**PART 1 – GENERAL**

**1.01 SUMMARY**

 A. Section Includes:

 1. Support structures.

 2. Tables frames.

 3. Shelves.

 4. Rolling suspended base cabinets.

 B. Related sections:

 1. Section 11610 - Laboratory Fume Hoods are a part of the work of this section.

 2. Section \_\_\_\_\_-\_\_\_\_\_: Furnishing and installation of plumbing utilities and final connections.

 3. Section \_\_\_\_\_‑\_\_\_\_\_: Furnishing and installation of exhaust ductwork and equipment, and final connection to fume hood(s).

 4. Section \_\_\_\_\_‑\_\_\_\_\_: Furnishing and installation of electrical utilities and final connections.

**1.02 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.

**1.03 SYSTEM DESIGN REQUIREMENTS**

 A. Modular dimensioned system of vertical upright support structures and cantilevered support frames.

 B. Heavy-duty support base with vertical uprights: Support structure for tables and shelves.
1. Modular units shall be suitable for wall, peninsula or island configurations.

 2. Mobile support frames can be ganged side-to-side and back-to-back.

 3. Equipped with leveling-casters that allow the work surface to be leveled and the equipment rack to be height-adjusted.

 C. Tables: Modular, interchangeable work surface support structures in adjustable height configurations.

 1. Adjustable height table frames support cantilever configurations.

 2. Leveling casters available on all adjustable height equipment rack frames.

1. System requirements:
	1. Independently support work surfaces, undercounter cabinets and shelves.
	2. Structural components are essentially self-supporting and independent of the building structure.
	3. Cabinet fastening devices cannot be accidentally released from framing system. Intentional release can be easily accomplished without disturbing the cabinet contents by simply loosening hand knob.
	4. Hand knob shall be designed to secure a rolling suspended cabinet in the desired location along the horizontal table frame rail.
	5. Suspended base cabinets can be trolled horizontally along the full width of the cantilevered table frame and positioned anywhere between the end supports without the use of tools.
	6. Work surfaces and shelves are adjustable vertically on 1” increments and can be removed with the use of simple hand tools.
	7. All work surfaces are reconfigurable by the user or maintenance personnel with removable and reinstallation of 8 positive mechanical attachments per support assembly.
	8. Leveling-casters allow precise movement of the equipment rack with little effort. Caster feet can be extended and can be lift the caster and equipment rack into a level and stationary position.
	9. Removable lower work surface shall allow for 24.5” clear usable space below the work surface within the same plane as the main work surface for equipment clearance.
	10. Overall equipment rack height shall not exceed 77” for free access though a standard door frame.
	11. Units of all sizes are tested and certified to hold 2600 pounds, plus the rack weight, distributed over four surfaces while maintaining full mobility. Unit tested for greater loads as worst case scenarios.
	12. All equipment racks shall be ADA compliant.

**1.04 SUBMITTALS**

 Include number of each type of submittal required if this information is not covered in Division 1 or elsewhere.

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

**1.05 QUALITY ASSURANCE**

1. Single source responsibility: Casework, work surfaces, laboratory fume hood and equipment and accessories shall be manufactured or furnished by a single laboratory furniture company.
2. All casework construction and performance characteristics shall be in full compliance with SEFA 8M standards. At the owner’s request, independent, third part testing must be submitted validating compliance and adheres to the architectural specifications.
3. Manufacturer's qualifications: Modern plant with proper tools, dies, fixtures and skilled workmen to produce high quality laboratory casework and equipment, 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 and requirements.
4. Installer's qualifications: Factory trained and/or certified by the manufacturer.
5. Cabinet identification: Equipment racks and cabinets are identified on drawings by manufacturer's catalog numbers. Unless otherwise modified on drawings or in specifications, catalog description constitutes specific requirements for each type of cabinet.

**1.06 DELIVERY, STORAGE AND HANDLING**

 A. Schedule delivery of laboratory furniture system so that spaces are sufficiently complete that material can be installed immediately following delivery.

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

**1.07 PROJECT CONDITIONS**

 Do not deliver or install equipment until the following conditions have been met:

 1. Windows and doors are installed, the building 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**

1. Casework and equipment manufacturer: Hamilton Laboratory Solutions, 825 East Albert Drive, Manitowoc, WI 54220.
2. Design, materials, construction and finish of equipment racks and casework specified are the minimum acceptable standard of quality for adaptable/mobile laboratory equipment racks.

**2.02 EQUIPMENT RACKS**

1. General requirements for tables:
2. Vertical structural support: 7-gauge extruded aluminum pre-tapped on two inch increments to accept mechanical fasteners for cantilevered frames.
3. Equipment rack base: 2” X 3” 11-gauge cold rolled horizontal base shall incorporate leveling-casters that enable the end-user to extend the leveler support foot to prevent any moment from equipment or personnel.
4. Table/shelf support frame: Frame and table support shall be 7-gauge steel plates. Horizontal rails shall be 7-gauge anodized extruded aluminum.
5. Finish: Chemical resistant urethane powder paint finish in manufacturer's standard color to be selected.

