

WARNING

In order to make the proper use of the Mobile Shelving Storage – Powered (Mechanical / Four-Post Shelving) technical specifications, please edit the document at the following points prior to print or email the document :

- 1.3.B. Select the appropriate term.
- 2.1.D. Select the floor option (1 or 2).
 **If option 1 chosen : Select plywood thickness.*
- 2.1.J. Items 1 to 22 : Select the appropriate options to the project.
- 2.2.C. to
2.2.O. Select the accessories applicable to the project.

SECTION 10 56 28 (10681)

MOBILE SHELVING STORAGE – POWERED (MECHANICAL)

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. Mobile Storage Units with four-post shelving.

1.3 PERFORMANCE REQUIREMENTS

- A. Seismic Performance : Provide mobile storage units capable of withstanding the effects of earthquake motions determined according to the building codes.
- B. Design Requirements : All shelving elevations as [per attached drawings] or [described in the specifications].
- C. Color Card : All available color selections. Vendors must provide a minimum of 12 color selections [powder coat paint finish].
- D. Installer Certificates : Signed by manufacturer certifying that installers comply with specified requirements.
- E. Product Certification : Submit manufacturer's certification that products comply with requirements of the specifications. A list of deviations must be provided for all items not meeting the specifications. The document must include appropriate justification of the alternate proposed design.
- F. 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.

- G. Reference list : Provide a list of three (3) mobile storage installations to be called or visited by Owner, Architect and Construction Manager. Installation must be of similar size, scope of specified system. Visit is intended to witness operation and quality of installation. Manufacturer is required to address all issues raised by Owner, Architect and Construction Manager. List must include contact names, phone numbers, size and quality of carriages and system operation.
- H. Mandatory : Manufacturers must be ISO 9001:2008 certified. Submit ISO certification with proposal.

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

- A. Manufacturer's Certifications : 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 will be given to one-source supplier.

1.5 PROJECT CONDITIONS

- A. Field Measurements : Verify 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 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 storage shelving system installation with other work to minimize possibility of damage and soiling during remainder of construction period.
- D. Preinstallation Conference : Conduct conference at project site. Review methods and procedures related to installation of mobile 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. Review structural loading limitations.
 - 3. 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.
 - d. Manufacturer's representative.

PART 2 PRODUCTS

2.1 MATERIALS – MOBILE STORAGE UNITS

- A. Basis of Design : Products are based upon Mechanical Movable Shelving Systems. Provide products complying with requirements of the following specifications and made by Montel Inc.
- B. Grout :
 - 1. General : The compound shall be a 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 air.
 - 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 -	4500 psi
	7 days -	8000 psi
 - 4. All tracks must be grouted the entire length of each run, including all rail joints. As the grout slightly expands during the cure process, it will be in permanent contact with the structural members being grouted. This will provide a continuous support to the system, and optimal weight distribution on the existing floor slab.
- C. Track :
 - 1. Rails shall be designed and manufactured to carry loads of 1000 pounds per linear foot of carriage. Made of minimum cold rolled steel (CRS) rail assembly of ¾" high x 1" wide is inserted in an aluminum sub rail treated against

oxidation caused by concrete. Rail contact surface shall be minimum 1" wide. Anti-tip device is required to meet local building code.

2. Rails shall be leveled with and not project above or below the walking surface.
3. Rails shall be designed to be anchored on top of structural concrete floor and to allow for adjustment so rails can be leveled over an uneven floor.
4. Maximum profile of recess adjacent to rail to accommodate manufacturer's carriages guidance system and/or anti-tip system not exceeding 7/16" wide x 3/4" deep.
5. All rail connection joints shall be designed to provide horizontal and vertical continuity between rail sections, to gradually transfer the concentrated wheel point load to and from adjoining sections.
6. Rail shall be located and positioned properly, leveled and grouted, allowing at least 1/4" for grout under high point. Grout to be worked under rail, any voids completely filled and trimmed upsides and flush with rails. This will allow proper weight distribution from rail to existing slab.
7. Levelness of rails : 3/32" maximum variation from true level within any module; 1/16" maximum variation between adjacent rails, perpendicular to rail direction; 1/32" maximum variation in 10' 0" of rail length, along any rail.
8. Rails to be rechecked for integrity of position and levelness and anchored into structural concrete slab, using anchors in sizes and quantities as determined by manufacturer.
9. Main rail section shall be a minimum of 10' 0" each with shorter sections used to terminate each individual rail assembly.

