**PART 1 – GENERAL**

**1.00 SUMMARY**

 A. Section Includes:

 1. Tables

 2. Shelves

 3. Support Structures

 B. Related Sections:

 1. Section 11603 - Laboratory Equipment

 2. Section 12344 - Wood Laboratory Casework

**1.01 ALTERNATE PROPOSALS**

 Proposals are invited from alternate manufacturers only if they comply with the minimum design requirements and the minimum performance requirements. A notarized letter stating full compliance must be included in alternate proposals signed by an officer of the manufacturer to ensure compliance.

**1.02 SYSTEM DESIGN REQUIREMENTS**

 A. Modular dimensioned system of support structures and tables.

 B. Support structure for tables, storage units and shelves.

 C. System requirements:

 1. Independently support work surfaces, undercounter cabinets, and overhead storage components.

 2. Structural components are essentially self-supporting and independent of the building structure.

 3. Cabinet fastening devices cannot be accidently released from framing system. Intentional release can be easily accomplished without disturbing the cabinet contents by loosening two bolts.

 4. Base cabinets can be removed without removal of the work surface.

 5. Cabinets can be relocated while fully loaded and installed in any position between table legs.

 6. Vertical height of table work surfaces, wall cases and shelves can be adjusted with simple, but positive mechanisms.

**1.03 SUBMITTALS**

 A. Shop Drawings: Provide 3/4" = 1'-0" scale elevations of all components, cross sections, rough-in and anchor placements, tolerances and clearances. Provide 1/4" = 1'0" rough-in plan drawings for coordination with other work. Rough-in shall show free area.

 B. Structural calculations and shop drawings are required to be submitted and approved by the Owner's Representative prior to product being manufactured.

 C. Before commencement of full production manufacturing, submit for Owner's Representative's approval, one complete Type MA moveable cart as shown on sheet A9.71. Do not proceed with full production of the cart before receiving written approval of the sample unit and approval of other submittal items listed above.

**1.04 QUALITY ASSURANCE**

 A. Single source responsibility: Casework, work surfaces, laboratory metal frames and shelving standards, and all accessories shall be furnished by a single, laboratory casework contractor.

 B. Manufacturers are required to manufacture the product as shown on the drawings and as specified herein, no exceptions.

 C. Manufacturer's qualifications: Modern plant with proper tools, dies, fixtures and skilled workmen to produced high quality laboratory moveable carts and casework, and shall meet the following minimum requirements:

 1. Five years or more experience in manufacture of laboratory casework and equipment of type specified.

 2. Ten installations of equal or larger size with similar requirements.

* 1. **REFERENCE STANDARDS**
1. All casework, worksurface and service fixture construction and performance characteristics shall be in full compliance with SEFA (Scientific Equipment and Furniture Association) standards. At the owner’s request, independent, third party testing must be submitted validating compliance and adheres to the architectural specifications.
	* + 1. SEFA 2.3 – Installation of Scientific Laboratory Furniture and Equipment.
			2. SEFA 3 – Work Surfaces
			3. SEFA 7 – Laboratory and Hospital Fixtures
			4. SEFA 8 – Laboratory Furniture

**1.06 DELIVERY, STORAGE AND HANDLING**

 A. Schedule delivery of moveable cart system so that lab spaces are sufficiently complete in order that material can be installed immediately following delivery.

 B. Protect finished surfaces from soiling or damage during handling and installation.

**1.07 PROJECT CONDITIONS**

 A. Do not deliver or assemble equipment until the following conditions have been met:

 1. Windows and doors are installed and the building is secure and weather tight.

 2. Ceiling, overhead ductwork and lighting are installed.

 3. All painting is completed and floor tile is installed.

**PART 2 – PRODUCTS**

**2.01 MANUFACTURER**

 A. Laboratory moveable cart system manufacturer. Hamilton Laboratory Solutions, 825 East Albert Drive, Manitowoc, WI 54220.

**2.02 TABLES**

 A. General requirements for tables:

 1. Work surface support frame: 11 gauge cold rolled steel tubing. Cabinet support channels: 14 gauge cold rolled steel. Weld members using the inert gas process.

 2. Support arms:

 a. Cantilever support arms: 11 gauge cold rolled steel.

