

SECTION 105626 (10672)

HIGH-DENSITY MOBILE STORAGE UNITS (ELECTRICALLY ASSISTED MOVEMENT)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawing and general provisions of the contract, including general and supplementary conditions and related specification sections shall apply to this section.

1.2 SUMMARY

- A. This section includes the following:

Solid state electronic controlled motor driven carriages and related equipment containing new or existing storage housings elsewhere specified.

1.3 RELATED WORK FURNISHED BY OTHERS

- A. Base floor capable of withstanding line load weight distribution created by load transfers from weight of system, storage housings, media, and occupants.
- B. Finished floor material and installation within system footprint if optional prefinished floor is not specified elsewhere.

1.4 REFERENCES

- A. American National Standards Institute (ANSI) Standards
- B. American Society for Testing and Materials (ASTM) Standards
- C. Underwriters Laboratories, Inc. (UL, C-UL)

1.5 DESCRIPTION

- A. General: High-density mobile storage system consisting of storage housings mounted on wheeled carriage assemblies riding on multiple steel rails.
 - 1. Purpose is to allow multiple ranges of storage housings to be accessed by means of one moving aisle, thus greatly reducing floor space requirements from that of conventional rows of storage housings.
 - 2. For clarification, the term storage housing shall refer to the shelving, rack, or cabinets which are a component of the high-density mobile system herein specified.
- B. Carriage: The carriage shall be formed of a bolted structural steel frame with precision machined and balanced steel wheels aligning to corresponding steel rails. All carriage motor, drive axle, and wheel bearings shall be permanently lubricated and shielded.
- C. Drive Controls: Each movable carriage shall contain an aisle selection control mounted on each moveable end panel to facilitate carriage movement and create the aisle selection. Each controller shall be intuitive with minimal user training and shall contain "Open" and "Stop" buttons. Control shall be positioned a maximum of 36 inches (914 mm) up from the lower edge of the carriage end panel. All carriage/aisle movement controls shall be within ADA reach guidelines.

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1. Each movable carriage shall be powered by a 40 watt minimum 24 VDC motor. Carriages with motors requiring greater voltage shall be unacceptable.
2. Carriage drive mechanism shall be a direct drive, line shaft drive, or a synchro drive per manufacturer recommendations to best provide a smooth, non-binding, and non-slipping movement. Drive system shall be designed to provide a movement speed of 3 inches (76 mm) per second.

D. Safety Items:

1. An infrared photoelectric safety sweep shall be provided at a minimum of one per aisle as a primary safety.
 - a. (optional) An infrared photoelectric safety sweep shall be provided on both sides of all movable carriages.
2. All carriage motors shall contain a dynamic self-regulating motor monitoring current limiting sensor system which shall detect any increase in resistance at a closing aisle and will immediately stop further aisle closure and back the closing aisle open 6 inches (13 mm) from the stop point. The Dynamic Monitoring System shall automatically adjust for changing carriage weight load conditions. Carriage systems which require user input to make these load adjustments shall be unacceptable.
3. (optional) An infrared photoelectric aisle entry sensor shall be provided at the entrance to each aisle to detect the presence of a person entering a closing aisle and shall prevent further closure of that aisle. Sensor shall be positioned 12 inches (25 mm) up from lower edge of carriage end panel to provide added protection for small children, step stools, etc. Carriage systems with sensors mounted higher shall be unacceptable.

E. Finishes:

1. Metal Components and Assemblies:
 - a. All components shall be finished with an electrostatically applied powder coat. Finish shall consist of a non-glare raised surface that provides scuff and scratch resistance. Finish shall be a non-VOC emitting hybrid powder coat which meets or exceeds ASTM test criteria for adhesion, flexibility, hardness, and humidity resistance. A minimum of 8 standard manufacturer's colors shall be offered at no additional charge and a minimum of 12 additional colors shall be available at an extended lead time. Any special color match shall be made available per the standard manufacturer's published policy.
 - b. (optional) An antimicrobial powder coat finish which shall hinder the growth of gram positive and gram negative bacteria. This shall also include molds and yeasts. The antimicrobial properties shall be present and fully active for the life of the finish. All other powder coat characteristics shall apply.
 - c. (optional) An ESD powder coat finish which shall dissipate an electrostatic charge. The electrostatic dissipation properties shall be present and fully active for the life of the finish. Color availability may be limited based on quantity required. All other powder coat characteristics shall apply.

