## PART 1 – GENERAL

**1.00 SUMMARY**

 A. Section Includes:

 1. Tables.

 2. Support structures.

 3. Shelves.

 4. Floor mounted and suspended base cabinets/wall cases.

 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.

**1.01 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 utility core and support structures and tables.

 B. Utility Cores: Support structure for tables, storage units and shelves, and service chase for all service and drain lines.

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

 2. Utility cores can be supported with floor plates bolted to floor and anchored to the ceiling grid system and/or structural ceiling deck or with multi-configured panel system, structural tables, and floor type casework.

 3. Equipped with easy to remove access panels with integral fasteners.

 C. Panels: Support structures for tables, storage units and shelves.

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

 2. Panels can be supported with adjoining perpendicular panels or structural tables or base units.

 3. Equipped with easy to remove access panels with integral fasteners.

 D. Tables: Modular, interchangeable work surface support structures in both fixed height and adjustable height configurations.

 1. **Adjustable height** tables include cantilever, four‑leg mechanical adjustable, and two-pedestal leg table, crank adjustable configurations.

 2. **Fixed height** tables include two‑leg, structural and extended frame configurations.

 3. Caster and leveler options are available on both fixed height and adjustable height tables.

 E. 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, other than floor and ceiling structure attachment.

 3. Core type support structures support cupsinks, service fittings, fixtures, and supply and waste lines using commercially available pipe clamps.

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

 5. Core access panels feature integral snap‑on "hook and loop" fasteners for quick, easy access to service chase area. All access panels are half width and can be removed even when cabinets are directly in front of the panel.

 6. Suspended base cabinets can be removed without removal of the work surface.

 7. Wall cabinets are adjustable vertically and laterally and can be removed without the use of tools.

 8. Suspended base cabinets can be relocated while fully loaded and installed in any position between table legs.

 9. 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 large scale plans and elevations of individual and battery casework units, cross sections, rough-in and anchor placements, tolerances and clearances. Indicate relation of units to surrounding walls, windows, doors and other building components.

 B. Product Data: Submit manufacturer's catalog for reference. Provide overall cabinet dimensions, configurations, construction details, joint details, attachment details, and roughing in details as required.

 C. Product samples to be submitted for approval (1 each):

 1. Worktop construction: 4" x 4" samples of each material.

 2. Finish: Samples 3" x 5" of all available standard stain colors and natural finish.

**1.04 QUALITY ASSURANCE**

 A. Single source responsibility: Laboratory furniture system, casework, work surfaces, laboratory equipment, laboratory fume hoods and accessories shall be manufactured or furnished by a single laboratory furniture company.

 B. Manufacturer's qualifications: Modern plant with proper tools, dies, fixtures and skilled fabricators to produced 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.

* 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 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. Design, materials, construction and finish of casework specified is the minimum acceptable standard of quality for adaptable laboratory wall system. The basis of this specification is Hamilton Laboratory Solutions, 825 East Albert Drive, Manitowoc, WI 54220.

 B. Vendors proposing equipment which differs from that specified must submit, at least ten days prior to bid, sufficient documentation, in the form of drawings, specifications and samples, to indicate their compliance with the requirements of the specifications, and secure written approval by the owner's/architect's representative in addendum form prior to bid date.

 C. Warranty: Provide manufacturer's one year warranty against defects in materials and workmanship. Subject to provisions of the warranty, manufacturer agrees to repair or replace non-conforming products or its parts for the warranty period following substantial completion.

**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.

 b. 4 leg adjustable height table frame: 11 gauge cold rolled steel.

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

 4. Finish: Chemical resistant powder paint finish in manufacturer's standard color to be selected.

 B. Cantilever Table Frame:

 1. Nominal table frame dimensions:

 a. Width: [24"] [30"] [36"] [48"] [60"] [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" 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 less than the table width to allow for clearance for table frame uprights on 24" deep table frames.

