

SECTION 10 76 00
STORAGE SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies manufactured items usually used in Document Storage areas.
- B. Items Specified:
 - 1. Automated Storage and Retrieval Systems.(Lateral filing Cabinets)
 - 2. High Density storage systems.(aisle saver type)
 - 3. Fixed Metal Storage Units.
- B. This section also specifies elevated deck between tracks, wheels, safety ramp and safety features for the for high density system. This section also include all structural uprights , base stabilization, operator controls and safety requirements for automated storage and retrieval system

1.2 RELATED WORK

- A. Color of finishes: Section 09 06 00, SCHEDULE FOR FINISHES. .
- B. Electrical: Related Electrical Specifications Sections. Sections to include power wiring devices conductors, and circuit protection. Power wiring to units from adequate power supply

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings:
 - 1. Each product specified.
 - 2. Layouts for each system specified, showing floor plans elevations, Sections, and installation details.
 - 3. ISO 9001 Certification for both high density units and automated storage and retrieval units.
- C. Samples:
 - 1. One of each type of exposed finish material.
- D. Manufacturer's Literature and Data:
 - 1. For all systems specified.
 - 2. Show type of material, gages or metal thickness in inches, finishes, and when required, capacity of accessories.

1.4 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage an experienced manufacturer who is ISO 9001 certified for design, production, installation and

service automatic storage & retrieval system and carriage mounted high density mobile storage units and support rails. Furnish manufacturer's certification attesting ISO 9001 quality system registration

1.5 PACKAGING AND DELIVERY

- A. Pack accessories individually to protect finish.
- B. Deliver accessories to the project only when installation work in rooms is ready to receive them.
- C. Deliver inserts and rough-in frames to site at appropriate time for building-in.
- D. Deliver products to site in sealed packages of containers; labeled for identification with manufacturer's name, brand, and contents.

1.6 STORAGE

- A. Store products in weathertight and dry storage facility.
- B. Protect from damage from handling, weather and construction operations before, during and after installation in accordance with manufacturer's instructions.

1.7 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
- B. American Library Association:
Cantilever Bracket Type Metal Library Bookstacks; Library Technology Reports.
- C. American society for testing and Materials (ASTM) Standards:
A653/A653M-07.....Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
- C. The National Association of Architectural Metal Manufacturers (NAAMM):
AMP 500 Series.....Metal Finishes Manual
- D. American Institute of Steel Construction (AISC) Standards.
Applicable standards for steel materials used in fabrication.
- E. American National Standards Institute (ANSI) Standards:
Applicable standards for fasteners used in fabrication
- F. Underwriter's Laboratories (UL):
Listings for electrical equipment and devices described in this specification.

**PART 2 - PRODUCTS- HIGH DENSITY MOBILE STORAGE SYSTEM-MECHANICALLY ASSISTED AND
AUTOMATED STORAGE & RETRIEVAL SYSTEM (LATERAL FILING CABINETS)AND
FIXED SHELVING**

2.1 GENERAL MOBILE SHELVING REQUIREMENTS

- A. Movable shelving system shall be a combination of mobile and stationary units. Mobile units shall be mechanically assisted, complete with tracks, safety devices and shelving.
- B. The sizes of movable and stationary ranges in the modules are shown in the drawings supplied with these specifications.
- C. The actual carriage lengths, depths and spacing between closed carriages will be as determined by the manufacturer.
- D. The maximum height of movable storage equipment, measured from top of structural concrete floor to top of canopy: 72" plus leveling requirements.
- E. All aisle widths and clearances for traffic shall be no less than shown on the drawings and shall not be encumbered by any operating control during normal use of the system
- F. All modules must be supplied with number of ranges as shown on the drawings.
- G. The movable and stationary ranges shall be consistent in design, construction, and configuration and with uniform shelf height in the final installation.
- H. The Carriages, shelves and related components shall be designed, constructed and tested and furnished to support and operate within the specified weight loads and within the specified tolerances.
- I. The operation of ranges shall be quiet, smooth, and exhibit no twisting, racking, irregular movement or noticeable variations through the complete cycle of operation under any loading conditions.
- J. The System alignment shall be 1/2" maximum variation, measured between the edges of end panels within each range in a modules in all aisle positions.
- K. Rails, tracks, wheels, and all drive components shall exhibit no abnormal friction, abrasion, binding or wear on or between contact surfaces.
- L. No drifting or rolling of stopped ranges will be acceptable.
- M. Under normal environmental and use conditions, components shall not rust or exhibit any other type of corrosion.