D. Floor [option 1 or 2] :

1. Floor/Ramp (Raised floor) :
 - 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 steel 12-gauge.
 - c. Floor panels shall be constructed of a minimum [5/8"] or [3/4"] thick, underlayment grade plywood. Floor panels must be provided between all rails the full-width of modules, except under stationary platforms.
 - d. The floor and ramp shall be constructed in a manner that will absolutely prevent any warping or deformation of the floor panels in a normal operating environment.
 - e. Floor covering is to be installed and supplied by the Owner.
2. Embedded rails:
 - a. Finished elevation of the raised floor shall be flush with the top of the rails.
 - b. Rail 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 rail (NIC).

E. Carriages :

1. All carriages shall be riveted construction for flexibility. Welded carriages are unacceptable. Carriages and stationary platforms shall be constructed of "C" shape profiles 1 ½" deep x 5" high, minimum 12-gauge steel, with 1000 pounds per linear foot minimum capacity. Wheel support sections shall be 12-gauge (minimum) 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. Fixed carriages, as shown on the drawings, shall be of same construction and height as the movable 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. Carriage face sections shall provide a smooth, clean appearance without any assembly holes or protruding hardware.
4. Carriage straightness shall have no more than ¼" maximum deviation from a true straight line. There shall be no permanent set or slippage in any spiced or welded joint when exposed to forces encountered in normal operating circumstances.
5. Carriage construction shall be so designed to allow the shelving uprights to be secured to the carriage frame with vibration proof anchor assemblies (two (2) per upright).
6. Each carriage shall have two (2) wheels per rail.
7. Carriages shall be powder coat (1.5 mil) inside and out. Color selection by Owner to match shelving. Powder coat paint finish is required for finish durability and elimination of any off gassing. Finish has to be inert, with no volatiles present in finished product. Visible galvanized steel structural carriage components are unacceptable.

F. Drive/Guide System (Mandatory) design :

1. Provide drive shaft minimum 1' 5/16" o.d. tubular steel or 1" o.d. solid steel, driving all wheels on one (1) side of each carriage to provide even carriage movement, even under unbalanced load conditions.

G. Wheels :

1. Wheels shall be constructed of solid minimum 1045 cold rolled steel (CRS) for smooth operation. Minimum load capacity per wheel 3200 pounds. Wheels shall be precision ground, balanced. All bearings shall be permanently shielded and lubricated.
2. All wheels shall be minimum 5" diameter (outside dimension). They shall be double flanged and sloped to insure efficient guidance. Load wheels are spherical to reduce friction; drive wheels shall be flat.
3. Guide wheels shall be at all wheel locations.

H. Face Panels :

1. All exposed face panels shall be steel (mandatory). End panels shall be full-depth and height of shelving units. Panels to be located on all operating ends of ranges as shown on drawings.

I. Operation and Controls :

1. The system shall be of the mechanical assist type having a chain sprocket drive system. A driving system is required to provide uniform movement along the total length of the carriage even with unbalanced loads on the carriage. The system shall be a positive drive to ensure that there is no play in the drive handle

and that the carriage will stop without drifting. All components of the system shall be compatible for smooth non-jerking, even movement along the total length of the carriage. Drive system shall have a minimum gear ratio requiring 1 pound of pressure to move a load of 6000 pounds. All bearings used in the drive mechanism shall be permanently shielded and lubricated.

2. Operating handles shall be three-spoke type with steel spokes (single spoke handles unacceptable), approximately 17" diameter, which transmit power through a chain drive to the drive wheels. Provide operating handles on drive end of carriages as noted on drawings. Each mechanical device shall come with a chain-tensioning.