 7. Weight capacity: Work surface plus 600 pounds.

 C. Structural Table Base:

 1. Nominal base dimensions:

 a. Width: [24"] [30"] [36"] [48"] [60"] [72"].

 b. Depth: [23"] [29"].

 c. Height: [26"] [29"] [36"].

 2. Capable of attaching to and providing support for cores and panels.

 3. Leg members shall have two finger locking hooks.

 4. Table frame shall provide support channels from which suspended cabinets can be hung and adjusted horizontally. 29" deep bases shall allow suspended cabinets to be hung directly in front of the leg member for complete cabinet utilization (e.g. 48" suspended cabinet hanging from 48" add‑on table base). 29" deep bases shall allow cabinets to straddle leg members, resulting in suspended cabinets hanging from two adjacent table bases. 23" deep bases shall allow cabinet to be hung only between table arm supports.

 5. Weight capacity: Work surface plus 600 pounds.

 D. Four Leg Adjustable‑Height Table

 1. Nominal base dimensions:

 a. Width: [36"] [48"] [60"] [72"].

 b. Depth: [23"] [29"].

 c. Height range: [28" to 37‑3/8"].

 2. Freestanding table capable of supporting suspended base cabinets.

 3. Table can be equipped with levelers or casters.

 4. Outer leg: 11 gauge cold rolled steel C‑channel.

 5. Inner telescoping leg: 16 gauge cold rolled steel rectangular tubing.

 6. Adjustment mechanism: Mechanical with locking bolts.

 7. Weight capacity: Levelers ‑ 600 pounds; casters ‑ 300 pounds.

 E. Adjustable Height Table (Crank Type):

 1. Nominal base dimensions:

 a. Width: [36"] [48"] [60"].

 b. Depth: [23"] [29"].

 c. Height range: [26" to 37"] [29" to 40"].

 2. Base shall be infinitely adjustable and self-‑ locking throughout its 11" range.

 3. Table shall be capable of supporting suspended cabinetry on 24" depth units only.

 4. Front and back cover panels: 20 gauge cold rolled steel.

 5. Structural modesty panel: Box construction of 18 gauge cold rolled steel.

 6. Cross rail: Box construction of 16 gauge cold rolled steel.

 7. Weight capacity: Work surface plus 300 pounds.

 F. Fixed Height Table:

 1. Nominal base dimensions:

 a. Width: [36"] [48"] [60"] [72"].

 b. Depth: [23"] [29"] [35"].

 c. Height: [29"] [36"].

 2. Freestanding table capable of supporting suspended base cabinets.

 3. Rectangular and 90 corner configurations.

 4. Structural modesty panel: Box construction of 18 gauge cold rolled steel.

 5. Leg upright: 16 gauge cold rolled steel.

 6. Feet: Die cast aluminum.

 7. Weight capacity: Leveler and casters - 600 pounds.

 G. Extended Frame Table:

 1. Nominal base dimensions:

 a. Width: [36"] [48"] [60"] [72"].

 b. Depth: [23"] [29"].

 c. Height: [29"] [36"] [66"] [84"].

 2. Structural modesty panel: Box construction of 18 gauge cold rolled steel with plastic "cable entry" grommets.

 3. Base unit shall provide support channels from which suspended cabinets can be hung and adjusted horizontally. 29" deep bases shall allow suspended cabinets to be hung directly in front of the leg member for complete cabinet utilization (e.g. 48" suspended cabinet hanging from 48" table base with structural modesty panel). 29" deep bases shall allow cabinets to straddle leg members, resulting in suspended cabinets hanging from two table bases with structural modesty panels.

 4. 16 Gauge Vertical Uprights: Accommodate overhead storage, loaded to accommodate a maximum rating for a total 1520 lbs.

 5. Weight capacity: Work surface plus 600 pounds.

**2.03 SUPPORT FRAMES**

 A. General requirements for core type support structures:

 1. Riser uprights: 6" wide 16 gauge cold rolled steel supplied with leveling guides.

 2. Slotted adjustment punched into riser upright: notched for one inch adjustment of components supported off riser upright.

