SECTION 10 56 26 – mobile storage shelving

SPEC NOTE: This Section is for “Standard” High Density Filing Storage Units. Low Height or Heavy-Duty High Density Filing Storage Units are available but require modifications to this Section to incorporate information regarding the other systems available.

1. General
   1. SUMMARY
      1. Section Includes supply and installation of the following:
         1. [Mechanical-Assist] [Powered], standard high-density mobile storage shelving system, complete with track, carriage, support rails, and accessories required to provide a complete installation, including leveling of support rails.
   2. related work not provided by this section
      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 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.
      4. Fire suppression system is by others.
   3. Definitions
      1. Bay: Single shelving section of a unit.
      2. Unit: Assembly of one or more bays.
      3. Module: Grouping of units with one or more access.
      4. System: Complete system including units, track, etc.
   4. system description – General

SPEC NOTE: Edit the following paragraph to reflect if the mobile storage unit is new or being relocated / salvaged from another area or Project.

* + 1. General: The system consists of [manufactured] [Owner furnished] storage units mounted on manufacturer’s track-guided carriages to form a compact storage system. System design permits access to any single aisle by moving units until the desired aisle is opened.
       1. The manufacturer’s proprietary unit interlock system prevents units from being moved while the open aisle is occupied. The carriage/rail system provides uniform carriage movement along the total length of travel, even with unbalanced loads.
    2. Carriage System Design and Features: The carriage system consists of a formed structural steel frame with wheels riding on steel rails mounted to the floor.
       1. Rails shall be types selected by the manufacturer to ensure smooth operation and self-centering of mobile storage units during travel without end play or binding. Rail types, quantities and spacing shall be selected by the manufacturer to suit installation conditions and requirements. All bearings used in the drive mechanism shall be permanently shielded and lubricated.
    3. Safety Features:
       1. Visual indicators/icons shall provide verification that carriages are in the locked or unlocked mode.
       2. One safety sweep shall be provided in each aisle. A full-length infrared photoelectric safety sweep shall be provided to stop carriage movement if the sweep contacts an obstruction while in motion. Sweep must be equipped with OSHA approved safety demarcation tape.
       3. Entire system shall be C-UL system listed.

SPEC NOTE: The following safety option can be applied to both a mechanical assist and powered mobile storage shelving.

* + - 1. Mechanical safety sweep strip shall be provided to stop carriage movement if the system detects objects or persons in the aisle while the carriage is in motion. Sweep must be equipped with OSHA approved safety demarcation tape. (In lieu of infrared photoelectric safety sweep.)

SPEC NOTE: The following safety options are “optional” and are for powered mobile storage shelving units only. Not required on mechanical-assist units.

* + - 1. Infrared photoelectric aisle entry sensor system shall be provided to stop carriage movement if the system detects persons entering a closing aisle.
      2. Zero Force Sensor (ZFS) system and electric braking devices shall be provided to prevent new carriage movement if the system detects objects or persons in the open aisle when an attempt is made to open another aisle.

SPEC NOTE: Select one of the following emergency backup power paragraphs for powered mobile storage shelving below and delete the one not required.

* + - 1. An Automatic Battery Backup shall be provided for emergency operations in case of primary power failure.
      2. A handheld rechargeable power pack shall be provided for emergency operations in case of primary power failure.
    1. Finishes:
       1. Fabricated Metal Components and Assemblies: Manufacturer’s standard powder coat paint finish.
       2. End Panels, Accessible Ends:

SPEC NOTE: Select one of the following options from the list below.

* + - * 1. Plastic laminate, manufacturer’s standard available textures and patterns.
        2. Manufacturer’s standard powder coat paint finish in standard available colours.
  1. system description – powered units
     1. Movement Controls for Powered Operation: Provide a carriage control panel on the accessible (open) end of each moveable carriage, located 1118mm (44”) above the base, centered on the face panel. Minimum controls shall include directional control buttons/icons, STOP/RESET push-button/icon and a red reset light/icon.

SPEC NOTE: Select one of the following movement options indicated below and delete the option not required.