 3. End caps: Flame resistant ABS plastic, color matched.

 B. Cantilever Table Frame:

 1. Nominal table frame dimensions (each cart is made up of 2 frames):

 a. Width: 36"

 b. Depth: 23"

 c. Height (table frame uprights): 20"

 2. Capable of vertical adjustment in one inch increments.

 3. Hanging hook: Five support fingers of 11 gauge cold rolled steel.

 4. Leveling/locking stud: Provide in leg member and design to engage the upright and provide a positive means of locking the cantilever table frame to the upright. Stud shall be capable of raising front edge of the work surface 0.120 - 0.150 inch for leveling purposes.

 5. Cantilever table frame shall provide support channels from which suspended cabinets can be hung and adjusted horizontally.

 6. 30" deep table frame must allow suspended base cabinets to be positioned in front of table frame uprights.

 7. Weight capacity: Work surface plus 600 pounds.

**2.03 SHELVES**

 A. General requirements for shelves:

 1. Shelves, hat channel supports, and separate 3" high seismic lip: 18 gauge cold rolled steel.

 2. Shelf brackets: 11 gauge cold rolled steel.

 3. Vertical shelf adjustment: One inch increments.

 4. Depth and weight capacity: [6" = 180 lbs.] [8" = 180 lbs.] [12" = 180 lbs.] [18" = 130 lbs.] [24" = 100 lbs.]

 B. Outside Shelf:

 1. Nominal dimensions:

 a. Length: 36"

 b. Depth: 6", 8", 12", 18"

 2. Shelf shall be capable of being locked into position.

 C. Connecting Shelf:

 1. Nominal dimensions:

 a. Length: 36"

 b. Depth: 14-1/2"

 2. Locks into existing shelves to form a single depth shelf when carts are locked back-to-back.

 3. Provide 1" high seismic lip at both narrow ends of each shelf.

**2.04 SUPPORT STRUCTURES**

 A. General requirements for panel type support structures:

 1. Riser uprights: 16 gauge cold rolled steel.

 2. Riser uprights to have an upper and lower portion connected together with an internal connecting device and no external fasteners. Upper riser portion can be removed and lower portion functionality is not to be affected.

 3. Vertical upright: notched for one inch adjustment of components supported off riser upright.

 4. Cart base: 2" x 3" 11 gauge steel rectangular tubing welded together.

 5. Casters: Provide (4) 3" dia. wheels with self-lubricating bearings, rated to carry 365 lb. min. each. Each caster must swivel and have a locking brake.

 6. End caps: ABS plastic, color matched.

 7. Finish: Chemical resistant powder coat paint finish in standard Hamilton colors.

 8. The maximum total load rating of unit is 900 lbs.

 9. The overall height of the mobile cart is 78" to 80", length 49", 61" and 73" and the depth is 30" with upper portion of the uprights attached. If the upper portion of the upright is removed, the overall height is 36.31".

 10. Mobile cart must be able to be tipped 10 degrees in any direction with no accessories attached and be able to right itself to its upright position.

 11. The 6’ cart must provide for two-three (3) foot long independently adjustable work surfaces and shelving options.

**2.05 CASEWORK MATERIALS**

 A. Sheet steel: Mild, cold rolled and leveled unfinished steel.

 B. Minimum gauges:

 1. 22 gauge: Solid door interior panels, drawer fronts, drawer bodies and shelves.

 2. 20 gauge: Case tops, ends, bottoms, bases, backs, vertical posts, uprights, glazed door members, door exterior panels and access panels.

 3. 15 gauge: Top front rails, top rear gussets, and intermediate horizontal rails.

 4. 14 gauge: Drawer suspensions, door and case hinge reinforcements and front corner reinforcements.

**2.06 CHEMICAL RESISTANT PLASTIC LAMINATE WORK SURFACE**

 A. Material: Plastic sheet material, GP50, formed of papers treated and coated with thermosetting resins, pressure bonded to one inch thick 45 lb. density particle board core and backed with melamine backer sheet. Bank exposed edges with 3mm edge banding. Provide material in color selected by Owner's Representative from manufacturer's full range of standard colors.

**2.07 CASEWORK FABRICATION**

 A. Suspended casework: 19" nominal height suspended casework units in one piece, wrap around design with reinforced front and rear posts.

 1. Provide finished back on all suspended cabinets.

 2. Do not provide toe base on suspended cabinets.

 3. Hanging brackets: Provide (2) two piece mechanical clamp brackets at front per cabinet, and (2) rear brackets. When slightly loosened, suspended cabinet can trolley horizontally.

