**PART 1 – GENERAL**

**1.00 SUMMARY**

 A. Section Includes:

 1. Steel casework.

 2. Table frames.

 3. Work surfaces.

 4. Sinks and outlets.

 5. Service fittings.

 6. Accessory equipment.

 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 CASEWORK DESIGN REQUIREMENTS**

A. Flush construction: Surfaces of doors, drawers and panel faces shall align with cabinet fronts without overlap of case ends, top or bottom rails. Horizontal and vertical case shell members (panels, top rails and bottoms) shall meet in the same plane without overlap, cracks or crevices.

B. Slim line styling: Front width of end panels 3/4" and front height of top and bottom members 1".

C. Self-supporting units: Completely welded shell assembly without applied panels at ends, backs or bottoms, so that cases can be used interchangeably or as a single, stand‑alone unit.

D. Interior of case units: Easily cleanable, flush interior. Base cabinets, 30" and wider, with double swinging doors shall provide full access to complete interior without center vertical post.

E. Drawers: Sized on a modular basis for interchange to meet varying storage needs, and designed to be easily removable in field without the use of special tools.

F. Case openings: Rabbeted joints all four sides of case opening for hinged doors and two sides for sliding doors in order to provide dust resistant case.

G. Framed glazed doors: Identical in construction, hardware and installation to solid panel doors. Design frame glazed doors to be removable for glass replacement.

**1.03 CASEWORK PERFORMANCE REQUIREMENTS**

A. Structural performance requirements: Casework components shall withstand the following minimum loads without damage or permanent deformation to the component or to the casework operation:

 1. Steel base unit load capacity: 500 lbs. per lineal foot.

 2. Suspended units: 300 lbs.

 3. Drawers in a cabinet: 150 lbs.

 4. Utility tables (4 legged): 300 lbs.

 5. Hanging wall cases: 300 lbs.

 6. Load capacity for shelves of base units, wall cases and tall cases: 40 lbs. per square foot, up to 200 lbs.

 B. Metal Finish Performance Requirements:

 1. Abrasion resistance: Maximum weight loss of 5.5 mg per 100 cycle when tested on a Taber Abrasion Tester #E40101 with 1000 gm wheel pressure and Calibrase #CS10 wheel.

 2. Hardness: Surface hardness equivalent to 4H pencil.

 3. Humidity resistance: Withstand 1000 hour exposure in saturated humidity at 100°F.

 4. Moisture resistance:

 a. No visible effect to surface finish after boiling water trickled over test panel inclined at 45°F for five minutes.

 b. No visible effect to surface finish following 100 hour continuous application of a water soaked cellulose sponge, maintained in a wet condition throughout the test period.

 5. Adhesion: Score finish surface of test panel with razor blade into 100 squares, 1/16" x 1/16", cutting completely through the finish but with minimum penetration of the substrate, and brush away particles with soft brush. Minimum 95 squares shall maintain their finish.

 6. Salt spray: Withstand minimum 200 hour salt spray test.

 C. Chemical Resistance Finish Performance Requirements:

At specifier's option, insert chemical resistance requirements.

**1.04 WORK SURFACE PERFORMANCE REQUIREMENTS**

*At specifier's option, insert here applicable performance requirements for selected work surfaces from Appendix A.*

**1.05 SUBMITTALS**

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

 A. Shop Drawings: Provide 3/4" = 1'-0" scale elevations of individual and battery of 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. Provide 1/4" = 1'-0" rough-in plan drawings for coordination with trades. Rough-in shall show free area.

 B. Product Data: Submit manufacturer's data for each component and item of laboratory equipment specified. Include component dimensions, configurations, construction details, joint details, and attachments, utility and service requirements and locations.

 C. Product Samples Upon Request: Submit for approval:

 1. Top sample.

 2. Finish sample (3" X 5" painted steel).

 D. Finish Samples: Submit [3 x 5] [\_\_x\_\_] inch samples of each color of finish for casework, work surfaces and for other prefinished equipment and accessories for selection by [Architect] [Owner].

Include following paragraph if specifier elects to include work surface performance requirements from Appendix A.1, A.2 or A.3.

 E. Test Reports: When requested by [Architect] [Owner], submit independent, third party, laboratory certified test reports verifying conformance to test performance specified.

**1.06 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 8 standards.** At the owner’s request, independent, third party 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. Ten years or more experience in manufacture of laboratory casework and equipment of type specified.