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2. Laminate Panels:

- a. High Pressure Laminate Finish: To be selected from manufacturer's 13 standard high pressure colors and patterns.
- b. (optional) High Pressure Laminate Finish: Provide another laminate manufacturer's color and pattern selection as desired by owner or architect.
- c. Low Pressure Laminate Finish: To be selected from manufacturer's 13 standard low pressure Melamine laminate finishes.

F. Sizes: Per manufacturer's standard offering.

1.6 PERFORMANCE REQUIREMENTS

A. Design Requirements:

1. Consult drawing for plan view and elevation details.
2. For ceiling height or sprinkler code requirements, rail with required clearance for leveling, carriage structure height, and storage housing heights must be considered for an overall system height.
3. Carriages shall be designed to accommodate existing or new storage housings as may be specified elsewhere in accompanying documentation.

B. Seismic Performance: Provide high-density mobile (compact) storage units capable of withstanding the effects of earthquake motion as required by applicable building codes. Site specific third party evaluation shall be provided by a licensed local structural engineer.

1.7 SUBMITTALS

A. Product Data: Submit manufacturer's product literature and installation instructions.

B. Drawings: Provide dimensional layout of complete system including elevations, adjacent room details including pertinent notations and descriptions. Provide dimensional drawings including elevations of all storage housings locating on or adjacent to the system specified. Provide power supply location(s).

C. Initial Selection Samples: For initial selection of colors and finishes, submit manufacturer's color chart(s) showing full range of colors and finishes available.

D. Samples: (optional) Provide minimum 3 inch (76 mm) square sample for each color and finish selected.

E. Warranty: Submit a copy of manufacturer's warranty.

F. Maintenance Data: Provide manufacturer's operation manual, maintenance and care instructions, and instructions for care and cleaning of the finish.

G. Reference List: Provide list of recently installed similar high-density Powered (electrically controlled) mobile storage installations.

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- H. A list shall be submitted of all specification deviations with a complete description and validation.

1.8 QUALITY ASSURANCE

- A. **Manufacturer Qualifications:** Engage an experienced manufacturer who has been continuously manufacturing this type of product without interruption for a minimum of 20 years and can supply a list of references upon request.
- B. **Manufacturing Qualifications:** Engage an experienced manufacturer who is ISO 9001 certified. Additionally, manufacturer shall be MAS Certified Green and RoHS Compliant.
- C. **Installer Qualifications:** Engage an experienced installer who is authorized by the manufacturer to install a high-density Powered (electrically controlled) mobile system of this magnitude and has a minimum of 3 years' experience with similar installations.

1.9 DELIVERY, STORAGE AND HANDLING

- A. Follow manufacturer's instructions and recommendations for delivery, storage and handling requirements.

1.10 PROJECT CONDITIONS

- A. **Field Measurements:** Verify all dimensions of perimeter area and proposed system prior to manufacture. Verify power supply location(s). Any variations shall be addressed by the general contractor or designated project representative prior to manufacture. Coordinate fabrication and delivery to ensure there is no delay in progress of the work.
- B. **Established Dimensions:** Where field measurements cannot be made without delaying the work, establish dimensions and proceed with fabricating high-density mobile storage units. At this point it is the sole responsibility of the general contractor or designated project representative to coordinate verified field dimensions with the manufacturer in a timely fashion.

1.11 SEQUENCING AND SCHEDULING

- A. Sequence high-density mobile storage system with adjoining work to minimize possibility of damage and soiling during entire construction period.
- B. Schedule installation of specified high-density mobile system after finishing operations; including ceiling tile, wall covering, and painting have been completed.
- C. **Delivery, Storage, and Handling:** Comply with all instructions and recommendations made by manufacturer or manufacturer's representative for delivery, storage, and handling requirements.
- D. **Pre-installation Conference:** Schedule and conduct conference on project site to review methods, procedures, and logistic details to coordinate installation of the high-density mobile system.
 - 1. Recommend attendees:
 - a. Owner's representative

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- b. Prime contractor or representative
- c. Architect, engineer, or person responsible for the layout design
- d. Manufacturer's representative
- e. Subcontractors or installers whose work may affect, or be affected by the installation of this system

1.12 WARRANTY

- A. Provide a written warranty, executed by contractor, installer, and manufacturer, agreeing to repair or replace equipment which fails in materials or workmanship within the established warranty period. This warranty shall be in addition to, and not a limitation of, other rights the owner may have under general conditions provisions of the contract documents.
- B. In addition, manufacturer shall warrant the high-density mobile storage system against defects in material and workmanship for the life of the system from date of final acceptance by owner. Lifetime warranty shall exclude electrical components which shall be warranted by the manufacturer by no less than 2 years. Manufacturer shall provide labor for 2 years from date of final acceptance provided all terms of the most recent warranty statement release are met.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. General: Specifications stated herein are based upon high-density compact mobile storage products manufactured by Datum Storage Solutions, Inc. Upon successfully meeting specification requirements, other manufacturers may be included following written acceptance.