 3. Frames: Cold rolled steel, resistance welded. Frame members and tie rail brackets: 16 gauge; corner gussets: 14 gauge.

 4. Base rails: 16 gauge.

 5. Top Rail Assembly: 16 gauge Top Rail; 18 gauge Reinforcement Channel

 6. Intermediate Cross Rails: 16 gauge.

 7. Closure panels: 20 gauge cold rolled steel.

 8. Closure panel fasteners: "Dual‑lock".

 9. Adjustable floor clamps: Two per frame; 11 gauge cold rolled steel.

 10. Plug caps: ABS flame retardant plastic, color matched.

 B. Structural Utility Frame:

 1. Nominal dimensions:

 a. Width: [24"] [30"] [36"] [48"] [60"] [72"].

 b. Depth: [6"].

 c. Height: [84" to 120"] with telescoping vertical riser.

 2. Service area: Minimum (two each 3" x 8"; above 36" work height, two each 4" x 8" horizontal utility chase below 36" work height) between uprights and tie rails for service installation.

 3. Floor clamps: 11 gauge cold rolled steel, supplied with one rawl bolt for concrete floor anchorage.

 4. Frame shall be capable of anchoring to the floor, and/or anchored to the base cabinets, and attaching to the ceiling grid at various heights, with infinite adjustment, with 2 (two) telescoping riser extensions:

 **[Specifier's Option]:**

 **Short riser extension: 7'9" to 9'3"**

 **Long riser extension: 8'9" to 10'3"**

 5. Frame, when secured to floor and ceiling grid, or building structure, shall be capable of supporting worst‑case loading conditions without end riggers.

 6. Hanging components (cantilever table frames, wall cases, shelves, etc.) shall be vertically adjustable in 1" increments.

 7. Closure panels shall snap on without tools and shall be removable without removal of cantilever table frames or suspended cabinetry.

 8. Installed 84" high core shall support following components, each loaded to its maximum rating for a total of 2,280 lbs. (evenly balanced on both sides).

 a. Outside shelves - 6", 8", 12" - 180 lbs.; 18" - 130 lbs.; 24" - 100 lbs.

 b. Wall cases - 300 lbs.

 c. Two cantilever work surfaces - 600 lbs. each side.

 9. Ceiling Channel:

 a. Bottom ceiling channel shall be manufactured from 20 gauge cold rolled steel to provide a positive means of attachment to the ceiling T-grid system and/or solid ceiling deck and the telescoping vertical riser.

 b. Upper Ceiling channel (suspended ceiling only) shall be manufactured from 18 gauge galvanized steel. Ceiling panel shall be sandwiched between the upper and lower channel and shall be drilled with self-tapping screws to provide a semi-permanent, secured, non-skidding ceiling attachment.

**2.04 SHELVES**

 A. General requirements for shelves:

 1. Shelves, hat channel supports, and separate 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.] [8" = 180 lbs.] [12" = 180 lbs.] [18" = 130 lbs.] [24" = 100 lbs.]

 B. Outside Shelf:

 1. Nominal dimensions:

 a. Length: [24"] [30"] [36"] [48"] [60"] [72"].

 b. Depth: [6"] [8"] [12"] [18"] [24"].

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

 3. Shelf brackets shall rise above the shelf surface to provide sides.

**2.05 SUSPENDED BASE CABINETS/WALL CASES**

 A. Design requirements, performance requirements, materials, fabrication and hardware shall comply in all respects with fixed wood and/or steel casework specifications in this section.

 B. Suspended cabinet hardware: Provide a system of steel C-channels and brackets attached to the casework frames, enabling the installation and removal of suspended base cabinets without the use of special tools.

 C. Suspended wall case hardware: Provide a system of 11 gauge cold-rolled steel hanger rails attached to the casework frames, to be vertically adjustable on one inch increments. Installation and removal of suspended wall cases to be accomplished without the use of tools.