2.2 MOVABLE SHELVING SYSTEM REQUIREMENTS

A. Rail System:

1. Rails shall be designed and manufactured to carry a minimum load of 1,000 pounds per linear foot of carriages.
2. Rails shall exhibit no movement or deflection during operation of mobile ranges.
3. Rails shall be level and not project above or below the walking surface.
4. Rails shall be designed to be attached on top of structural concrete floor and to allow for adjustment so rails can be leveled over an uneven floor.
5. 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.
6. Rail: All systems shall operate with a minimum of 2 tracks. All tracks must be driven. The tracks shall be placed no further than 84" center to center. The tracks shall not exceed 1-1/8" in height. Tracks shall consist of a 1" x 1" bar stock with a Rockwell rating of B95 or higher. The rail bar stock shall be plug welded onto an 11 gauge structural "C" channel 4-9/16" wide. The 1" x 1" bar stock shall be connected at all joints with a circular spring pin that will insure both vertical and horizontal alignment of adjoining rails. Tongue and groove type rail connections that insure horizontal alignment only are not acceptable. Systems which require grouting are difficult to re-level and are, therefore, unacceptable. Track anchors are every 13.36" on center maximum (2 per location).
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.

B. Grouted systems are not acceptable.

C. Deck/Ramp:

1. Deck and Ramp to be specified per end user.
2. Floor covering per finish schedule in Section 09 06 00 SCHEDULE FOR FINISHES.

D. Safeties - Mechanically Assist

1. Primary Safety Aisle Lock: For Protection of the operator and/or materials left in the aisle, the system shall have an aisle safety lock. A minimum of one (1) visible safety lock shall be provided per range. The visible safety lock shall be located directly above the hand crank, approximately waist-level on the front of the end frame assembly. The safety lock must be finger-controlled to prevent movement of the range in either direction. A spring steel roll pin (which is installed in the latch lever) directly engages a slotted disk which is mounted to the gear drive mechanism and prevents the handle from being able to turn. A manually operated spring loaded anti-roll pin will not satisfy this requirement.
2. Mechanical Floor Level Safety Bar:
A Passive Mechanical Floor Level Safety System must be incorporated that insures in-aisle, full time user safety. A steel hinged safety bar must run the full length to the bottom and on both sides of each movable carriage flush with the bottom line of each range frame. The system shall stop movement anywhere in the module when a force of as little as ten ounces is applied to the safety bar. **WHEN THE SWEEP IS ACTIVATED, AN INTERNAL DEVICE SHALL INTERLOCK WITH THE DRIVE TRAIN RESULTING IN A POSITIVE STOP.** The device must be completely mechanical in design and not utilize AC/DC electrical current in any form. The passive safety sweep shall automatically reset upon de-activation.

E. Carriage/Drive/Guide:

1. Carriage: All modular carriage frames shall be a minimum 11 gauge steel "U" channel design to insure rigidity of the system, Only steel carriage frames shall be considered and must be no less than 5" high x 1-3/4" wide with 11 gauge cross-bracing members at no interval greater than 48" center to center. The steel carriage frames shall be painted with quality powder coat paint or baked enamel. The overall carriage height with wheels shall not exceed 5-1/2". Stationary carriages at the end of the system shall be of the same construction and height as the movable carriages and must be anchored to the tracks.
2. Carriage Load: The standard load capacity of any carriage shall be a minimum of 1,000 lbs. per lineal foot.
3. Drive Train-Double Flanged Wheels: True 5" dia, (measured bearing surface to bearing surface not including flange) drive wheels located on one side of the carriage shall be connected by a full

length coupled tubular drive shaft. the dimensions of the drive shaft must have at least an outside dimension of 1.125", with an inside dimension of .885", with a wall thickness of at least .120". All wheels on one side of the carriage shall be drive wheels. Double flanged wheels shall act as a guiding system. All additional wheels shall be of the same specifications of the 5" double flanged wheels. Each wheel shall be mounted on a .750" diameter solid steel shaft which is supported by permanently lubricated; self-aligning sealed ball-bearing pillow blocks. Systems utilizing a chain driven system mounted on the drive track or systems not requiring all tracks driven, twist and rack and are, therefore, unacceptable. The connection between the drive shaft and the wheel shaft shall be by two (2) steel spring pins placed at 90 degree angles to insure the elimination of any play. Coupling type devices shall not be allowed and are not acceptable. Ranges less than 18" in depth shall use wheels not less than 3-5/8" dia. Bearing surface.

4. Operation: The handle is turned in the direction of the desired range movement. A sprocket on inboard end transmits the motion via a chain to a sprocket on the axle on one side of the undercarriage. The axle is common to all wheels on that side, and therefore, functions as drive wheels. This system must be designed so that the following gear ratios are available as options: 1:4,000.

F. Operating Handles:

1. Handles: The system must be designed such that a choice of interchangeable handles are available. The handle shall be a single crank, 3-prong, or a collapsible/disengaging single crank handle.

2.3 END FRAMES

- A. The end frame must be constructed of no less than 18 gauge cold rolled steel of commercial quality and painted with powder coat paint or quality baked enamel. This end frame shall be a structural component to insure the integrity of the shelving mount between the carriage and the end frame. The shelving must be attached to the end frame at the top, the middle and the bottom of the end frame to insure stability of the shelving and integrity of the mount to the carriage. The Choice of the color of the end frame is to be specified by the customer from factory standard paint colors.