 B. Cantilever Table/Shelf Frame:

* + - 1. Nominal table frame dimensions:
				1. Width: [30”] [36"] [48"] [60"] [72”]
				2. Depth: [18”] [30"].
				3. Height: [6.5"].
			2. Capable of vertical adjustment in one-inch increments.
			3. Support arm bracket: Support frame of 7-gauge cold rolled steel plates that incorporates four mechanically fastened machine bolts that interlock into a machine trended welded lock nut.
			4. Cantilever table frame shall provide aluminum support channels from rolling suspended cabinets can be hung and adjusted horizontally.
			5. Weight capacity:
				1. Total equipment rack plus 2600 pounds.
				2. Work surface plus 1000 pounds.
				3. Shelf unit plus 550 pounds.
				4. Lower shelf plus 440 pounds.
			6. Work surface and shelf materials shall be available in phenolic resin and epoxy resin options.

 **2.03 SUPPORT STRUCTURES**

General requirements for equipment rack and cantilevered type support structures:

1. Riser uprights: 7-gauge extruded aluminum supplied with two parallel rows of machine threaded holes that accept bolts which positively engage the table and shelf frames.
2. Frames: Rails shall be 7-gauge anodized aluminum.
3. Side support brackets: 7-gauge cold rolled steel.
4. Bottom shelf rails: 11-gauge cold rolled steel.
5. Slotted adjustment machined into riser upright: punched for one-inch adjustment of components supported off riser upright.
6. Extruded aluminum vertical upright equipped with full-height front slot for attached of equipment and rack accessories. Adjustment is infinite with the height of the vertical.
7. Aluminum retaining rods at the back and side of work surfaces for loading safety and visual and physical load barriers. Upper shelves can accommodate retaining on sides, back and front edges.

**2.04 SHELVES**

1. General requirements for shelves:
2. Shelves are supported with an assembled cantilevered frame with rear rails.
3. Shelf brackets: 7-gauge cold rolled steel.
4. Vertical shelf adjustment: One inch increments.
5. Weight capacity: [18"d = 550 lbs.]

 B. Shelf:

 1. Nominal dimensions:

 a. Length: [30”] [36"] [48"] [60"] [72”]

 b. Depth: [18"]

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

 C. Shelf materials shall be available in phenolic resin and epoxy resin options.

**2.05 SUSPENDED BASE CABINETS**

1. Design requirements, performance requirements, materials, fabrication and hardware shall comply in all respects with fixed wood and/or steel casework specifications in this section.
2. Rolling cabinet hardware: Provide a system of aluminum rails and steel brackets attached to the casework frames, to be vertically adjustable on one-inch increments. Hand knob shall be designed to secure a rolling suspended cabinet in the desired location along the horizontal table frame rail. Hand Installation and removal of rolling cabinets to be accomplished without the use of special tools.

**2.06 FINISHES**

 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 dripped, solvent based finishes are not and will not be acceptable.
				1. Exterior and interior exposed surfaces: 1.5 mil average and 1.2 mil min.
				2. Backs of cabinets and other surfaces not exposed to view: 1.2 mil average.

B. Cabinet Surface Finish Tests:

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

# 2.07 CABINET SURFACE FINISH TESTS

##  A. Chemical Spot Test

###  B. 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.

 C. Test Procedure

1. 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.
2. 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:
	1. 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.
	2. 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.
3. 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

###  D. 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.

## 2.08 HOT WATER TEST

### Purpose of Test

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

### 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.

###  C. Acceptance Level

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

## 2.09 IMPACT TEST

###  A. Purpose of Test

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

 B. 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.

 C. Acceptance Level

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

## 2.10 PAINT ADHESION ON STEEL TEST

###  A. 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.

### B. 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.

###  C. Acceptance Level

 Ninety or more of the squares shall show finish intact.

## 2.11 PAINT HARDNESS ON STEEL TEST

###  A. Purpose of Test

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

###  B. Test Procedure

1. 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).
2. 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.
3. Acceptance Level

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

**PART 3 – EXECUTION**

**3.01 INSTALLATION**

 A. Furniture system installation:

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

 2. Set system components plumb, square, and straight with no distortion and securely anchored to building structure. Shim as required using concealed shims.

 B. Install suspended casework, work surfaces, sinks and accessory items per Section 12345.

**3.02 ADJUSTING**

 A. Repair or remove and replace defective work, as directed by [Architect] [Owner] 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. Provide all necessary protective measures to prevent exposure of laboratory furniture system and attached components from exposure to other construction activity.

 B. Advise contractor of procedures and precautions for protection of material, installed laboratory furniture system, casework and fixtures from damage by work of other trades.

**END OF SECTION**