2.2 BASIC MATERIALS

- A. General: Provide materials and quality of workmanship, which meet or exceed established industry standards for products specified. Material selection and composition shall be manufacturer's option unless indicated otherwise. Fabricate units from ASTM Class 1, cold-rolled commercial grade sheet or coil steel with all bends and radiuses consistent and true.
- B. Laminate Panels:
 - 1. High Pressure Plastic Laminate: Shall conform to NEMA LD-3 .040 inch (1 mm) vertical grade.
 - 2. Low Pressure Laminate: Shall be constructed from 3/4 inch (19 mm) 45 lb./cu. ft. (720 kg/m³) particleboard core panel with integral heat bonded laminated surface on face and back.
- C. Grout (optional): Shall be high strength; controlled expansive grout with superior dynamic load stability, which when mixed with water shall harden rapidly to produce a permanent foundation for the mobile storage system. Grout shall be non-corrosive, non-metallic and

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non-shrink. The grout after curing shall have a minimum strength of 8000 pounds (3629 kg) per square inch.

2.3 MANUFACTURED COMPONENTS

A. Rail:

1. Rail shall be ASTM/AISI Type 1018 steel of manufacturer's selection designed and manufactured to carry a load of 1000 pounds per lineal foot (1488 kg/m) of carriage length.
2. Rail surfaces at all wheel contact points shall be unfinished. For long term durability and aesthetics, paint or powder coat finishes shall be unacceptable.
3. Rail shall be designed to be anchored to structurally sound base floor capable of supporting fully loaded system and exhibiting a maximum deflection not to exceed L/700.
4. Rail shall be positioned, leveled and secured in accordance with the manufacturer's instructions, providing a minimum of 1/4 inch (6 mm) of grout under the rail from the high spot on the floor. (optional): Void under leveled rail shall be completely filled with a non-shrink grout. Provide a minimum of 1/4 inch (6 mm) of grout under the rail from the high spot on the floor.
5. Rail shall be drilled and tapped to accommodate leveling screws adjacent to all anchor holes. All rails must extend completely under all stationary ranges. Rail leveling shall be shall be a captive fastener type. (optional): Install stationary carriage (platform) adjacent to the decking.
6. Rail shall be level not to exceed 1/16 inch (1.6 mm) maximum variation from true level within module and 1/16 inch (1.6 mm) maximum variation between adjacent rails perpendicular to rail direction. Each section of rail shall be a minimum of 12 inches (305 mm) and a maximum of 72 inches (2134 mm) with shorter length used only to terminate each individual rail assembly.
7. Each end of the rail shall be connected by means of stainless steel dowels pinned between the rail splice. The splice shall be designed for the most severe operating conditions. Connection joints shall demonstrate vertical and horizontal continuity and provide a transfer of load to and from the adjoining rail sections. Butt splice joints and tongue and groove rail splice joints which only prevent movement in one direction are unacceptable.

B. Floor and Ramp:

1. Floor shall be constructed of a minimum of 3/4 inch (19 mm) underlayment grade exterior glue 5-ply plywood. There shall be no open gaps between the floor and the rail. Fire retardant rated plywood shall be available as an option where required by code. Substitute a polyvinyl clad board flooring (optional) which requires no additional floor covering tile or carpet and provides a slip resistant surface.
2. Ramp shall be constructed of plywood, painted steel, stainless steel, or galvanized steel.

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3. Ramp shall not extend beyond the end of the carriage if at all avoidable. It shall be understood that with certain ramp and carriage size combinations this may be unavoidable. The vertical transition from the ramp edge to the floor shall be a maximum of 1/8 inch (3 mm) with ramp having a maximum slope of nine degrees.
4. Ramp shall extend under all mobile and stationary carriages.
5. Ramp shall meet ADA minimum requirements.

