**PART 1 – GENERAL**

**1.00 SUMMARY**

 A. Section Includes:

 1. Worktops

 2. Support Structures

 3. Shelves

 4. Upper and Lower Storage Units

**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 MINIMUM DESIGN REQUIREMENTS**

 A. System components, cabinets, tops and accessories must be interchangeable within the system to allow for maximum adjustability.

 B. Modular dimensioned system of 1-1/4" (width) x 1" (depth) wall rail style support structures.

 C. Wall Rail: Wall attached support structure for tables, storage units and shelves, and component accessories.

 1. Modular units shall be suitable for wall, peninsula or island configurations.

 2. Slotted Vertical Rails can be supported by horizontal channels bolted to wall structure.

 3. Equipped with easy to remove insert panels.

 D. Minimum System Requirements

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

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

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

 4. Wall cabinets are adjustable vertically and laterally and can be removed with the use of simple hand tools.

 5. Cabinets can be relocated while fully loaded and installed in any position between cantilevered table support arms on 23" deep worksurfaces.

 6. Vertical height of table work surfaces, wall cases and shelves can be adjusted with simple, but positive mechanisms (on one inch increments).

 7. Work surface must support a minimum of 400 lb., live loads, shelves must support a minimum of 180 lbs. - 6" deep shelves to 100 lbs. - 24" deep shelves live loads.

 8. Cabinets can be mounted in front of cantilevered support arms on 29" deep worksurfaces.

**1.03 SUBMITTALS**

 A. Shop Drawings: Provide 1/2" = 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 trades. Rough-in shall show free area.

 B. Provide color selection charts from manufacturer's standard colors.

 C. Instruction: Submit for review and approval written instructions in booklet form providing additional details on safe and proper operation and maintenance.

**1.04 QUALITY ASSURANCE**

 A. Single source responsibility: Laboratory furniture system and work surfaces shall be manufactured or furnished by a single laboratory furniture company.

 B. Manufacturer's qualifications: Modern plant with proper tools, dies, fixtures and skilled workmen to produce high quality casework and equipment, and shall meet the following minimum requirements.

 1. Five years or more experience in manufacture of laboratory casework.

 2. Ten or more installations of equal or larger size and requirements.

* 1. **REFERENCE STANDARDS**
1. All casework, work surface 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 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**

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

 1. Windows and doors are installed and the building is secure and weathertight.

 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. Laboratory Furniture System Manufacturer: Hamilton Laboratory Solutions, 825 East Albert Drive, Manitowoc, WI 54220.

**2.02 WORK SURFACES AND SUPPORTS**

 A. Cantilever Table Frame:

 1. Nominal table frame dimensions:

 a. Width: 24", 30", 36", 48", 60" and 72"

 b. Depth: 23", 29"

 c. Height: 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. Total width of suspended cabinets must be equal to the table width on 29" deep table frames.

 7. Weight capacity: 600 pounds includes the work surface.

**2.03 SUPPORT STRUCTURES**

 A. General requirements for wall rail type support structures:

 1. Horizontal Vertical Rails: Cold rolled 11 gauge steel, slotted vertical, notched for one inch adjustment of components.

 2. Horizontal Frames: Cold rolled steel, 11 gauge slotted for 6 inch adjustment of vertical rails.

 3. Base cover: 18 gauge cold rolled steel.

 4. Insert panels: 20 gauge cold rolled steel/or optional fabric covered tackboard.

 B. Wall Rails:

 1. Nominal dimensions:

 a. Width: single slotted 1-1/2", double slotted 3"

 b. Depth: 1.0"

 c. Height: 36", 84"

 2. Horizontal cross rails: 14 gauge cold rolled steel.

 3. Rail, when secured to wall, shall be capable of supporting worst-case loading conditions.

 4. Hanging components (cantilever table frames, shelves, etc.) shall be vertically adjustable in one inch increments.

 5. Closure panels shall be inserted without tools and shall be removable without removal of cantilever table frames or suspended cabinetry.

 6. Installed 84" high rails shall support following components, each loaded to its maximum rating:

 a. Outside shelves.

 b. Wall cases.

 c. One cantilever work surface.

**2.04 SHELVES**

 A. General requirements for shelves:

 1. Shelves, have removable shelf 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.; 12" = 180 lbs.; 18" = 130 lbs.; 24" = 100 lbs.

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

**2.05 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, 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 – 1999 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. 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.

**3.02 ADJUSTING**

 A. Repair or remove and replace defective work, as directed by FAU (Facilities Planning Representative) upon completion of installation.

**3.03 CLEANING**

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

 B. Clean all dust, dirt and debris resulting from installation from floors and walls.

**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