2.4 ANTI-TIPS

A. Undercarriage Anti-Tip: Install on each of the wheel frames per movable carriages less than 24" D; required on all ranges less than 24" in depth.

1. For safe operation of the system, an anti-tip device shall be provided and bolted to the carriage, which has a lip riding under the flange on each rail (2 per wheel). Anti-tip angles must be constructed of no less than 11 gauge steel and must have a bottom flange (interlocking with rail) of no less than 7/8" wide.

2.4 AUTOMATED STORAGE & RETRIEVAL SYSTEM (LATERAL FILING CABINET)

A. General Specification Data: Base Unit includes lockable door, top, all safety circuits, safety light curtain, emergency stop right, Touch bars (upper and lower) motor and electronics and as follows:

- | | |
|------------------------------------|---------------------------|
| 1. Drive Gear Motor; | AC- Gear Motor - 1.5 kva. |
| 2. Power Supply: | 110 Volt/1 ph/ 60 Hz. |
| 3. Fuse: | 16AMP Delay |
| 4. Maximum Imbalance Load: | 300 kg 9660 lbs) |
| 5. Max. Total Load | 4070 kg (8,973 lb). |
| (includes carrier dead weight) | |
| 6. Top Tolerance at Balanced Load: | +/- 15 mm (.059") |
| 7. Cycle Speed: | 7.0 inches/second |
| 8. Averaged Power Consumption: | 2.0 KVA |
| 9. Noise Level : | <60db (A) |

B. Standard Safety Features:

1. Error Indicator.
2. Safety Light Standard: Curtain. Safety Switches for lower front
3. E -Stop Operator right side.
4. Upper and Lower Mechanical Safety Bars (doors)
5. Safety Switches for lower front and hand Crank Opening.

C. Additional Safety Features:

1. Emergency Service Switch.

D. Standard Features:

1. Electronics located in bottom Access Panel.
2. Hand Crank for installation of carrier and Service
3. Lockable Doors.
4. Top Dust Cover.
5. Access for Service from front.
6. UL Label.

E. Additional Features and Options: T- 3LCD mounted in Posting Board.

1. T- 3LCD mounted in Posting Board.
 2. Automatic Security Door.
 3. 126- Steel Letter Size Tray.
 4. Each User (up to 25) has a unique 4 digit PIN code. (The PIN identifies the approved shelves assigned to the user).
- F. Units can be placed side by side, or back to back. A minimum of 250 mm(10 inches) distance between carousel sides and building walls required.
- G. CAROUSEL SPECIFICATIONS: - Basis of Design : KardexRemstar Lektriever ELF:
1. Model Number: 125-1811S.
 2. Overall Unit Width: 2630 mm (103.54 inches)
 3. Overall Unit Depth (without posting board) 1202 mm (47.3 inches)
 4. Overall Unit Height: 3000 mm (118.1 inches)
 5. Unit Weight Empty (includes carrier weight: 2840 lbs.
 6. Unit Weight - Fully loaded: 7196 lbs.
 7. Average Access Time (¼ carousel revolution): 7.1 seconds.
 8. Work Counter (posting board) Depth: 300 mm (11.82 Inches)
 9. Working Counter (posting board) Height: 1000 mm (39.37 inches)
 10. Access Opening Height: 493 mm (19.41 inches)
- I. Type: Light gray laminate.
- J. Carousel's Carrier Configuration:
1. Carrier with 60 deg. Lip:
 - a. Quantity: 18
 - b. Clear height: 9.88 inches.
 - c. Clear Width: 89.37 inches.
 - d. Max. Capacity : 242 lbs.
 - e. Average capacity 242 lbs.
 - f. Carrier Weight: 62 lbs.
- K. Total linear filing Inches (LFI) for I unit : 1602.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before starting work notify Resident Engineer in writing of any conflicts detrimental to installation or operation of units.
- B. Verify with the Resident Engineer the exact location of Units
- C. Examination: Examine floor surfaces with installer present for compliance with requirements for installation tolerances and other conditions affecting performance of systems specified.

!. For installations on existing floors , ensure that ensure that rail spacings indicated on the shop drawings are in proper locations and weight of lateral units and mobile files will not over stress the existing structural members.

3.2 INSTALLATION

- A. Set work accurately, in alignment and where shown. Items shall be plumb, level, free of rack and twist, and set parallel or perpendicular as required to line and plane of surface.
- B. Instal in strict compliance with the manufacturers written instructions.

3.4 CLEANING

After installation, clean as recommended by the manufacturer and protect from damage until completion of the project.

3.5 DEMONSTRATION/TRAINING

- A. Schedule and conduct demonstration of installed equipment and features with Owner's personnel.
- B. Schedule and conduct maintenance training with Owner's maintenance personnel. Training sessions should include lecture and demonstration of all maintenance and repair procedures that end user personnel would normally perform.

3.6 Protection

- A. Protect systems against damage during remainder of construction period.
Advise Owner of additional protection needed to ensure that systems will be without damage or deterioration at time of substantial completion.

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