* + - 1. System controls shall start motors on each movable carriage [“sequentially” to minimize power demands] [“block” to start all at once] and shall provide dynamic braking to provide smooth operation. No additional hardware shall be required to change between “sequential” and “block” movement. Maximum running speed shall be limited to 84mm (3.3”) per second.
      2. Provide solid state controls and indicator lights/icons for a visual indication of safety system operation. Provide each aisle with a programmable distance sensor to ensure proper timing for start/stop operation.
      3. Pushing the directional control button/icon on any moveable carriage adjacent to the desired aisle location in the direction away from the desired aisle location opens the system at the desired aisle.
         1. The selected aisle shall open automatically regardless of the position of the carriages.

SPEC NOTE: The following paragraph (Manual Reset) is the “standard” option. Select Automatic Reset paragraph if that is required on the project. Delete the paragraph that doesn’t apply.

* + - * 1. Manual Reset: The carriage control head will display a flashing red reset light/icon at the newly opened aisle indicating that the aisle is locked open and requires resetting before another aisle can be opened. Provide for automatic lockout and manual reset of controls if selected aisle is not moved within a preset period of time.
        2. Automatic Reset: The carriage control heads will display a constant green light, or green arrow icon, at all carriages indicating that the system is ready for the next aisle access. Provide for automatic reset if system is equipped with optional Zero Force Sensor (ZFS) system safety feature, or other redundant safeties.
      1. Controls shall feature safety activated message and direction indicator designating which aisle safety was activated or back lit message indicating which aisle is in use (i.e. “Right Aisle in use” or “Left Aisle in use”).
    1. Drive System for Powered Operation: The system shall be designed with a positive type motorized drive which minimizes end play and that carriages will stop without drifting. All system components shall be selected to ensure a smooth, even movement along the entire carriage length.
       1. Each electric carriage shall be provided with a current limited fractional horsepower gear motor, connected to drive wheel assembly with a roller chain.
       2. System shall include a chain sprocket drive system to ensure that carriages move uniformly along the total length of travel, even with unbalanced loads.
       3. A tensioning device shall be provided on each chain drive (when applicable).
       4. All bearings used in the drive mechanism shall be permanently shielded and lubricated.
       5. System shall operate on 115 V.A.C. 50/60 hertz, 20-amp dedicated circuit provided by others, one per module.
       6. Overhead mounted power pantograph distribution system shall conceal all interconnecting wiring.
  1. system description – Mechanical-Assist units
     1. Movement Controls for Mechanical-Assist Operation: Triple or single arm operating wheels with rotating hand knobs shall be provided on the accessible (drive) ends of shelf units, centered on the end panel, located 1051mm (40”) from the base of each unit to permit units to be moved to create a single aisle opening. Turning the handle transmits power through chain drive to drive wheels on each carriage.
     2. Drive System for Mechanical-Assist Operation: The system shall be designed with a positive type mechanically-assisted drive which minimizes end play, ensures there is no play in the drive handle, and that carriages will stop without drifting.
        1. System shall include a chain sprocket drive system for each movable carriage to ensure that carriages move uniformly along the total length of travel, even with unbalanced loads. All system components shall be selected to ensure a smooth, even movement along the entire carriage length.
        2. Drive system gearing shall be designed to permit 1 lb. of force applied to the drive handle to move a minimum of 4,000 lbs. of load.
        3. A tensioning device shall be provided on each chain drive with provision for adjusting tension without removing end panels.
        4. All bearings used in the drive mechanism shall be permanently shielded and lubricated.
  2. PERFORMANCE REQUIREMENTS
     1. Design Requirements:
        1. Limit overall height to 3658mm (12’).
        2. Limit overall length to 24689mm (81’).
        3. Max Weight: 1000 lbs per linear foot.

SPEC NOTE: Select the following paragraph for mechanical assist mobile storage shelving only.

* + 1. Ease of Movement: Provide mechanically assisted units capable of being moved by exerting a maximum horizontal force of 5 pounds on the operating wheel.

SPEC NOTE: Delete the following paragraph if there is no requirement for seismic performance on the Project.

