Users can operate the module with a card swipe access.]

3. [(Optional) Automatic Brake: Provide an automatic security brake on each powered carriage.]

4. [(Optional) Controlled Access Mechanical Lock: Provide a mechanical lock to make the whole module locked.]

5. [(Optional) Building Interface: Provide the powered mobile to interface with the building's fire alarm system, lighting system, power generator or building management system for security [Module Security Park] and fire protection [Module Fire Park].]

6. [(Optional) Environmental Monitoring Sensors: Provide [humidity and temperature] [water] sensors to monitor the environmental conditions at the location of the powered mobile module. The module shall move automatically depending on the preset ranges of temperature and/or humidity or when water is detected.] Select [Auto-Cycle] [Auto-Closing/Security Park] [Auto-Spacing/Ventilation Park] [Automatic Priority Aisle].]

L. Carriages Movement:

1. Each carriage shall provide controlled acceleration and deceleration to protect stored books or objects. Each motor shall have a dynamic braking system (with programmable stop distance) that will stop the carriage whenever a safety feature is activated.

2. Controls shall provide movement with a controlled running speed of 3" (76mm) per second. Speed parameters for gentle start-up, cruising speed, and braking movements shall be programmable with the [PIN-Code Control] [Remote Monitoring Software].

3. Module movement shall start carriages [sequentially to minimize power demands] [by block to move all carriages at once.] Capability to change easily from Sequential Movement to Block Movement with the [PIN-Code Control] [Remote Monitoring Software]. Module movement must not require any modification to the module configuration and without the use of an external device such as a computer.

4. Multi-Tasking Aisles: Carriages movement shall be initiated while other carriages are already moving and completing their move cycle.

5. [Automatic Carriage Reversal: System must be programmable to allow automatic carriage reversal upon safety activation when entering a closing aisle.]

6. [Automatic Priority Aisle: Module shall be programmed to automatically reposition the system to predetermined aisle(s). Module shall be programmed so the most frequently used aisle(s) is always opened by default after a predetermined period of inactivity.]

7. [Module Auto-Closing: Module shall be preprogrammed to close all ranges after a predetermined period of inactivity to protect stored material from sprinkler systems, light, dust, etc. This feature shall close the module at specific times or after work hours to prevent unauthorized access.]

8. [Module Auto-Spacing/Ventilation Park: Once activated, aisle spacing shall be evenly distributed for ventilation. The sequence shall be activated by an internal timer (preset time), a key switch located on the master panel, or a dry contact from the customer building interface.]

9. [Mobile-Static Carriage Interchangeability: Permits modifications to make one or multiple carriages into a stationary carriage and vice-versa. Provide to create additional aisles per module.]

10. [Keyless Override Mode: Carriage movement shall move one at a time with reduced speed using a 4-digit PIN code. Systems requiring a key to override the system are not acceptable permitted.]

M. Auxiliary Override:

1. Mechanical Ratchet Backup: Each carriage shall be equipped with a mechanical ratchet device connected directly to the full-length drive shaft to ensure complete accessibility in case of primary power failure, no operational downtime, simplified system installation, and easy relocation. Provide a mechanical ratchet tool to operate each carriage manually. Ratchet tool shall be easily connected to the mechanical ratchet device without removing the face panel. Removable plastic-molded cap shall be installed at each bottom right corner of each face panel.

2. [(Optional) Automatic Built-In Battery Backup: Powered mobile system shall be always operational even during power failures. Provide one battery backup per module. Battery must always be recharging. All preprogrammed functionalities, standard and optional safeties, and speed shall remain operational.] Handheld portable battery backup requiring the use to hold and move the carriages one by one is not acceptable.

N. Accessories:

1. [(Optional] Hinged Face Panel: Every electrical mobile carriages shall be equipped with an electrical panel with hinges in order to have access to electronic board from the front. The panel is made of 18 gage steel and requires a key to be opened.]

2. Hinged Face Panel : Every electrical mobile carriages shall be equipped with an electrical panel with hinges in order to have access to electronic board from the front. The panel is made of 18 gage steel and requires a key to be opened. This panel shall be mandatory with ground embedded wire track.

3. [(Optional) Dual Controls: Provide additional control panel at end of each powered carriage for accessing from either end of the aisles.]

4. [(Optional) Automatic Overhead Aisle Lighting: Each aisle shall be equipped with automatic lighting. Lighting system shall illuminate upon opening or entering a selected aisle, turn off when the aisle is exited, contributing to energy conservation (LEED).]