C. Carriages:

1. Carriages are to be bolted or welded steel construction at the discretion of the manufacturer. Riveted carriages or components shall be unacceptable. Galvanized components are unacceptable. Components of unlike finish or material are unacceptable. Steel shall be ATSM-A1008 Commercial Type B or better.
2. Carriage side structural members shall be not less than 4.5 inches (114 mm) in height from bottom flange of carriage to storage housing base or foot.
3. Carriage shall be designed for a capacity of 1000 pounds per linear foot (1488 kg/m).
4. Carriage construction shall provide for shelving to be securely anchored with vibration-proof fasteners.
5. Carriages designed to recess the shelving or storage housing, thus creating a lip and causing the carriage to protrude beyond the plane of the face of the shelving or storage housing shall be unacceptable.
6. Carriages shall be powder coat finished inside and out. Galvanized components and unfinished structural steel components shall be unacceptable.
7. Fixed carriages (platforms) shall be of the same construction and height as the mobile carriages. Fixed carriages (platforms) shall be securely anchored. (optional): Fixed carriages (platforms) shall rest on continuous rail located beneath the fixed carriages.
8. Splices shall be designed to maintain proper unit alignment with no visible fasteners on the outside of the carriage. Fasteners connecting any carriage splice joint shall be vibration-proof in design.
9. Carriages shall be straight and square. There shall be no movement in any splice, bolted, or welded connection when loaded to recommendation and normal operation is performed.

D. Wheels:

1. All wheels whether load or driven shall be a minimum of 5 inches (127 mm) in diameter to outer guide flange and precision machined for smooth operation and to ensure compatibility to the corresponding rail.
2. Bearings shall be permanently lubricated and shielded.
3. Dynamic load rating on wheel bearings shall be a minimum of 3500 pounds (1588 kg) per wheel.

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E. Guidance:

1. Guide Design:

- a. A minimum of 2 guide rails and 4 guide wheels shall be required to ensure precise carriage tracking alignment.
- b. All guide rails shall have a flat top surface to provide friction-free alignment with the carriage guide wheel flanges.
- c. All carriage wheels shall have a precision milled load surface which when coupled with the rail surface will ensure precise carriage tracking.
- d. Roller guide and center flange methods of guidance shall be unacceptable.

2. Line Shaft Drive:

- a. Shaft shall be a minimum of 3/4 inch (19 mm) diameter solid steel.
- b. Drive shaft shall be a non-load bearing member of the drive mechanism for ease of movement.
- c. Couplers shall be securely keyed and locked into place to prevent looseness in the drive mechanisms.
- d. Drive motor must drive at midpoint of carriage length and transfer drive motion in a balanced manner to the carriage ends.

3. Synchro Drive: (optional)

- a. System shall consist of 3/4 inch (19 mm) diameter solid steel drive shafts and machined couplers.
- b. Wheels on both sides of the carriage shall be driven in a synchronous motion. Systems that do not drive both sides synchronously are unacceptable.
- c. Drive motor must drive at midpoint of carriage length and transfer drive motion in a balanced manner to the carriage ends and to both sides of the carriage.

F. Operation:

1. User interface control shall contain an electrostatic capacitive touchpad. The user interface control shall not incorporate any moving parts. Systems utilizing buttons, switches, or other mechanical devices shall be unacceptable.
2. User interface control shall be intuitive and provide clear and easy to understand indicators. Additionally, to minimize downtime in the unlikely event a problem might arise, the user control shall contain a diagnostic display to pinpoint the problem. Systems which provide only a problem indication with no diagnostic capability are unacceptable.
3. The carriage control system must provide for operation of the mobile system at the face panel mounted user interface/operator control head.
4. A mechanically adjustable distance sensor shall be provided at each aisle to provide carriage stopping distances as needed should oversize media be protruding over the shelf edge.