* + 1. Seismic Performance: Provide mobile storage units capable of withstanding the effects of earthquake movement when required by applicable building codes.
  1. submittals
     1. Product Data: Submit manufacturer's product literature and installation instructions for each type of shelving, track and installation accessory required. Include data substantiating that products to be furnished comply with requirements of the contract documents.
     2. Shop Drawings: Show fabrication, assembly, and installation details including descriptions of procedures and diagrams. Show complete extent of installation layout including clearances, spacings, and relation to adjacent construction in plan, elevation, and sections. Indicate clear exit and access aisle widths; access to concealed components; assemblies, connections, attachments, reinforcement, and anchorage; and deck details, edge conditions, and extent of finish flooring within area where units are to be installed.
        1. Show installation details at non-standard conditions. Furnish floor layouts, technical and installation manuals for every unit shipment with necessary dimensions for rail layout and system configuration at the project site. Include installed weight, load criteria, furnished specialties, and accessories.
           1. Provide layout, dimensions, and identification of each unit corresponding to sequence of installation and erection procedures. Specifically include the following:
           2. Location, position, and configuration of tracks on all floors.
           3. Plan layouts of positions of carriages, including all required clearances.
           4. Details of shelving, indicating method and configuration of installation in carriages.
        2. Provide location and details of anchorage devices to be embedded in or fastened to other construction.
        3. Provide installation schedule and complete erection procedures to ensure proper installation.
        4. Show locations of wiring and disconnects required for operating movable carriage units.
     3. Samples: Provide minimum 150mm (6”) square example of each colour and texture on actual substrate for each component to remain exposed after installation.
     4. Selection Samples: For initial selection of colors and textures, submit manufacturer's color charts consisting of actual product pieces, showing full range of colors and textures available.
     5. Maintenance Data: Provide in form suitable for inclusion in maintenance manuals for mobile storage units. Data shall include operating and maintenance instructions, parts inventory listing, purchase source listing, emergency instructions, and related information.
        1. Submit manufacturer's instructions for proper maintenance materials and procedures.
        2. Submit manufacturer's printed instructions for maintenance of installed work, including methods and frequency recommended for maintaining optimum condition under anticipated use conditions. Include precautions against using materials and methods which may be detrimental to finishes and performance.
  2. QUALITY ASSURANCE
     1. Manufacturer Qualifications: Engage an experienced manufacturer who is ISO 9001 certified for the design, production, installation, and service of motorized, carriage mounted high-density mobile storage units and support rails. Furnish manufacturer’s ISO 9001 quality system registration certificate.
     2. Installer Qualifications: Engage an experienced installer who is a manufacturer's authorized representative for the specified products for installing carriages and anchoring shelving units to carriages.
        1. Minimum Qualifications: One (1) year experience installing systems of comparable size and complexity to specified project requirements.
        2. Guaranteed twenty-four (24) hour minimum response time to service call.
  3. DELIVERY, STORAGE AND HANDLING
     1. Follow manufacturer’s instructions and recommendations for delivery, storage and handling requirements.
     2. Store units at site on raised wood pallets protected from the elements and corrosive materials, and Do not remove from crates or other protective covering until ready for installation.
  4. site CONDITIONS
     1. Site Measurements: Verify dimensions before fabrication. Indicate verified measurements on Shop Drawings. Coordinate fabrication and delivery to ensure no delay in progress of the Work.
     2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating mobile storage units without field measurements. Coordinate construction to ensure actual dimensions correspond to established dimensions.
  5. SEQUENCING AND SCHEDULING
     1. Sequence storage shelving system installation with other work to minimize possibility of damage and soiling during remainder of construction period.
     2. Schedule installation of specified products and accessories after finishing operations, including painting have been completed.
     3. Provide components, which must be built in at a time which causes no delays general progress of the Work.
     4. Pre-installation Conference: Schedule and conduct conference on project site to review methods and procedures for installing mobile storage units including, but not limited to, the following:
        1. Review project conditions and levelness of flooring and other preparatory work performed under other contracts.
        2. Review and verify structural loading limitations.
        3. Recommended attendees include:
           1. Owner's Representative.
           2. Prime Contractor or representative.
           3. Consultant, and Structural Engineer.
           4. Electrical Engineer when required for Powered Units.
           5. Manufacturer's representative.
           6. Subcontractors or installers whose work may affect, or be affected by, the work of this section.
  6. Warranty
     1. Provide a written warranty, executed by Contractor, Installer, and Manufacturer, agreeing to repair or replace units which fail 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.
     2. Warrant the entire movable compact shelving installation against defects in materials and workmanship for a period of five (5) years from date of acceptance by the Owner.