2.4. MANUFACTURED COMPONENTS – 4-POST SHELVING

A. Upright frames: Upright frames are made of two or more cross members welded to the top and bottom (and center if necessary) of the post and form a rectangular upright frame. Each post shall be made of 16-gauge 1 ¼" x 1 ½" rectangular shaped cold rolled steel. The lateral sides of the posts are slotted at every one inch increment. The slots are 3/16" wide x 5/8" long and are designed to accommodate a variety of shelf and roll-out drawer configurations. The back of the post is also slotted at every 1 ½" increment with two rows of slots side by side from top to bottom. They are 3/16" wide x 5/8" long with 3/8" between the two rows. The uprights must allow for component integration on either 1" or 1 ½" increment depending only on the selected shelf component. Due to aesthetic concerns, user's performance requirements, safety of users and stored materials, and to provide maximum flexibility, "L & T 4-Post" utility shelving system styles are unacceptable.

B. Cross members: Cross members are 4" high x ½" wide. They are made of 16-gauge steel folded to create a "U" shape channel. At both ends, hook type design allows to snap the cross members in both rows of slots at the same time. In seismic zones, the cross members are welded to the post. Non-welded frames must be available to minimize shipping volume, thus reducing truck pollution.

C. Levelers: Each post shall have an integrated leveler, inserted into formed upright tube, which allows for ¾" adjustment to accommodate for uneven floor surface. No temporary shims or other third party leveling device will be accepted.

D. Center back panel [optional on double face sections]: Center back panels are made of 20-gauge steel and constructed in such a way as to form and integral finished product.

E. Full-back panel [optional for single sections]: Full-back panels are made of 20-gauge steel box formed ½" thick and affixed to the post to form an integral finished product.

F. Supported type:

1. Full-depth shelves: Full-depth shelves are made of box rolled formed 22-gauge steel, with "Four Bend" ¾" edge construction which adds additional strength and capacity as well as it creates a hidden safety edge to protect people and items. The full-depth shelves are supported by two longitudinal shelf supports and the appropriate number reinforcement channels. Shelves are also available in 18-gauge steel as an option.

2. Longitudinal supports: [¾" high supports] or [1 ¼" high supports for heavy duty application] are made of one "U" shaped 12-gauge steel channel. A standard formed steel claw is welded at each end to form a complete support. These supports are inserted into the slots located at the back of the post.

3. Front-to-back reinforcement channels: [¾" high reinforcement channels] or [1 ¼" high reinforcement channels for heavy duty application] are made of 12-gauge steel formed in a "U" shaped channel and are sitting on the longitudinal shelf supports.

4. Base support: A 12-gauge steel special "U" shaped channel is provided for the bottom shelf. The support is inserted at the bottom of each post and anchored to the floor or to the carriage, in compliance with seismic standards.

G. Hooked type:

1. All shelves and canopy tops shall be constructed of minimum 18-gauge steel with "Four Bend" ¾" edge construction and clipped on the uprights with use of steel hooks. No raw steel edge shall be visible or felt under each shelf's surface. Welded reinforcement can be added to accept heavier loads. Shelves floating on support are unacceptable (1" thick shelf with 3 bends also available). No portion of shelf storage capacity can be obstructed or otherwise blocked by support posts. (Shelves shall be installed between uprights for maximum unimpeded usage.)

2. All shelving shall be back-to-back shelves and must be designed in a manner that will

allow removal of shelves, trays, and drawers without the use of tools or otherwise disruptive actions. Shelves must have the ability to be individually added, removed, or adjusted without disrupting or otherwise impacting adjacent shelves' placement. Canopy tops required on all sections.

3. To provide maximum flexibility, all shelves must be adjustable on 1" centers along the entire height of upright.

4. Maximum deflection under load; must maintain L/140 based on a uniform distributed load of 50 pounds per square foot.

H. Sway brace (required with back-to-back hooked type): 1 1/8" wide sway braces are made of two 16-gauge steel bars, assembled with a rivet. Sway braces are connected to the posts by means of mechanical rivet or dowel pins. Sway braces are positioned where needed on taller shelving sections to add lateral stability.

I. End panels: Shall be constructed of 20 gauge steel, 2" thick, they are bolted to bottom and top upright cross members.

J. Side closure panels (optional): Shall be constructed of 20-gauge steel, they are formed to be flush with the edge of the shelving upright and bolted to bottom and top upright cross members.

K. Plain back stops (single entry): Shall be 5 17/32" high formed of 20-gauge steel with a 3/8" bend on top and bottom and a 1 3/16" bend on each side.

L. Slotted back stops (single entry): Shall be 5 17/32" high formed of 20-gauge steel with a 3/8" bend on top and bottom and a 1 3/16" bend on each side. Slots are located on 1" increments for divider adjustment.

M. Plain center stops (double entry): Shall be 4 3/16" high formed of 20-gauge steel with offsets bends to center on upright frame.

N. Slotted center stops (double entry): Shall be 4 3/1" high formed of 20-gauge steel with two offset bends. Slots are located on 1" increments for divider adjustment.

O. File dividers: Shall be formed of 20-gauge steel with one lug at the top rear and two lugs on the bottom to engage slots in the shelf for easy adjustment on 1" horizontal centers. The front top corner of the divider is rounded with an approximate 2" radius.