J. Safety options [**option 1a, 1b, 1c or 2a**] :

1. Active Safety :
 - a. Locking Pin (for single access) : Shall be located on the handle. The user has to push a knob which will then lock the respective carriage. Both carriages on each side of the aisle have to be secured..
 - b. Lever Arm (for single or dual access) : Once engaged after a 90-degree rotation, this device will lock the mechanism, preventing movement of the carriage. Carriages on both sides of the aisle has to be secured. In dual access application, a full-length shaft will connect both ends of carriage.
 - c. Toe-level Safety Sweep (for single or dual access) : Consist of hinged aluminum safety bar running full length of the mobile carriages, flush with bottom of carriage frame and on both sides of carriage. Upon activation of the sweep, an internal device shall interlock with drive train resulting in positive stop anywhere in the module. A one-pound pressure applied on the safety bar will activate the safety. The safety shall automatically reset upon removal of the obstruction or if carriage is backed away from the obstruction. This active safety shall not require any electricity or battery to be activated (mandatory).
2. Passive Safety :
 - a. Automatic Protecting Device (for single or dual access) : This system will be automatically activated, as soon as a more-than-three-inch aisle is created, preventing the carriages from backing up (the user does not have to activate the safety). Users will need to press the button and simultaneously look in the opened aisle, before creating another aisle. In dual access application, a steel wire will connect safety mechanisms at both ends of carriages..

2.2 MATERIALS – FOUR-POST SHELVING

- A. Upright frames : Upright frames are made of two or more cross members mechanically assembled without screws or rivets to join the top and bottom (and center if necessary) of the post and form a rectangular upright frame. The post is made of 16-gauge 1 ¼" x 1 ½" rectangular shaped cold rolled steel. The post is slotted on each side 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” increments. Back post has also two rows of slots at the back, 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” increments depending only on the selected shelf component.

- 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.
- C. 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 an integral finished product.
- D. 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.
- E. 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.
- F. 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. Welded reinforcement can be added to accept heavier loads. Shelves floating on support are unacceptable (1” thick shelf with 3 bends also available).
 - 2. All shelving shall be back-to-back shelves and shall have capability of being adjusted without use of tools. Canopy tops required on all sections.
 - 3. All shelves shall 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.
- G. 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 dowell pins. Sway braces are positioned where needed on taller shelving sections to add lateral stability.

- H. End panels : Shall be constructed of 18-gauge steel, 1 3/8" thick, they are bolted to bottom and top upright cross members.
- I. Side closure panels : 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.
- J. 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.
- K. 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.
- L. Plain center stops (double entry) : Shall be 4 3/16" high formed of 20-gauge steel with offsets bends to center on upright frame.
- M. Slotted center stops (double entry) : Shall be 4 3/16" high formed of 20-gauge steel with two offset bends. Slots are located on 1" increments for divider adjustment.
- N. 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.
- O. Sliding reference shelf : Shall be 11" deep by 30" wide, 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.
- P. 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 1/4" 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.
- Q. 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 receive a nylon strip and provide a smooth pull-out

and push-in movement. 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 1/4" in height, 3/4" 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.

2.3 FINISH SPECIFICATION

A. Shall be the finest of their respective kinds and those best adapted to the construction for which they are employed to meet ISO 9001:2000 Quality standards. All steel shall be the best 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 :
[B-a) Powder coat finish]

All steel parts shall be made 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 by spraying, making certain 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 acetic acid, household ammonia, 10 % lye, alcohol, 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 great value books. 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 EXAMINATION

- A. Fully grout tracks.
- B. Permanently attach shelving units to carriages. Stabilize shelving units to comply with mobile storage unit manufacturers written requirements. Reinforce shelving units to withstand the stress of movement where required and specified.
- C. Track and infill between tracks shall be installed prior to covering. Install system to comply with final layout drawings, in strict compliance with manufacturer's printed instructions. Position units level and plumb, at proper location relative to adjoining units and related work.
- D. 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.
- E. Adjust : Adjust components and accessories to provide smoothly operating, visually acceptable installation.
- F. 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.

END OF SECTION