SPEC NOTE: Delete the following paragraph if the Client doesn’t want to continue with a maintenance plan with the Manufacturer.

* 1. MAINTENANCE
     1. Provide manufacturer’s extended maintenance agreement for three (3) years, commencing on the day the standard maintenance warranty ends.

1. Products
   1. APPROVED PRODUCTS AND MANUFACTURERS

SPEC NOTE: Select one of the following options below and delete the option not required on the Project.

* + 1. Powered Operated Mobile Storage Shelving Units:
       1. Basis of Design Materials: Eclipse Powered System by Spacesaver Corp.
    2. Mechanical-Assist Operated Mobile Storage Shelving Units:
       1. Basis of Design Materials: Standard Mobile Storage Shelving, Mechanically-Assisted, by Spacesaver Corp.
  1. Materials
     1. Structural Steel Sections and Steel Plate: New stock (not weathered or rusted); to conform to CAN/CSA-G40.21, Grade 300W (44W) and Grade 350W (50W) for wide flange shapes.
     2. Hollow Structural Sections (HSS): New stock; to conform to CAN/CSA-G40.21, Grade 350W (50W), Class C, stress relieved.
     3. Sheet Steel (Structural Quality): Conforms to ASTM A1011/A1011M.
     4. Sheet Steel (Commercial Quality): Conforms to ASTM A653/A653M, stretcher levelled, or temper rolled.
     5. Tube: Conforms to ASTM A53.
     6. Aluminum Plate and Sheet: ASTM B209M, Alloy 6061-T6.
     7. Aluminum Extrusions: ASTM B221M, Alloy 6063-T6.
     8. Non-Shrink Grout: Premixed, high strength, maximum bearing, impact resistant, non-shrink non-metallic aggregate grout having minimum 76 Mpa 28-day compressive strength and conforms to ASTM C939 and ASTM C1107/C1107M.
     9. Primer Paint: CISC/CPMA 2-75.
     10. Bolts, Nuts, Washers: Conforms to ASTM A325.
     11. Welding Materials: Conforms to CSA W59.
     12. Painting:
         1. Shop Applied Structural Steel Primer: Apply a minimum of 2 mils dft./coat. Grey coloured primer is acceptable.
     13. Isolation Coating: Acid and alkali resistant bituminous paint.
     14. Melamine prefinished laminated plastic panels: panels consisting of 0.178 mm thick melamine resin impregnated decorative sheet thermally fused to rigid particleboard substrate. Particleboard substrate to CAN3-0188.1, Grade R.

SPEC NOTE: Delete the following paragraph if Powered Operation is not required on this Project.

* + 1. Electrical Devices and Controls: C-UL System Listed for type of application and service.
  1. manufactured components
     1. Rails:
        1. General: Provide manufacturer's proprietary design units with the following properties:
        2. Material: ASTM/AISI Type 1035 or 1045 steel, manufacturer’s selection.
        3. Capacity: 1,000 pounds per lineal foot (1385kg/m) of carriage.
        4. Minimum Contact Surface: 16mm (5/8”) wide.
        5. Provide rail sections in minimum 1829mm (72”) lengths.
        6. Rail configuration shall permit attachment to top of structural floor system with provision for leveling rails to compensate for variations in floor surface level.
        7. Provide rail connections designed to provide horizontal and vertical continuity between rail sections, to gradually transfer the concentrated wheel point load to and from adjoining rail sections. Butt joints without connections are not permitted.
        8. Anti-Tip Rail Form Covers: Manufacturer shall provide for protection if required to prevent damage to rails during concrete back pours, and when anti-tip devices are installed.
        9. Once rails are leveled, they shall be supported the full length with the specified grout.
     2. Floor / Ramp:
        1. Floor/Ramp Sheathing:
           1. Minimum 19mm (3/4”), 7-ply underlayment grade plywood. Particleboard sheathing materials are not permitted.
        2. Provide fire retardant treated floor/ramp materials when required by code.

SPEC NOTE: Modify the Section number identified below to reflect the Section that is covering the flooring. Currently Section 09 30 00 Tiling is used as a place holder.