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

 D. Installer's qualifications: Factory trained and/or certified by the manufacturer.

 E. Cabinet identification: 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.

**1.07** **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 1.2 – Laboratory Fume Hoods

2. SEFA 2.3 – Installation of Scientific Laboratory Furniture and Equipment

3. SEFA 3 – Work Surfaces

4. SEFA 7 – Laboratory and Hospital Fixtures

5. SEFA 8 – Laboratory Furniture

**1.08 DELIVERY, STORAGE AND HANDLING**

 A. Schedule delivery of casework and equipment so that spaces are sufficiently complete and material can be installed immediately following delivery.

 B. Protect finished surfaces from soiling or damage during handling and installation. Keep covered with polyethylene film or other protective coating.

 C. Protect all work surfaces throughout construction period with 1/4" corrugated cardboard completely covering the top and securely taped to edges. Mark cardboard in large lettering "No Standing."

**1.09 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 are the minimum acceptable standard of quality for inset steel laboratory casework. The basis of this product specification is Hamilton Laboratory Solutions, 825 East Albert Drive, Manitowoc, WI 54220

**2.02 CASEWORK MATERIALS**

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

 B. Minimum gauges:

 1. 20 gauge: Solid door interior panels, drawer fronts, scribing strips, filler panels, enclosures, drawer bodies, shelves, security panels and sloping tops.

 2. 18 gauge: Case tops, ends, bottoms, bases, backs, vertical posts, uprights, glazed door members, door exterior panels and access panels.

 3. 16 gauge: Top front rails, top rear gussets, intermediate horizontal rails, table legs and frames, leg rails and stretchers.

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

 5. 11 gauge: Table leg corner brackets and gussets for leveling screws.

C. Glass for glazed swinging and sliding doors and/or unframed doors: **[Specifier's Option]**

* 6mm Clear Float Glass (unframed)
* 6mm Safety Glass – Laminated (framed)
* 6mm Safety Glass – Tempered (framed)

**2.03 CASEWORK FABRICATION**

 A. Base Units and Cases:

 1. Base units and 25", 31" and 37" high wall cases: End panels and back reinforced with internal reinforcing front and rear posts.

 2. 49" and 84" high cases: Formed end panels with front and rear reinforcing post channels; back shall be formed steel panel, recessed 3/4" for mounting purposes.

 3. Posts: Front post fully closed with full height reinforcing upright. Shelf adjustment holes in front and rear posts shall be perfectly aligned for level setting, adjustable to 1/2" o.c.

 4. Secure intersection of case members with spot and arc welds. Provide gusset reinforcement at front corners.

 5. Base unit backs: Provide drawer units without backs and cupboard units with removable backs for access to services behind units.

 6. Base unit backs: Provide fixed backs at all drawer and cupboard units. No access to services behind.

1. Bottoms: Base units and 25", 31", 37" and 49" high wall cases shall have one piece bottom with front edge formed into front rail, rabbeted as required for swinging doors and drawers and flush design for sliding doors.

Following paragraph is a casework back option for access to services behind units.

1. Top rail for base units: Interlock with end panels, flush with front of unit.

Following paragraph is a casework back option for vermin protection (no access to services behind).

 9. Horizontal intermediate rails: Recessed behind doors and drawer fronts.

 10. Base for base units: 4" high x 3" deep with formed steel base and 11 gauge die formed steel gussets at corners. Provide 3/8" diameter leveling screw with integral bottom flange of minimum 0.56 sq. in. area at each corner, accessible through openings in toe space.

 11. Tops of wall cases: One piece, with front edge formed into front rail.

 B. Drawers: [Steel – **Standard Default**]

 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 coved raceways for both case and drawer with nylon tired, ball bearing rollers; self‑centering and self‑closing when open to within 3" of the closed position.

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

 5. Provide security panels for drawers with keyed different locks.

 6. File drawers: Provide with 150 lbs. full extension slides for full access and operation.

 C. Drawers: [**Specifier’s Option**]

 1. Wood Drawer Fronts: 3/4 ” thick, solid core 3-ply construction veneered two sides and banded four sides with 3mm hardwood or 3/4” radiused hardwood. Standard manufacturer’s option to include:
• Plain-Sliced Red Oak (Combination Grain) • Rift-Cut Red Oak (Combination Grain)
• Plain-Sliced Maple (Vertical Matched Grain)
• Rift-Cut Red Oak (Vertical Matched Grain)
• Plain-Sliced Red Oak,3/4” Radiused Edge (Combination Grain)
• Rift-Sliced Red Oak, 3/4” Radiused Edge (Combination Grain)
• Plain-Sliced Select White Maple• Rotary-Cut Select White Maple
• Plain-Sliced Select White Maple (Vertical Matched Grain)
• Rotary-Cut Select White Maple (Vertical Matched Grain)
• Plain-Sliced Select White Maple, 3/4” Radiused Edge (Combination Grain)
• Rotary-Sliced Select White Maple, 3/4” Radiused Edge (Combination Grain)

 2. Plastic Laminate Drawer Fronts: 3/4” thick, solid core 47 psi particleboard construction with 3mm PVC edge banding machine applied to the front edge.