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5. System shall provide soft carriage starting and stopping.
 6. (optional) User interface controls shall be available at each end of each possible aisle.
 7. User interface controls and user aisle access both into the aisles and around the system shall conform to all applicable codes including but not limited to the Americans with Disabilities Act.
- G. End and/or Face Panels:
1. End panels shall be provided to mount the carriage movement/information readout control, aisle entry sensor (if equipped), and enhance the aesthetics of the system.
 2. End panels must extend the full width of the carriage and extend from the bottom edge of the carriage to the top of the storage housing on the carriage.
 3. End panel selection shall be from the following options:
 - a. Steel: Panels shall be fabricated from no less than 20-gauge material, 48 inches (1219 mm) in width shall be fabricated from 16-gauge powder coated steel. Panels 48 inches (1219 mm) wide and greater may be fabricated from a lesser gauge sheet steel if additional reinforcing hat channel are provided. Finish and color shall be selected from manufacturer's full offering.
 - b. High Pressure: Shall consist of plastic laminate clad particle board with steel powder coated side channel which shall protect the panels from cart damage and provide a durable alternative to some other manufacturers plastic tubes or edging.
 - c. Thermal Fused Low Pressure: Shall consist of plastic laminate clad particle board with black plastic integral side edge covers and spacer tubes.
 - d. Solid Wood: Shall be design, wood species and finish as determined by architect. Finished product shall meet applicable AWI standards for appearance and craftsmanship. Products shall be sourced locally.
- H. Accessories:
1. Provide manufacturer's standard. Location and quantity as indicated on the drawings.
 - a. Aisle Presence Safety System (optional) which shall consist of an aisle entry sensor at every aisle opening. This system shall require a visual inspection of the open aisle prior to allowing an aisle closure and resultant new aisle selection.
 - b. All systems/aisles shall have the ability of incorporating a series of sensors which shall detect the presence of a person in an open aisle and which shall prevent that aisle from closing.
 - c. A manual override capability shall be provided on every carriage to provide manual movement in the event of a power outage. The manual override mechanism shall be readily accessible to the end user without the need to remove end panels, shelves, or gain access to the inside of the carriage.

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- d. Universal Power Source (UPS) (optional) shall be available to provide system power in the event of a power outage. All safety devices and system functionality shall remain operational when the UPS is activated. The UPS shall switch on and off automatically as needed and require no user input.
- I. Environmental Requirements: All carriages, steel shelving, and steel end panels shall contain a minimum of 40% recycled steel content, comprised of a mixture of post and pre-consumer and industrial. Finishes on carriages, steel shelving, and steel end panels shall be a powder coat finish with low VOC (volatile organic compounds) and application must incorporate a powder recycle process.

2.4 FABRICATION

- A. General: Coordinate all parties to ensure timely execution of this project and to related work. Ensure that all necessary information relating to this portion of the project has been transmitted to the parties involved.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify that building floor structure is adequate to support high-density mobile system within limits of established deflection criteria based on mobile system type and manufacturer's published criteria. Basis shall be L/450. Verification shall be provided by a locally licensed structural engineer.
- B. With installer present, examine floor area within area of mobile system to verify that it is within levelness tolerance per manufacturer's requirements for rail installation.
- C. With installer present and prior to installation, examine mobile carriages for proper sizing, proper placements of support members for the shelving, and to ensure that storage housing mounting surface is square and level.
- D. For all installations it shall be the installer's responsibility to know and to execute all phases of the installation in compliance with local building codes.

3.2 INSTALLATION

- A. General: Follow all manufacturer's documented instructions and procedures for installation of rail, floor and ramp if applicable, fixed and movable carriages, shelving, panels and related accessories.

3.3 FIELD QUALITY CONTROL

- A. Verify all fixed and movable carriages are installed and operating square and level. Correct if necessary.
- B. Verify all end or face panels, shelving components and accessories are aligned properly. Correct if necessary.
- C. Replace components that are scratched, dented, or damaged in any manner with new items from the manufacturer. Surface scratches may be touched up but repair must be complete and undistinguishable.

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3.4 ADJUSTING

- A. Adjust all components and accessories to provide smooth operation and proper tracking alignment. Perform final visual check that all panels align when aisles are closed, and all gaps are consistent.

3.5 CLEANING

- A. Upon completion of installation, clean all components and surfaces. Cover to protect from dust and environmental fallout as a result of other work continuing in the surrounding area. Remove all packaging material and debris that accumulated as a result of the installation immediately upon completion. Leave area of installation neat, in broom clean condition, and ready to present to appropriate persons.

3.6 DEMONSTRATION AND TRAINING

- A. Schedule and conduct demonstration of the high-density mobile system. Review all safety features and proper carriage operation with owner's personnel. Review any additional features or points of interest as appropriate.
- B. Schedule and conduct maintenance training with owner's maintenance personnel. Training session should include a full operation demonstration and all preventative maintenance and minor repair procedures for the high-density mobile system that they would normally be expected to perform.

3.7 PROTECTION

- A. Protect system against dirt and damage during remainder of construction period. Recommend to owner of any additional precautions needed to ensure that system will remain unharmed during balance of construction in surrounding area.

END OF SECTION