* + - 1. Finished flooring / ramp materials: As indicated in Section [09 30 00].
      2. Ramps at entrances to system. Full floor between all rails.
    1. Carriages:
       1. Provide manufacturer's design movable carriages fabricated of welded steel construction. Galvanized structural components and/or riveted carriages are unacceptable. 1,000 pound per foot (1385kg/m) minimum capacity.
       2. Provide fixed carriages of same construction and height as the movable carriages, anchored to rails. Setting fixed shelving directly on floors is not permitted.
       3. When required, provide bolted carriage splices designed to maintain proper unit alignment and weight load distribution.
       4. Design carriages to allow the shelving uprights to recess and interlock into the carriages a minimum of 19mm (3/4”). Top mount carriages are unacceptable.
       5. Provide each carriage with two wheels per rail.
    2. Drive / Guide System:
       1. Design: Provide drive system which prevents carriage whipping, binding and excessive wheel/rail wear under normal operation.
          1. If line shafts are used, all wheels on one side of carriage shall drive.
          2. If synchronized drives are used, a minimum of one wheel assembly driving both sides of carriage at center location required. Drive shaft shall exhibit no play or looseness over the entire length of that assembly.
       2. Shafts: Solid steel rod or tube.
       3. Shaft Connections: Secured couplings.
       4. Bearing Surfaces: Provide rotating load bearing members with ball or roller bearings. Provide shafts with pillow block or flanged self-aligning type bearings.
    3. Wheels:
       1. Materials: Manufacturers standard for design application.
          1. Minimum load capacity per wheel: 3200 lbs. (1455kg).
       2. Size: Minimum [127mm (5”)] [75mm (3”)], outside diameter drive wheels.
       3. Guides: Determined by manufacturer; minimum two (2) locations.

SPEC NOTE: Delete the following paragraph if Powered Operation is not required on this Project.

* + 1. Motors:
       1. Manufacturers Standard Type: 90VDC.
    2. Face Panels:

SPEC NOTE: Select one of the following finishes below. Delete what is not required.

* + - 1. Materials:
         1. Plastic laminate clad particleboard with plastic edging on vertical edges.
         2. Steel.
      2. End panels must cover the full height and width of shelving.

SPEC NOTE: Select one of the following shelving options below. Delete what is not required.

* + 1. Shelving: [Cantilever][Four Post][Case-Type][Wire].

SPEC NOTE: Delete the following paragraph if Powered Units are not required on the Project.

SPEC NOTE: Consult with Technical Representative if unsure about an accessory item identified below. Budget price will also increase with each accessory, so consulting with your technical rep during design stage will limit sticker shock, possibly resulting in value engineering out items that were designed for.

* 1. accessories – powered UNITS
     1. Touch Technology Control: Provide a touchscreen control head on every carriage that has standard system start/stop/reset controls, Infrared Capable Controls and Infrared Remote Controls, and Touch Technology Aisle Access Controls. (as described below) Depending on access rights user can perform the following system controls at each control head: Access aisle left or right of Touchscreen, Toggle stationary locally, Toggle power for the system, Toggle the auxiliary relay output, Tutorials for basic system and safety operation, Administrative functions
     2. Touch Technology Aisle Access Control: Provide a numeric touchscreen keypad at each carriage. 3 – 15 digit Pin-code access can be programmed and reprogrammed by the user, as needs dictate.
     3. Touch Technology Aisle Access Control with Pin-code and Card: Provide a numeric touchscreen keypad at each carriage. 3 – 15 digit Pin-code access. Provide a Card access at one or more carriage location(s). Both Pin and Card access can be programmed and reprogrammed by the user, as needs dictate.
     4. Touch Technology Control Audio: Provide audible, volume controlled, voice prompts and tone activation upon pressing icon controls.
     5. Touch Technology Control Tutorials: Provide audio/visual system use tutorials on touchscreen control head.
     6. Infrared Capable Controls and Infrared Remote Controls: Provide infrared capable control panel at end of each motorized carriage and [one] [two] [additional] handheld infrared remote control user key(s). (In lieu of standard or touchpad controls.)
     7. Individual Touchpad Aisle Access Controls: Provide a 10-digit push button keypad at each secured carriage. 4-digit PIN access code can be programmed and reprogrammed by the user, as needs dictate. (In lieu of standard or infrared capable controls.)
     8. Touchpad System Access Control: Provide one 10-digit push button keypad for each motorized system module. Touchpad control will be used to activate or deactivate system operation. (In addition to standard or infrared capable controls.)
     9. Dual Controls: Provide additional control panel at end of each motorized carriage.
     10. Programmable Aisle: Provide the ability to create more than one aisle per mobile storage module.
     11. System controls shall start motors on each movable carriage [“sequentially” to minimize power demands] [“block” to start all at once] and shall provide dynamic braking to provide smooth operation.
     12. Automatic Battery Backup: Provide an integrated uninterruptible power supply for emergency operations in case of primary power failure. (Includes the Plug-In-The-Wall Power option.)
     13. Power Pack Override: Provide [one] [two] [additional] handheld rechargeable battery pack units to operate modules in case of main power failure.
     14. Plug-In-The-Wall Power: Provide a plug-in-the-wall power option, if permitted by local building code. (In lieu of permanent power connection.)
     15. Automatic Aisle Lighting: Provide top-mounted fluorescent light fixtures.
     16. Stationary aisle lock: Provide key switch to make a movable carriage into a stationary carriage.
     17. Automatic Brake: Provide an automatic security brake on each motorized carriage.
     18. Auto Move Interface: Provide the capability for the motorized mobile storage shelving system to move automatically depending upon the Owner’s requirements. Select [System Auto Cycle] [System Priority Aisle] [System Closed Park] [System Ventilation Park].
     19. Building Management Interface: Provide the capability for the motorized mobile storage shelving system to interface with the building’s fire alarm system or building management system for fire protection [System Fire Park] and security [System Closed Park].