1. Drawer suspension: **[Specifier's Option]**

1. Heavy duty coved raceways for both case and drawer with nylon tired, ball bearing rollers; self‑centering and self‑closing when open to within 3" of the closed position – **Standard Default**
2. Accuride (or equal) 150 lb. full extension drawer slides. File drawers: Provide with 150# full extension slides for full access and operation.

1. Provide drawer with rubber bumpers. Friction centering devices are not acceptable.
2. Provide security panels for drawers with keyed different locks.

 E. Doors: [Steel – **Standard Default**]

 1. Solid panel doors: 3/4" thick, double wall, telescoping box steel construction with interior pre-painted and sound deadened. Reinforce interior of front panel with welded steel hat channels. Hinges with screws to internal 14 gauge reinforcing in case and door. Hinges shall be removable; welding of hinges not acceptable. Doors shall close against rubber bumpers.

 2. Frame glazed doors: Outer head to be one piece construction. Inner head to consist of top, bottom and side framing members which are removable for installation or replacement of glass. Provide continuous vinyl glazing retainer to receive glass. In all other respects, framed glazed door construction and quality shall match solid panel doors.

 3. Sliding doors – solid or framed glazed: Design for tilt-out removal after removal of bottom guide. Doors shall be hung with nylon tired sleeve bearing rollers in formed steel top hung track and shall close against rubber bumpers.

1. Unframed sliding glass doors: Glass with edges ground set in extruded aluminum shoe with integral pulls, wheel assemblies and top and bottom extruded aluminum track. Provide rubber bumpers at fully opened and closed door position.

F. Doors: [**Specifier’s Option**]

1. Wood Door Fronts:3/4” thick, solid core 3-ply construction veneered two sides and banded four sides with 3mm hardwood or ¾” Radiused hardwood. Standard manufacturer’s option to include:
• Plain-Sliced Red Oak (Combination Grain) – **Standard Default**• Rift-Cut Red Oak (Combination Grain)
• Plain-Sliced Maple (Vertical Matched Grain)
• Rift-Cut Red Oak (Vertical Matched Grain)
• Plain-Sliced Red Oak,3/4” Radiused Edge (Combination Grain)
• Rift-Sliced Red Oak, 3/4” Radiused Edge (Combination Grain)
• Plain-Sliced Select White Maple• Rotary-Cut Select White Maple
• Plain-Sliced Select White Maple (Vertical Matched Grain)
• Rotary-Cut Select White Maple (Vertical Matched Grain)
• Plain-Sliced Select White Maple, 3/4” Radiused Edge (Combination Grain)
• Rotary-Sliced Select White Maple, 3/4” Radiused Edge (Combination Grain)

 G. 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.

 3. Pull out shelves: Same suspension as specified for drawers.

 H. Base molding: 4" high, to be furnished and installed by flooring contractor.

 I. Corner base guards: 4" high #304 stainless steel corner guards.

 J. Hardware:

 1. Drawer and hinged door pulls: Clear anodized extruded aluminum, screw attached on 4" centers. **[Specifier's Option]**

 • Pull Locationa. Configuration 1 (Standard)

 Horizontal at drawers, vertical at doors

 b. Configuration 2 (Option)

 Horizontal at drawers and doors.

 c. Configuration 3 (Option)

 Horizontal at drawers, vertical at doors.

 d. Configuration 3 Only

 Flush stainless steel finger pull

####  • Pull Types - Available in Configuration 1 & 2 Only

* 1. Brushed Aluminum rectangular style finger pull (Standard)
	2. Aluminum wire finger pull (Option)
	3. Chameleon powder coat wire finger pull (Option)
	4. Black powder coat wire finger pull (Option)
	5. Gray powder coat wire finger pull (Option)
	6. Stainless steel wire finger pull (Option)
	7. 26S Satin chrome wire finger pull (Option)
	8. Polished chrome wire finger pull (Option)

 • Pull Types - Available in Configuration 1 & 3 Only

 Semi-recessed polypropylene pull (Option)

 a. Chameleon

 b. Black

 c. Gray

 d. White

 2. Sliding door pulls: Recessed stainless steel, styled and sized to harmonize with drawer pulls.

 3. Hinges: Institutional type, five knuckle projecting barrel hinges, minimum 2‑1/2" long, type 302 or 304 stainless steel. Provide two hinges for doors up to 36" high; three hinges for doors over 36" high. Drill each leaf for three screw attachment to door and frame.