 B. Drawers:

 1. Drawer fronts: 3/4" thick, double wall construction, pre-painted prior to assembly and sound deadened.

 2. Drawer bodies: Bottom and sides formed into one-piece center section with bottom and sides coved and formed top edges. Front and back panels spot welded to center section.

 3. Drawer suspension: Heavy duty covered raceways for both case and drawer with nylon tired, ball bearing rollers; self-centering and self-closing when open to within 5" of the closed position.

 4. Provide drawer with rubber bumpers. Friction centering devices are not acceptable.

 C. Shelves:

 1. Form front and back edges down and back 3/4". Form ends down 3/4".

 2. Reinforce shelves over 36" long with welded hat channel reinforcement the full width of shelf.

 D. Hardware:

 1. Drawer recessed pulls: Manufacturer's standard plastic pulls.

**2.08 METAL FINISH**

A. Metal finish:

 1. Preparation: Spray clean metal with a heated cleaner/phosphate solution, pre-treat with iron phosphate spray, water rinse, and neutral final seal. Immediately dry in heated ovens, gradually cooled, prior to application of finish.

 2. Application: Electrostatically apply urethane powder coat of selected color and bake in controlled high temperature oven to assure a smooth, hard satin finish. Surfaces shall have a chemical resistant, high grade laboratory furniture quality finish of the following thickness: **Liquid, dipped, solvent based finishes are not and will not be acceptable.**

 a. Exterior and interior exposed surfaces: 1.5 mil average and 1.2 mil min.

 b. Backs of cabinets and other surfaces not exposed to view: 1.2 mil average.

B. Cabinet Surface Finish Tests:

 **All casework construction and performance characteristics shall be in full compliance with SEFA 8 standards.** At the owner’s request, independent, third party performance testing must be submitted validating compliance and adheres to the finish specifications.

## **1. Chemical Spot Test**

###  1.1 Purpose of Test

The purpose of the chemical spot test is to evaluate the resistance a finish has to chemical spills.

 **Note:** Many organic solvents are suspected carcinogens, toxic and/or flammable. Great care should be exercised to protect personnel and the environment from exposure to harmful levels of these materials.

###  1.2 Test Procedure

 Obtain one sample panel measuring 14" x 24" (355.6mm x 609.6mm). The received sample to be tested for chemical resistance as described herein.

 Place panel on a flat surface, clean with soap and water and blot dry. Condition the panel for 48-hours at 73+ 3F (23(+ 2(C) and 50+ 5% relative humidity. Test the panel for chemical resistance using forty-nine different chemical reagents by one of the following methods:

 **Method A –** Test volatile chemicals by placing a cotton ball saturated with reagent in the mouth of a one-ounce (29.574cc) bottle and inverting the bottle on the surface of the panel.

 **Method B –** Test volatile chemicals by placing five drops of the reagent on the surface of the panel and covering with a 24mm watch glass, convex side down.

 For both of the above methods, leave the reagents on the panel for a period of **one hour.** Wash off the panel with water, clean with detergent and naphtha, and rinse with deionized water. Dry with a towel and evaluate after 24-hours at 73±3°F (23°±2°C) and 50±5% relative humidity using the following rating system:

**Level 0 –** No detectable change.

**Level 1 –** Slight change in color or gloss.

**Level 2 –** Slight surface etching or severe staining.

**Level 3 –** Pitting, cratering, swelling, or erosion of coating. Obvious and significant deterioration.

 **Test No. Chemical Reagent Test Method**

 1. Acetate, Amyl A

 2. Acetate, Ethyl A

 3. Acetic Acid, 98% B

 4. Acetone A

 5. Acid Dichromate, 5% B

 6. Alcohol, Butyl A

 7. Alcohol, Ethyl A

 8. Alcohol, Methyl A

 9. Ammonium Hydroxide, 28% B

 10. Benzene A

 11. Carbon Tetrachloride A

 12. Chloroform A

 13. Chromic Acid, 60% B

 14. Cresol A

 15. Dichlor Acetic Acid A

 16. Dimethylformanide A

 17. Dioxane A

 18. Ethyl Ether A

 19. Formaldehyde, 37% A

 20. Formic Acid, 90% B

 21. Furfural A

 22. Gasoline A

 23. Hydrochloric Acid, 37% B

 24. Hydrochloric Acid, 48% B

 25. Hydrogen Peroxide, 3% B

 26. Iodine, Tincture of B

 27. Methyl Ethyl Ketone A

 28. Methylene Chloride A

 29. Mono Chlorobenzene A

 30. Naphthalene A

 31. Nitric Acid, 20% B

 32. Nitric Acid, 30% B

 33. Nitric Acid, 70% B

 34. Phenol, 90% A

 35. Phosphoric Acid, 85% B

 36. Silver Nitrate, Saturated B

 37. Sodium Hydroxide, 10% B

 38. Sodium Hydroxide, 20% B

 39. Sodium Hydroxide, 40% B

 40. Sodium Hydroxide, Flake B

 41. Sodium Hydroxide, Saturated B

 42. Sulfuric Acid, 33% B

 43. Sulfuric Acid, 77% B

 44. Sulfuric Acid, 96% B

 45. Sulfuric Acid, 77% and Nitric

 Acid, 70%, equal parts B

 46. Toluene A

 47. Trichloroethylene A

 48. Xylene A

 49. Zinc Chloride, Saturated B

### 1.3 Acceptance Level

 Results will vary from manufacturer to manufacturer. **Laboratory grade finishes should result in no more than four Level 3 conditions.** Suitability for a given application is dependent upon the chemicals used in a given laboratory.

##  **2. Hot Water Test**

###  2.1 Purpose of Test

 The purpose of this test is to insure the coating is resistant to hot water.

###  2.2 Test Procedure

 Hot water, 190°F to 205°F (88°C to 96°C), shall be allowed to trickle (with a steady stream and at a rate of not less than 6 ounces (177.44cc) per minute on the surface, which shall be set at an angle of 45-degrees, for a period of five minutes.

### 2.3 Acceptance Level

 After cooling and wiping dry, the finish shall show no visible effect from the hot water.

##  **3. Impact Test**

###  3.1 Purpose of Test

 The purpose of this test is to evaluate the ductility of the coating.

###  3.2 Test Procedure

 A one-pound ball approximately 2" (50.8mm) in diameter shall be dropped from a distance of 12" (304.8mm) onto a flat horizontal surface, coated to manufacturer’s standard manufacturing method.

###  3.3 Acceptance Level

 There shall be no visible evidence to the naked eye of cracks or checks in the finish due to impact.

##  **4. Paint Adhesion on Steel Test**

###  4.1 Purpose of Test

 The paint adhesion test is used to determine the bond of the coating to steel. This does not apply to non-steel products.

###  4.2 Test Procedure

This test is based on ASTM D2197-86 “Standard Method of Test for Adhesion of Organic Coating”. Two sets of eleven parallel lines 1/16" (1.587mm) apart shall be cut with a razor blade to intersect at right angles thus forming a grid of 100 squares. The cuts shall be made just deep enough to go through the coating, but not into the substrate. They shall then be brushed lightly with a soft brush for one minute. Examine under 100-foot candles of illumination.

###  4.3 Acceptance Level

 Ninety or more of the squares shall show finish intact.

##  **5. Paint Hardness on Steel Test**

###  5.1 Purpose of Test

 The paint hardness test is used to determine the resistance of the coatings to scratches.

### 5.2 Test Procedure

 Pencils, regardless of their brand, are valued in this way: 8-H is the hardest, and next 11 order of diminishing hardness are 7-H, 6-H, 5-H, 4-H, 3-H, 2-H, H, F, HB, B (soft), 2-B, 3-B, 4-B, 5-B (which are softest).

 The pencils shall be sharpened on emery paper to a wide sharp edge. Pencils of increasing hardness shall be pushed across the paint film in a chisel-like manner until one is found that will cut or scratch the film. The pencil used before that one, that is the hardest pencil that will not rupture the film, is then used to express or designate the hardness.

###  5.3 Acceptance Level

 The paint shall have a hardness of 4-H minimum.

**PART 3 – EXECUTION**

**3.01 INSTALLATION**

 A. Cart system installation:

 1. Assemble system in strict accordance with manufacturer's instructions.

**3.02 ADJUSTING**

 A. Repair or remove and replace defective work, as directed by (Owner's representative) upon completion of installation.

**3.03 CLEANING**

 A. Clean shop finished laboratory furniture system surfaces and touch up as required.

**3.04 PROTECTION OF FINISHED WORK**

 A. Do not install until construction is complete on the project.

1. Advise Owner's Representative of procedures and precautions for protection of material, installed laboratory furniture system, casework and fixtures from damage by other work.

END OF SECTION