SPEC NOTE: Delete the following paragraph if Mechanical-Assist Units are not required on the Project.

SPEC NOTE: Consult with Technical Representative if unsure about an accessory item identified below. Budget price will also increase with each accessory, so consulting with your technical rep during design stage will limit sticker shock, possibly resulting in value engineering out items that were designed for.

* 1. Accessories - Mechanical-Assist units
     1. Dual Control: Provide operating handle at each end of movable carriages.
     2. Anti-Tip Devices: Provide manufacturer’s standard fixtures.
     3. Waist High Carriage Locks: Provide manufacturer’s standard.
     4. Carriage Mount Locks: Provide manufacturer’s standard.
     5. Photo Sweep Scanning and Safety Stop (Line Powered).
     6. Mechanical Sweep and Safety Stop (Line Powered).
     7. Mechanical Sweep and Safety Stop (Battery Powered).
     8. Mechanical Sweep and Safety Stop (Non-Powered).
  2. fabrication
     1. General: Coordinate fabrication and delivery to ensure no delay in progress of the Work.
     2. Wheels: Provide precision ground and balanced units with permanently shielded and lubricated bearings.
     3. Carriages: Fabricate to ensure no more than 6mm (1/4”) maximum deviation from a true straight line. Splice and weld to ensure no permanent set or slippage in any spliced or welded joint when exposed to forces encountered in normal operating circumstances.
  3. Finishes
     1. Fabricated Metal Components and Assemblies: Manufacturer’s standard powder coat paint finish.
     2. End Panels, Accessible Ends:

SPEC NOTE: Select one of the following options from the list below.

* + - 1. Plastic laminate, manufacturer’s standard available textures and patterns.
      2. Manufacturer’s standard powder coat paint finish in standard available colours.

SPEC NOTE: Select one of the following colour options below.

* + 1. Colours: [As selected by the Consultant from the manufacturer’s standard product line.] [As indicated in Section 09 06 05 – Product and Finish Schedule.][As indicated on the Drawings.]

1. Execution
   1. EXAMINATION
      1. Examine floor surfaces with Installer present for compliance with requirements for installation tolerances and other conditions affecting performance of mobile storage units.
      2. Verify that building structural system is adequate for installing mobile storage units at locations indicated on approved shop drawings.
         1. In new construction, ensure that recesses for rails in floors are at proper spacing and depths, with allowance for grouting.
         2. For installations on existing floors, ensure that rail spacings indicated on shop drawings are in proper locations so existing load-bearing structural members are not over stressed.
      3. Verify that intended installation locations of mobile storage units will not interfere with, nor block established required exit paths or similar means of egress once units are installed.

SPEC NOTE: Delete the following paragraph if Powered Operation is not required on this Project.