 4. Door catches: Adjustable type, spring actuated nylon roller catches.

 5. Elbow catches: Spring type of cadmium plated steel, with strike of suitable design.

 6. Locks: National Lock Remove‑A‑Core 5‑disc **[Standard]**
**[Optional: 5-pin]** tumbler, heavy duty cylinder type. Exposed lock noses shall be dull nickel (satin) plated and stamped with identifying numbers.

 7. Keying: Locks [location shown on drawings] shall have capacity for 225 primary key changes. Master key one level with the potential of 40 different, non‑interchangeable master key groups.

 *Select above for master key, below for grand master key s*ystem.

 8. Keying: Locks [locations shown on drawings] shall have capacity for 2000 primary key changes. Master key one level with built in flexibility to accommodate, if required, 3‑levels: 1 Grandmaster, 59 Master groups and 70 Sub‑master groups with 13 primary changes under each.

 9. Keys: Stamped brass available from manufacturer or local locksmith, and supplied in the following quantities unless otherwise specified:

 • Two (2) for each keyed different lock.

 • Three (3) for each group keyed alike locks.

 • Two (2) for master keys for each system.

 10. Label holders: [locations shown on drawings] Formed steel with satin chrome finish, 1" x 1‑1/2", screw installed.

 11. Shelf clips: Die formed steel, zinc plated, designed to engage in shelf adjustment holes.

 12. **[Specifier's Option]** File followers: Metal backs engaging in steel bottom channel, with spring positioning lock.

**2.04 TABLE FRAMES**

 A. Table frames: 4‑1/2" high "C" channel front and back aprons, end rails and cross rails.

 B. Table drawers: Provide front and back rails; drawer unit, hardware and suspension same as specified for base unit drawers.

 C. Legs: 2" x 2" steel tube legs with welded leg bracket. Attach legs with two bolts to front and back aprons and weld to end rails. Each leg shall have a recessed leveling screw and a black, coved vinyl or rubber leg shoe, 2" in height.

 *Following two paragraphs are options; edit as appropriate for project.*

 D. Knee space frame: 2" high apron where no drawers required.

 E. Leg rails and stretchers: Channel formed.

**2.05 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

 a. 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.

 b. 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±3°F / 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 # 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

###

###  c. 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

### a. Purpose of Test

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

### b. 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 (177.44 cc) per minute on the surface, which shall be set at an angle of 45° 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.

##  3. 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.

 4. 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.

##  5. 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

 • 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.

 c. Acceptance Level

 The paint shall have a hardness of 4-H minimum with no visible puncture of the finish surface.

**2.06 WORK SURFACES**

Insert specification for selected work surfaces from Appendix A.

**2.07 SINKS, DRAINS AND TRAPS**

*Insert specification for selected sinks, drains and traps from Appendix B.*

**2.08 LABORATORY FITTINGS**

Insert specification for selected laboratory fittings from Appendix C.

**2.09 ACCESSORY EQUIPMENT**

Insert specification for selected accessory equipment from Appendix D.

**PART 3 – EXECUTION**

**3.01 INSTALLATION**

 A. Casework installation:

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

 2. Bolt continuous cabinets together with joints flush, tight and uniform, and with alignment of adjacent units within 1/16" tolerance.

 3. Secure wall cabinets to solid supporting material, not to plaster, lath or gypsum board.

 4. Abut top edge surfaces in one true plane. Provide flush joints not to exceed 1/8" between top units.

 B. Work surface installation:

 1. Where required due to field conditions, scribe to abutting surfaces.

 2. Only factory prepared field joints, located per approved shop drawings, shall be permitted. Secure joints in field, where practicable, in the same manner as in factory, with dowels, splines, adhesive or fasteners recommended by manufacturer.

 3. Secure work surfaces to casework and equipment components with material and procedures recommended by the manufacturer.

 C. Sink installation: Sinks which were not factory installed shall be set in chemical resistant sealing compound and secured and supported per manufacturer's recommendations.

 D. Accessory installation: Install accessories and fittings in accordance with manufacturer's recommendations. Turn screws to seat flat; do not drive.

**3.02 ADJUSTING**

 A. Repair or remove and replace defective work, as directed by [Architect] [Owner] upon completion of installation.

 B. Adjust doors, drawers, hardware, fixtures and other moving or operating parts to function smoothly.

**3.03 CLEANING**

 A. Clean shop finished casework, touch up as required.

 B. Clean countertops with diluted dishwashing liquid and water leaving tops free of all grease and streaks. Use no wax or oils.

**3.04 PROTECTION OF FINISHED WORK**

 A. Provide all necessary protective measures to prevent exposure of casework and equipment from exposure to other construction activity.

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

END OF SECTION