P. Sliding reference shelf: Shall be 11" deep and made of 20-gauge steel reinforced on each side with steel angles to secure slides. Shall operate on double extension ball bearing slides equipped with rubber bumpers on each end of travel. The assembly is securely attached to underneath the storage shelf, flush with the front edge.

Q. Modular drawers: All drawers shall be easily relocated at 1" increments without using any tools. They are made of 18-gauge steel with 3 bends at the front and side top-lips. Each top-lip shall have perforations on the inside upper edge at every 1" increments to receive partitions. A front cover made of 18-gauge steel shall be bolted to each drawer and shall incorporate a 5" wide x 1 ¼" high flush mounted handle. The clear inside space have to be as a minimum overall : nominal dimensions less 1/8" in height, 2" in depth and 4" in width. The load capacity shall be 180 pounds per drawer. Drawers shall be available on 1" height increments from 4" to 12" high. The sliding ball bearing support shall provide a smooth pull-out extension up to a maximum of 28" of stroke for deeper drawers. The sliding ball bearing glide shall be mounted on a hook-support made of 16-gauge steel. An interlock system can be incorporated to a group of drawers and will prevent to open more than one drawer at a time. A locking device can be added to a group or individual drawers.

R. Modular Trays: All trays shall be easily relocated at 1" increments without using any tools. They are made of 18-gauge steel with 3 bends at the front and the side top-lips. Each side top-lip is designed to provide a smooth pull-out and push-in movement (using a nylon strip or a low friction

coating). This 3-bend lip shall be 15/16" wide with two additional 9/16" bends to act as a reinforcement channel and support the tray pan. The front and back of the tray will incorporate a 5" wide x 1" high opening with a round edge which will act as pull handles. The front and the back of the top-lips will be formed of two 3/8" bends to provide adequate rigidity and a smooth finish. The clear inside space shall be as a minimum overall: nominal dimensions less ¼" in height, ¾" in depth and 4" in width. The load capacity shall be 75 pounds per tray. Trays shall be available on 1” height increments from 2" to 8" high. A pair of guide supports will provide the adjustability for the trays. Each support shall consist of a “U” channel welded to a 16-gauge steel plate and shall be designed to prevent the tray from tipping when pulled out.

2.5. FINISH SPECIFICATIONS

A. Shall be the finest of their respective kinds and those best adapted to the construction for which they are employed to meet ISO 9001:2008 quality standards. All steel shall be superior quality mild, cold rolled, pickled, and double annealed, free from scale and buckle. All plating used on exposed parts shall be metallic furniture stock. All gauges are U.S. standard. The design of all parts shall be such that the completed installation shall present a neat and finished appearance and shall be free from exposed sharp edges or projections. All other special materials shall be as hereinafter specified.

B. All components shall be painted with an electrostatically applied powder coat finish. All steel parts shall be machined smooth and thoroughly cleaned by a process of completely washing in a phosphatizing solution to insure removal of oil, grease or other foreign material which in any way would interfere with the adhesion of the priming coat. Following the cleaning process, all parts shall be coated and confirming every part is thoroughly and completely covered with fine powder coat, and baked to the paint manufacturer’s recommendation. The finish for powder coat shall be medium gloss, giving a reading of 50 to 60 degrees on a standard gloss meter and must be capable of withstanding severe hammer and bending test without flaking. The finish for epoxy-polyester hybrid powder coat shall be a minimum 1.2 mil thickness capable of resisting methyl ethyl ketone, salt spray, abrasion and printing, and all normal usage resistant requirements of a good finish. In addition, powder coat shall not be off gassing to prevent deterioration of collection and other stored materials. Colors to be selected by owner.

PART 3 - EXECUTION

3.1. EXAMINATION

A. Examine subfloor surfaces, with installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of mobile storage units.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of mobile storage units.

2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2. INSTALLATION

A. Install components and accessories after finishing operations, including painting, have been completed. Install shelving units to comply with final layout drawings, in strict compliance with manufacturer’s printed instructions and structural calculations. Position unit's level and plumb at proper location relative to adjoining units and related work

B. Field Quality Control: Remove and replace components that are chipped, scratched, or otherwise damaged and which do not match adjoining work. Provide new matching units, installed as specified and in manner to eliminate evidence of replacement.

C. Adjust: Adjust components and accessories to provide smoothly operating, visually acceptable installation.

D. Cleaning: Immediately upon completion of installation, clear components and surfaces. Remove

surplus materials, rubbish and debris resulting from installation upon completion of work and leave areas of installation in neat, clean condition.

E. Protection: Protect system against damage during remainder of construction period. Advise Owner of additional protection required to ensure shelving units will be without damage or deterioration at time of substantial completion.

3.3. DEMONSTRATION/CUSTOMER TRAINING

A. Provide complete training to end-user's staff. Training shall include general safety and operation instructions, and basic preventative maintenance procedures.

END OF SECTION