* + 1. Verify that adequate capacity permanent power sources have been installed at locations indicated on approved shop drawings.
    2. Prepare written report, endorsed by Installer, listing conditions detrimental to proper performance of mobile storage units, once installed.
    3. Proceed with installation only after unsatisfactory conditions have been corrected.
  1. INSTALLATION
     1. Rails:
        1. Lay out rails using full-length units to the maximum extent possible. Use cut lengths only at ends to attain total length required. Locate and position properly, following dimensions indicated on approved shop drawings.
        2. Verify thickness of finished floor materials to be installed (by others) and install level 1.6mm (1/16”) above finished floor surfaces.
        3. Verify level, allowing for a minimum 6mm (1/4”) of grout under high points. Position and support rails so that no movement occurs during grouting.
        4. Set rails in full grout bed, completely filling any voids entire length of all rails including rail connectors. Trim up sides flush with rails to ensure proper load transfer from rail to supporting floor.
           1. Using shims in lieu of full grouting is not permitted.
        5. Installation Tolerances: Do not exceed levelness of installed rails listed below:
           1. Maximum Variation From True Level Within Any Module: 2.4mm (3/32”).
           2. Maximum Variation Between Adjacent (Parallel) Rails: 1.6mm (1/16”), perpendicular to rail direction.
           3. Maximum Variation In Height: 8mm (1/32”), measured along any 3048mm (10’) rail length.
        6. Verify rail position and level; anchor to structural floor system with anchor type and spacings indicated on approved shop drawings.
     2. Floors/Ramps:
        1. General: Finished elevation shall be 1.6mm (1/16”) below top of rails.
        2. Place floors and ramps to the extent indicated on approved shop drawings. Extend ramps under all movable and stationary ranges. Do not extend ramps beyond the ends of carriages.
        3. Construct floors and ramps to prevent warping or deformation of floor panels in a normal operating environment. Support panels on levelers at maximum 406mm (16”) on center.
        4. Ramp Slope: Do not exceed the following:
           1. ADA Accessible Ramps: Maximum 1:12 slope (4.76 degrees).
           2. Other Ramps: Maximum 9-degree slope (1.9:12).
           3. Vertical Transition, Ramp Edge to Floor: Maximum 3mm (1/8”).
     3. Shelving Units Installation:
        1. General: Follow layout and details shown on approved shop drawings and manufacturer's printed installation instructions. Position units level, plumb; at proper location relative to adjoining units and related work.
        2. Carriages:
           1. Place movable carriages on rails. Ensure that all wheels track properly, and centering wheels are properly seated on centering rails. Fasten multiple carriage units together to form single movable base where required.
           2. Position fixed carriage units to align with movable units; make final leveling adjustments with leveling screws.
        3. Shelving Units:
           1. Permanently fasten shelving units to fixed and movable carriages with vibration-proof fasteners.
           2. Stabilize shelving units following manufacturer's written instructions. Reinforce shelving units to withstand the stress of movement where required and specified.

SPEC NOTE: Delete the following paragraph if Powered Operation is not required on this Project.

* + - 1. Wiring:
         1. Make final control wiring connections between modules under single control.
         2. Test wiring for continuity and proper connections with regulated field power supply before making final power connections.
         3. Make final wiring connections to permanent power source. Connection to power source by others.
         4. Test system operation by cycling all units through complete operations sequences.
  1. FIELD QUALITY CONTROL
     1. Verify shelving unit alignment and plumb after installation. Correct if required following manufacturer’s instructions.
     2. Remove components which are chipped, scratched, or otherwise damaged and which do not match adjoining work. Replace with new, undamaged, matching units.
  2. ADJUSTING
     1. Adjust components and accessories to provide smoothly operating, visually acceptable installation.
  3. CLEANING
     1. Immediately upon completion of mobile shelving installation, clear components and surfaces.
     2. Remove surplus materials, rubbish and debris resulting from mobile shelving installation upon completion of work and leave areas of installation in neat, clean condition.
  4. DEMONSTRATION/TRAINING
     1. Schedule and conduct demonstration of installed equipment and features with Owner's personnel.
     2. Schedule and conduct maintenance training with Owner's maintenance personnel. Training session should include lecture and demonstration of all maintenance and repair procedures that end user personnel would normally perform.
  5. PROTECTION
     1. Advise Owner of additional protection needed to ensure that system will be without damage or deterioration at time of substantial completion.

END OF SECTION