

SECTION 105626 (10672)

HIGH-DENSITY MOBILE STORAGE UNITS (MECHANICALLY 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, apply to this section.

1.2 SUMMARY

- A. This section includes the following:

Multi-spoke handle driven mechanical assist 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

1.5 DESCRIPTION

- A. General: High-density mobile storage system consisting of storage housings mounted on wheeled carriage assemblies riding on multiple steel rails. 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. 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 bearings shall be permanently lubricated and shielded.
- C. Drive Controls: Triple arm operating control with ergonomic user-friendly knobs shall be provided on the drive ends. A minimum of one operation knob per carriage shall be within ADA reach guidelines at all times.
 - 1. Front drive control consisting of chain, sprocket, and upper drive bearing assembly shall be completely self-contained and provide for drive chain tension adjustment located conveniently below the drive handle without the need to remove the carriage end panel. Carriage drive assemblies which require end panel removal for drive chain tension adjustment shall be unacceptable.

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2. Carriage drive mechanism shall be a line shaft drive, or a synchro drive per manufacturer recommendations to best provide a smooth, non-binding, and non-racking movement. The drive to the wheels shall be a balanced design providing drive torque from the midpoint of the length of the carriage out the carriage ends. Drive system shall be designed to provide a movement of up to 4000 pounds (1814 Kg) of load with only 1 pound (0.4536 Kg) of user effort at the drive control handle.
3. All bearings throughout the drive system shall be permanently lubricated and shielded.

D. Safety Items:

1. A user activated aisle safety locking mechanism shall be provided at every carriage control to prevent unintentional carriage movement. Aisle safety lock shall incorporate 2 points of contact to prevent unintentional movement of handle. Aisle safety lock knob mechanism shall contain a red indicator to alert user of lock status.
2. (optional) Each movable carriage shall incorporate a fully self-contained safety sweep brake mechanism requiring no battery or external power source which activates a carriage brake by means of side sweep panels on both sides of the movable carriage. Mechanical safety sweep brake shall allow for a carriage that is in the locked safety activated state to be backed away from a person or obstruction. Systems that when engaged lock the carriage and prevent it from backing away from the safety activation point 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.
2. Laminate Panels:
 - a. High Pressure Laminate Finish: To be selected from manufacturer's 13 standard high pressure colors and patterns.

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- 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.
- 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 type high-density mobile installations.
- H. A list shall be submitted of all specification deviations with a complete description and validation.

1.8 QUALITY ASSURANCE

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- 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 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. 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
 - b. Prime contractor or representative
 - c. Architect, engineer, or person responsible for the layout design
 - d. Manufacturer's representative

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- 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. 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 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:

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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. (optional): Substitute a polyvinyl clad board flooring 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.
 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.

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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.

E. Guidance:

1. Guide Design:
 - a. A minimum of 2 guide rails shall be required to ensure precise carriage tracking alignment.

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- 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 mechanism must drive to 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 mechanism must drive to 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. Gearing requirements unless specified will be at the discretion of the manufacturer based on anticipated weight load and carriage size. Reduction drive units must be available resulting in the noted carriage travel per revolution of the composite 3-spoke ergonomic operator control handle:
 - a. Single Reduction (.250 gear ratio) @ 3.487 inches (89 mm) carriage travel per handle revolution.
 - b. Double Reduction (.166 gear ratio) @ 2.316 inches (59 mm) carriage travel per handle revolution.
 - c. Triple Reduction (.125 gear ratio) @ 1.744 inches (44 mm) carriage travel per handle revolution.
- 2. Operator handles shall be provided in an ergonomic three-spoke design with three rotating knobs.
- 3. All operator handles shall be provided with a minimum 1.81" (46 mm) diameter ergonomic push-pull knob (Aisle Safety Lock) located at the center of the operator handle to secure adjacent carriages in place while an aisle is being occupied. Smaller knobs shall be unacceptable.

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4. A red indicator on the Aisle Safety Lock Knob shall exhibit a red indicator visible when the aisle lock is pushed in and activated.
 5. (optional) Operator handles shall be available at each end of each possible aisle.
 6. Operator handles and aisle access both into 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 or chain box covers shall be provided to cover the drive chain mechanism 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: (optional)
1. Provide manufacturer's standard. Location and quantity as indicated on the drawings.
 - a. Carriage mounted lock
 - b. Mechanical carriage safety sweep and brake
 - c. Chain box cover
 - 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

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- 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/700. 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.

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.

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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