**2.06 SERVICE/UTILITY PANELS**

 A. Service/Utility facing inserts shall be 20 gauge cold rolled steel. Service facing inserts shall be attached with non-exposed carbon steel/zinc plated fasteners to the support frame. Service facing inserts shall provide a means of support and easy access and reconfiguration for the following utilities:

 **Integrated Electrical Fixture Panels:**

* 15 and 20 Amp Duplex Outlets
* UPS Outlets, GFI Outlets
* Fiber Optic Quick Connects
* Voice, Data, Modem and Fax Connects
* PC Toten Ring Connects

**Integrated Service Fixture Panels:**

* Air, Gas, Vacuum
* DiH20
* Hot Water/Cold Water

 **Integrated High Purity Gas Panels:**

* Designed to supply instrument grade gases including
* UHP (99.999% pure)
* Regulator Valves of Stainless Steel and/or Brass/Copper
* Outlet Valves of Stainless Steel and/or Brass/Copper

  **Integrated Cup Sink Panels:**

* One piece molded polyethylene liner with integral cupsink with revisions of gooseneck nozzles with/without vacuum breakers.

**2.07 UPPER FACING INSERTS**

 **(Specifier's Options)**

 A. Removable and reconfigurable 6mm laminated safety glass panel held in place within the structural core by an extruded PVC channel.

 B. Removable and reconfigurable steel access panels attached with snap-on "hook and loop" fasteners.

 C. Removable and reconfigurable fabric/acoustical access panels attached with snap-on "hook and loop" fasteners.

 1. Nominal Dimensions:

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

 b. Height: 26.5"

 c. Depth: 1" (Located at center of 6" wide Wall Core)

**2.08 CEILING FACING INSERTS**

 A. Structural Utility Frame to support a system of ceiling enclosure units. Telescoping Vertical Riser to incorporate an integral panel frame within standard module dimensions to be attached bottom and sizes to the support structure and captured at the top by the ceiling channel.

 1. Nominal Dimensions:

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

 **b. Depth: (Specifier's Option)**

 c. Height: three sizes: 12", 24" and 36" (Nominal)

 [Specifier's Option]:

 Ceiling Enclosure:

 a. 20 gauge cold rolled steel, powder coated

 b. 20 gauge panel frame capturing a 6mm laminated safety glass panel

 c. 1/2" fabric covered tackable, acoustical panel

**2.09 MODULAR DOOR FRAME ASSEMBLIES**

 A. Structural Utility Frame to support a system of door module units. Structural Utility Frame to incorporate an integral door frame within standard module dimensions. Manufacturer to supply hinge hardware. Owner to finish door to building standard. Owner to provide door latch/lock.

 B. Active door units to incorporate a tempered glass window option. Door Module to accommodate 40" wide laboratory fume hoods, mobile instrumentation and apparatus without removal of door unit.

 1. Nominal dimensions:

 a. Width: 48" (36" Active Door/8" Inactive Door) Single and Double swing capabilities; 60" (36" Active Door/20" Inactive Door) Single and double swing capabilities.

 b. Depth: 1-3/4" thick Hollow Core door units to be suspended for a 7" wide 16 gauge cold rolled steel integral door jam.

 c. Door Height to Door Jam: 6'8" clear

 2. Door Units:

[Specifier's Option]:

 a. 20 gauge cold rolled steel, primed only, with sound deadening material.

 b. \*Plain Sliced Oak, book matched veneers, unfinished, with sound deadening material.

 c. \*Rotary Cut Birch, book matched veneers, unfinished, with sound deadening material.

 d. \*Rotary Cut Maple, book matched veneers, unfinished, with sound deadening material.

 \*Hard wood lumber, clean and free of defects. All lumber kiln dried to uniform moisture content of six percent.

**2.10 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 standards.** At the owner’s request, independent, third party performance testing must be submitted validating compliance and adheres to the finish specifications.

## 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.

## 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.

 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